

**Investigation of relationship between agricultural growth and macroeconomic variables in Iran**Masoud Dehdashti <sup>1</sup>, Hamid Mohammadi <sup>2</sup><sup>1</sup> Department of Economics and Management, Dashtestan Branch, Islamic Azad University, Dashtestan, Iran<sup>2</sup> Department of Agricultural Economics, University of Zabol, Zabol, Iran[dehdashti@diau.ac.ir](mailto:dehdashti@diau.ac.ir)

**Abstract:** Agriculture is one of the main sectors of Iranian economy that contributes to economic growth and it can release Iranian economy from depending on single-product situation. Agriculture sector like other sector is affected from changes in macroeconomic variables. During passing to a developed agriculture, it is important to consider the macroeconomic variables relation as the relations affect the economic policies efficiency and agricultural growth. Investigating these variables impacts on agriculture sector may help policy makers and planners. This study investigates dynamic relation between agricultural sector income and macroeconomic variables in integration framework during 1338-1387. To get the study objective, autoregressive distributed lag (ARDL) approach and Johansson integration model was used. Findings of the study showed a long-run relationship between selected macroeconomic variables and agriculture sector income. There is a positive (negative) relation between agriculture prices and agriculture income in short run (long run) . We also found a negative (positive) relation between interest rate (exchange rate) and agriculture income in short and long run. A positive relation in short run and negative relation in long run also are expected between money volume and agriculture income. Oil income has a positive and significant impact on agriculture income; however, it is unimportant in value and occurs with time lag.

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**1. Introduction**

Decreasing of oil resources and the increasing vulnerability of single product economy, the need for policy in this country requires deep. Agriculture is one of the most important sectors of the economic that can provide growth aspects and independence and self-sufficiency. Contribution of agriculture to economic development, food security, supply of raw materials industry creating additional sources of external borders to imports of capital goods and productive employment indicates the importance of agriculture and its role in the economic of developing countries (Najafi, 2003).

Iran's irrigated land suitable to produce in very good Position to achieve such growth rates in the agricultural sector. But some of the existence policies required facilitating the full realization of its potential to increase farm income and transfer coefficient and the rural non-farm sector takazry it does not work (mouler, 2004).

The role of agriculture as the main cause of poverty strengthening day by day. Its rural in poverty all aviation as its role in ensuring food security. In low-income countries the majority of the population are poor and their income directly from agricultural or indirect to gain a dependent agricultural growth can to help improve farmers income and then this revenue help to non-agricultural and ultimately help to reduce poverty and increase of welfare of the community to effectively (ahmad, 2002). In general,

in economic development status agriculture sector (particularly in developing countries) is particular importance. Hence the implementation of economic policies (monetary policy, financial and commercial) for consistency with the global economy and optimum use of limited resource and the macroeconomic variables as instruments for government policy is necessary (nassiri, 2004) agriculture's role in Iran's economy as developing country is no exception. The share of agricultural in employment, GNP and exports and also the changes in the Iran's economic.

Development status reflects the degree of economic dependence to agriculture and existence agriculture. Agricultural sector in country had Sustainable growth and was as economic growth index. Although in recent centuries has taken Step in the industrial development but, Iran's agricultural sector directly and indirect is main economic activities for people of our country. After the Islamic revolution, in the first second and third and also in fourth program, agriculture was as development (Tehranchiyan, 2007). Government policies on agricultural development can lead to self-sufficiency in food production needed and increasing of agricultural exports thereby reducing dependence of foreign sources of oil provide (nasiri, 2004).

Governments to intervene in the agricultural sector and food security on the one hand through macroeconomic policies such as monetary policy,

financial and currency trading and the other using certain agricultural and food policy intervention with influence on the trend of prices and production of crops in economic (Qetmiri & Harati, 2003). Given the importance of the agricultural sector, the government's economic policies had in this sector the importance and high sensitivity. Implementation of these policies done by impact of these policies on macroeconomic variables. Monetary policy through changes in the volume of money, interest rates or the granting of financial liabilities is done. Financial policies apply through the implementation of development plans and annual budgets and the state tax and non tax revenues (Sasoli & Saleh, 2007). Policies related to the exchange rate through changes in relative prices, cause changes in allocation resources and resulting in changes of income distribution (Davoudi, 2007). With the devaluation of national currency (increasing of exchange rate) will increase the relative price of imported good, therefore, the tendency for domestic commodity and its price rises and income will improve. For example a weakened dollar (weakening of the domestic currency) tends to export its agricultural sector due to lower prices for agricultural commodities in the country, increase of income through improved farming. Similarly, lower interest rates lead to higher farm incomes in the country. Because discount rates, commodity prices without necessarily be less productive, reduce production costs. Prices of agricultural products directly by specific policies including pricing policies such for agricultural crops or indirectly through policies are affected. Fiscal policy through subsidies or tax changes on the directly and indirectly through subsidies to agricultural inputs prices are affected by this section. Also credit policies through changes in the cost of investment in agriculture and foreign policies that the real exchange rate to be carried out, the impact on import prices of foodstuffs or materials producers, the food prices are affected (Qetmiri & Harati, 2003). The effect of oil revenues on agricultural income can vary depending to economic conditions. The order hand, imports of capital goods increased oil revenues in the agricultural sector and increase public investment and credit in the agricultural sector. On the other hand, in countries like our country's growing oil revenues could increase by uncontrolled imports of consumer goods and intermediate and loss of competitiveness, especially in industrial goods to the country that ultimately will lead to Dutch disease. The long-term effects of oil development in terms of both economics and infrastructure requirements that may vary (Mehrara & Miri, 2010). Believe Knuston and colleagues (2000) the relationship between the global economy and agriculture, two channels of

main communication international economic with agricultural can be considered. The first channel related to markets of international goods that conditions of international economic on demand for exports and imports effect supply. Second, related to international capital markets is that demand and supply of national capital, interest rates and exchange rates change in the absence of government intervention. In fact, Macro-Economic Variables are as the enforcing instruments and policies which affect the entire economy. Macro-Economic Variables not only are effective on real income of farmers and relationships relating to other parts of the economy, but also are effective on trade between agricultural and non-agricultural sectors. However, there is a lot of discussion about the mechanism of macro-economic relationship, although different studies have been performed in this field, yet, the effects of macroeconomic variables on the price level and real income in the agricultural sector is a vague and open question (Penson and Gardner, 1999). Effects of different economic variables on the national economy were different and the study of such effects from various aspects is important. So, study of linkages of agriculture with macroeconomic in order to better understand the causes and consequences of changes in agricultural income are evaluated importantly (Baek and Koo, 2008). Paying attention to the points mentioned above and considering the role of agricultural sector in economic growth and development of country and also the importance of the effect of Macro-Economic Variables on it, the analysis of the linkage between such variables with the income of agricultural sector is an important step in order to choose appropriate policies. In Iran, little attention is paid to the direct evaluation and simultaneous short-term and long-term effects of Macro-Economic Variables over the income of agricultural sector. The aims of study, to review the effects of variables of liquidity, interest rates, exchange rates and oil revenue on the income of the agricultural sector in Iran.

## 2. A review of past studies:

Theoretical and experimental studies on the relationship of the mid-1970s and after that have been conducted macroeconomic variables on agricultural sector. In some studies, these variables have to be completely exogenous in the agricultural sector models. Some recent studies have examined the impact of macro variables as endogenous in the agricultural sector. Lachal and Womack (1998) found that the rate of exchange is a significant factor in determining price and trade flows. Significant changes in domestic interest rates on agriculture have been emphasized by Devadoss and Colleagues

(1985), Devadoss and Mayer (1986). On the other hand, such studies like Saghaian and colleagues (2002), Ivanova and colleagues (2003) and Cho and colleagues (2004) have examined the relationship between monetary variables (money and interest rates) and the agricultural sector. Kaabia and Gil (2000) have examined the effects of short-term and long-term macroeconomic variables on agriculture in Spain using the convergence method of Johansson and Vector Error Correction Model (VECM) and showed that mostly the theoretical long-term relationships between macroeconomic variables and agricultural sector is established. While the real demand for money does not depend on the total income and, so, nominal money is neutral. Also, agricultural prices in the long-term are homogeneous and the remarkable thing is that agricultural variables didn't have a meaningful effect on macroeconomic variables. The analysis of short-term relationship between the variables showed that although the long-term agricultural variables are homogeneous, it seems that in short term the agricultural prices are more flexible and reacted faster than input price and farmers benefit from increasing the money supply and common level of prices in a very short term, but instead they incur the loss in long term. Kargbo (2005) reviewed the effect of monetary policy and macroeconomic variables besides the supply and demand factors on food prices in African countries. The results of these studies showed that the variables of income, exchange rate, monetary and trade policies besides changes in level of food production had great effect on food prices, therefore, using Macroeconomic policies to improve food-related policies should be emphasized.

Peng and colleagues(2004) have studied the effects of monetary variables (money supply and interest rates) on prices paid for food in China. For this purpose, they used a VECM approach and found that the monetary variable and food prices in China have a long-term balance. Moreover, the direction of money supply is towards the food price index and then interest rate and the effect of money supply on food prices is more than the interest rates. The results of his study indicate that prices of agricultural products react to the change in interest rate and exchange rate. Harry and colleagues (2009) have examined the relationship between exchange rates, prices of crude oil and cereal prices in the United States. The overall results indicate that the prices of corn, cotton and soybean are associated with the oil price, but for wheat this relationship is not established and exchange rate relating to prices over time is effective. Baek and Koo (2009) have studied macroeconomic variables on net income of farms in America using the ARDL. The results showed that

the exchange rate paid a crucial role in determining a long-term behavior of farmers, but have less effective in the short-term. Also, crops price, and interest rates are main determiners of America's income agricultural sector, in both short and long term. Therefore, the results of this study indicate that changes of macroeconomic variables have wide affect on the ups and downs of America's farm economy. The results of this study have confirmed the hypothesis based upon this point that the macro policies influence farmers more than farm policies. Also, from domestic studies we can indicate study which is done by Fetters (1996), as studied the effect of monetary and fiscal policies on main variables of agricultural sector during the years of 1971- 1991. Based on his research results, and expansionary monetary and fiscal policy, have a positive effect on agricultural production and have negative effect on investment in agricultural sector. Also, the effect of expansionary monetary policy on exports is positive while the effect of expansionary fiscal policy on the export sector is not significant. Moghaddasi and Yazdani (2000) showed that the effect of monetary and fiscal policy on investment agricultural sector and the proportion of agricultural export to total non-oil exports are negative, while the aforesaid policy has a positive relationship with the added value and export and price of agricultural products. Qatmiry and Herat (1382), using ARDL model, reviewed the effects of macro variables on index of food price. The results showed that in short term, the index of food price has a positive relation with the real price of exchange and cash flow and while has a diverse relation with open degree of economy.

Sassoli and Saleh (2007), in order to examine the short term and long term effect of monetary and fiscal policy on added value of agricultural sector, used the data of years of 1977-2004 and logarithmic function form and ARDL and ECM Model (ECM) were used. Results showed that the government costs have positive impact on added value of agricultural sector and with the increase of 1% government costs, added value of agricultural sector increase 5%. But monetary policies have a negative effect and with 1 percent increase in money supply, the rate of 23 percent of agricultural added value is reduced. ECM Model showed that in short term, with the increase of 1% government costs in agricultural sector causes the increase of 5.4% added value of agricultural sector and 1 percent increase in money supply will cause decrease of 19% in added value of this sector. The error correction coefficient mark indicates that in each year 36% of imbalance of a period is adjusted in added value in next period. Azamzadeh and Khaliliyan (2010) have studied the impact of monetary policy on food prices during the

period of 1973-2006. Therefore, the money variables, exchange rates and interest rates were considered as the monetary policy variable and used to estimate the ARDL approach. The results showed that there's a long-term relationship between monetary policy and food price index and the food price index has positive relation with interest rate, liquidity volume and exchange rate. Therefore in this study, short and long run effects of macroeconomic variables on agricultural income during the years 1959 to 2008 were reviewed. All data used in this study was collected from Letters of Statistic of Central Bank and the Statistical Center of Iran and the calculations used by software Excel 2003, Eviews 6 and Microfit 4.0 is done.

### 3. Recognition Pattern:

In order to examine the changes in income for the agricultural sector, the neoclassical production function is used. The overall shape of the income generated in agriculture is as follows:

$$(1) Q = f(X, E)$$

Where, Q is production vector, X is input vector, consisting both fixed and variable inputs, and the E is vector of variables that describe the transfer of technology and other factors of production such as subsidies. Also benefit the agricultural sector can be considered as follows:

$$(2) \pi = P(X, E) - CX$$

Where, P is the vector of prices (product), and C is a vector of input prices. Optimum benefit is obtained from the maximization of equation. Considering the first order condition,  $\frac{\partial f}{\partial X} = c$ ,  $\frac{\partial \pi}{\partial X} = P \cdot \frac{\partial f}{\partial X} - C$ , where  $\frac{C}{P} = c$  is a vector of input real price. The first condition for profit maximization function can be stated as functions of P, C and E (Baek and Koo, 2009). Substituting in equation (2) the optimal profit function ( $\pi^*$ ) or farm income ( $Y^*$ ) is obtained as follows:

$$(6) \ln Y_t = \beta_0 + \beta_1 \ln P_t + \beta_2 \ln IR_t + \beta_3 \ln ER_t + \beta_4 \ln M2_t + \beta_5 \ln OI_t$$

The main objective of this study is to examine the long-run relationship between macroeconomic variables and the added value of agriculture sector. Equation (6) plans long-run relationships between desired variables.

### 4. Methodology:

In order to examine the long-run and short run relationships between dependent variable and explanatory variables of pattern, we can use convergent methods like Engle-Granger method,

$$(3) (\pi^*) = Y^* = g(P, C, E)$$

Considering that the aim of this study is to estimate the coefficients of macroeconomic factors, particularly oil income, currency and interest rate, the transfer factors (E) like government subsidies in equation (3) is assumed constant. Therefore, to examine changes in agricultural income, agricultural income based on Baek and Koo's Model (2009) was as follows:

$$(4) Y_t^* = g(P_t, IR_t, ER_t, M2_t, OI_t)$$

Where in the ( $Y_t^*$ ) the income (value added) in agricultural sector in nth year,  $P_t$  is the price index of agricultural products in Tth divided by the value added of the agricultural sector based on the value added of agricultural sector in base year (1997) was calculated.  $IR_t$  is interest rate in year of t, profit rate of deposits of long term of government bank,  $ER_t$  is real exchange rate in year t,  $M2_t$  is money supply (liquidity volume of Iran) in year t, and  $OI_t$  is oil revenues in year t. The real exchange rate in this study to help Morley-Samuel was calculated. In this method, for calculating the real exchange rate based on the formula below, the nominal exchange rate is adjusted to internal and external price index. (Shaghaghi Shahri, 2005) index. (Shaghaghi Shahri, 2005).

$$(5) \quad PER = NER \frac{P^*}{P} \quad \text{wh}$$

ere in this relationship, RER is the real exchange rate, NER is nominal official exchange rate, P is the price index for consumer goods and services in Iran (CPI) and  $P^*$  is the index of import goods and services ( $P_M$ ).

Changing equations to logarithmic form has desirable features and simplifies the interpretation of results, so, the logarithmic form of relation (4) is expressed based on Baek and Koo's Model (2009) as follows:

ECM. Although, due to existed limits in using Engle-Granger method, ECM methods and also in order to avoid the defects existed in such methods like baise existence in small samples and lack of ability to do the test of statistical hypotheses, suitable methods are offered to analyze the relations between variables as in this field we can indicate Auto Regressive Distributed Lag (ARDL) (Engel and Granger, 1987). This model has a special advantage, as it does not require that all variables have the same cointegration. Also, besides estimating the coefficients of long-term

pattern, an error correction model (ECM) can be applied to examine how to balance short-term adjustments imbalances used. Using this method eliminates the problems associated with autocorrelation and variables. Thus, the estimates of

the ARDL approach due to avoiding such problems and autocorrelation and endogenous are unbiased and efficient (Pesaran et al, 2001). Accordingly, dynamic ARDL model is thus:

(7)

$$\ln Y_t = \alpha_0 + \sum_{i=1}^m \beta_i \ln Y_{t-i} + \sum_{i=1}^n \gamma_i \ln P_{t-i} + \sum_{i=1}^o \theta_i \ln IR_{t-i} + \sum_{i=1}^p \lambda_i \ln ER_{t-i} + \sum_{i=1}^r \mu_i \ln M2_{t-i} + \sum_{i=1}^s \nu_i \ln OI_{t-i} + \gamma_0 \ln P_t + \theta_0 \ln IR_t + \lambda_0 \ln ER_t + \mu_0 \ln M2_t + \nu_0 \ln OI_t + u_t$$

In this regard, m, n, o, p, r, and s the number of variables to be optimized for Variables. A convergence between the plethora of economic variables provides the base of using templates error

correction (Noferesty, 2000). The ARDL error correction model is as shown below (Pesaran al, 2001):

(8)

$$\Delta \ln Y_t = \Delta \hat{\alpha}_0 + \sum_{i=1}^m \hat{\beta}_i \Delta \ln Y_{t-i} + \sum_{i=1}^n \hat{\gamma}_i \Delta \ln P_{t-i} + \sum_{i=1}^o \hat{\theta}_i \Delta \ln IR_{t-i} + \sum_{i=1}^p \hat{\lambda}_i \Delta \ln ER_{t-i} + \sum_{i=1}^r \hat{\mu}_i \Delta \ln M2_{t-i} + \sum_{i=1}^s \hat{\nu}_i \Delta \ln OI_{t-i} + \delta ECT_{t-1} + \hat{u}_t$$

where in, the  $\Delta$  and,  $\alpha, \beta, \gamma, \theta, \lambda, \mu, \nu$  are estimated coefficients of equation (6). ECT represents a component of the error correction.  $\delta$  is component of error correction and shows the speed of adjustment form short-term to long term.

for finding the number of convergent vectors can be used. When using Johansson method, it's necessary that the variables are no stand. However, most studies suggest that there's an experience of co integration from order (1) I, and more in most macroeconomic time series. Therefore, all static variables using Dickey - Fuller are generalized was examined. Dickey-Fuller generalized test results for variables in the intercept and with intercept and trend in Table 1 are shown. Comparison of the critical value of ADF statistic Mac Kinon resulted that all static variables are measured on a difference.

**5. Determine the appropriate number of lags in the VAR Pattern**

Before discussing about the results of the estimation model, ARDL, its essential to examine the presence or absence of long-run equilibrium relationship between the model variables (Noferesty, 2000). For this test Johansson - Juselius convergence

**Table 1: Ducky- Fuller generalized test to determine the static variables**

Intercept from the origin			Intercept from origin and trend	
Variable	ADF test	Level Probability of 5%	ADF test	Level Probability of 5%
LAGR	-7.52* *	3.53	-7.82	-2.94
LPARG	-5.21* *	3.53	-5.17* *	-2.94
LR	-5.87* *	3.53	-5.86* *	-2.94
LER	-6.03* *	3.53	-6.06* *	-2.94
LM2	-7.76	3.53	-7.65*	-2.94
LOI	-5.57* *	-3.66	-3.96	-5.49

Source: Research results  
And \*\*, Significant of levels 5% and 10%, respectively.

Determine the optimum interval method involves the convergence of Johansson (P) in the VAR model is to ensure that the sentences are from

the white noise and the static I (0). For this work, the Information Criterion of (AIC), Schwarz Information Criterion - Byzyn (SC) and likelihood ratio (LM) are

used. If, an equation from the viewpoint of algebraic has the largest amount of Information Criterion of (AIC), Schwartz and Byzyn will be selected as the best equation. Referring to Table 2 and standard

results of Information Criterion of (AIC), Schwartz and Byzyn, the interrupt 3 was determined as the optimal model.

**Table 2) VAR Order Selection**

Schwartz and Byzyn	AIC	Interruption
22.24	111.49	0
43.75	108.17	1
64.85	121.32	2
113.69	140.41*	3

### 6. Estimating the Number Of Vectors Converge:

Using Johansson method, the existence of convergent vectors and number of long term relationship between model variables, with the help of Trace Test and Maximal Eigen Value are examined. The Trace Test studies this hypothesis (zero hypotheses) as the number of convergent vectors is equal to  $r$  and its opposite assumption is existence of  $r$  vector of convergence. If the statistical quantity is greater than critical values, the null

hypothesis is rejected. Similarly, Maximal Eigen Value test is used. Table (3) the amount of statistics and Maximal Eigen Value statistics are seen on meaningful surface of 95%. Totally, considering the results of these two statistics, between the income of agricultural sector and extrovert variables of agricultural products, the interest rate, real exchange rate, money supply and oil income, maximum 4 convergence vectors are confirmed.

**Table (3) - The accumulation of test results and test the maximum eigenvalue of**

Maximum eigenvalue test		Effect test					
		The test statistic	critical value in level	critical value level	The test statistic	critical value level	The critical value level
$H_1$	$H_0$		95%	90%		90%	95%
		*84/56	48/47	45/71	*158/53	18 /109	104/3
1 $r=$	0 $r=$	*66/89	42/67	39/90	*91/63	82/23	77/55
2 $r=$	1 $r \leq$	*40/37	37/07	34/16	*58/32	55/93	53/01
3 $r=$	2 $r \leq$	*34/82	31/00	28/32	*39/59	36/33	33/28
4 $r=$	3 $r \leq$	22/16	24/46	22/78	11/83	23/83	21/01
5 $r=$	4 $r \leq$	3/48	11/54	9/75	3/48	11/54	9/75
6 $r=$	5 $r \leq$	*84/56	48/47	45/71	*158/53	109/18	104/3

Source: Research results

\*significant at 5% level

### 7. Estimation Results and Interpretation of Pattern:

The results of dynamic ARDL model to estimate the relationship of the form (7) and offered through Schwarz Criterion-Byzyn and Akaiek are considered three intervals. Considering that 4 convergence vectors are obtained by Johansson Method, a vector that is compatible with theoretical discussions and also be coordinate with theoretical expectations in Iran, was chosen as highest vector as is shown in table (4).

Coefficients (Table 4) express long-term relationship variables in agricultural sector of Iran.

Accordingly, all coefficients are significant variables in this model are meaningful. Note that all variables are inserted in logarithmic form in models; the estimative coefficients represent the tension. Intercept varies doesn't have the economic interpretation. The negative coefficient of the price index of agricultural products (-0/113), expresses the inverse relationship between farm price and income of the agricultural sector, which is consistent with the theory. Thus 1% increase in price of agricultural products in the long term will reduce the revenue of this sector 0.11 percent. This negative relation can be stated this way that in long term, in one hand, the inflation created in

prices due to money supply, increase more on prices of agricultural savings than added received price and will cause to reduction of the income of this sector. On

the other hand, the trade limits in long term are minimized and internal and external prices are in same direction, the increase of internal prices will cause to reduce the competition power between internal and external produces and whereas much part of the income of agricultural sector is obtained through the export, so this matter will have negative impact over this sector.

On the other hand, the negative coefficient for interest rates (-0/156) suggests the existence of negative long-run relationship between interest rates and income of agricultural sector. Accordingly, an increase in interest rates to fall of 15% of agricultural income will result. The profit rate is influential on capital investment decisions of farmers and thereby lead to changes in the cost of farming. Rising interest rate, cost of borrowing money to farmers, the costs of operating and capital costs, long-term investment, reducing the income of farmer will result.

Positive coefficient (0/131) for the real exchange rate suggests that this is a long term direct relationship between real exchange rate and agricultural income, which is established so that a percentage increase in agricultural income in exchange for Iran will increase 0.13%. This is

consistent with the theory and economic theories. Positive relationship between real exchange rate and agricultural production due to the increase in real exchange rates tend to stimulate exports and imports decreased, thus increasing the prices of domestic agricultural production and income of this sector will be improved.

The negative coefficient for money supply (-0/225), the model suggests an inverse relationship between volume and liquidity in this part of income. One percent increase in the volume of cash income for the agricultural sector to the 0.22 percent discount will be.

The reason for this matter can be this that in long term the increase rate in production costs (wages of work force) is due to increasing the money supply and is more than the price growth rate and thus the income of this sector is decreased.

The negative coefficient for oil income is positive and small (0/062). It means that in long term, the increase of oil incomes will have a little but positive impact on agricultural income. It's probably because of increasing the import of mediator goods and increases the oil income and increases the civil investments on agricultural sector. But, generally, connections between oil and agriculture are weak and the impact of increase the oil income over agricultural sector is as indirect.

**Table 4 - Results of long term model coefficient estimates (3,0,0,0,0,1) Ardal**

Variable	Coefficient	Standard error	Statistic T	Possibility
C	*9/24	0/176	14/05	0/000
<i>LPAG</i>	*113/0-	0/045	2/49-	0/019
<i>LR</i>	*0/156-	0/061	2/56-	0/016
<i>LER</i>	**0/131	0/065	2/00	0/054
<i>LM2</i>	*0/225-	0/090	2/50-	0/018
<i>LOI</i>	*0/062	0/025	2/45	0/021
<i>DUM</i>	*0/067-	0/025	2/68-	0/012
<i>T</i>	*0/045	0/011	4/04	0/000

Source: Research results

\*, \*\*, Significant in levels 5 and 10 percent, respectively.

### 8. Estimation of Error Correction Model (ECM)

There is a convergence between the set of macroeconomic variables and the income from the agricultural sector provides error correction model. Error correction model, in fact, links the volatility of short term to their long-term variables. The error correction model coefficients and their standard deviations for the three states of interruption have been expressed in Table 5. Considering the calculated

results in Table 5, the coefficients of the variable of agricultural prices, interest rates, real exchange rate, liquidity volume, and the intercept of the trend was statistically significant and represents a short-term relationship with income of agricultural sector. But the oil revenue for each year has no effect on the same year, but the proceeds of oil sales in previous periods (three periods) has significant effect on the agricultural sector in the short term. Because by

improving the government's oil revenues, the investment and government spending in this sector also increase.

The error correction coefficient ECM (-1) reflects the variable rate adjusted speed to the imbalance between long-term model. Considering this that error correction coefficient is meaningful and negative (-0.45) and it's meaningful statistically, so we can conclude that 45% of imbalance in agricultural sector will destroy its long

term amounts after passing one period. On the other word, the full adjustment the results made by the implementation of a policy will be done after nearly two years that this confirmed the relatively rapid movement of the balance of income of farming. On the other hand, being smaller unit of the coefficient of stability and convergence with the means to achieve balance. Also, the significance of the ECM suggests the existence of causality between the variables of long-term pattern of income of agriculture.

**Table 5 - Estimated ECM results**

Variable	Coefficient	Standard error	T statistic	Possibility
<i>dC</i>	*5/080	1/24	4/09	0/000
<i>dLPAG</i>	*0/113	0/045	2/49	0/019
<i>dLR</i>	*0/121-	0/059	2/05-	0/049
<i>dLER</i>	*0/103	0/051	2/02	0/043
<i>dLM2</i>	*0/178	0/074	2/40	0/023
<i>dLOI</i>	0/174	0/13	1/27	0/216
<i>dLOI<sub>1</sub></i>	*0/038	0/020	1/89	0/049
<i>dLOI<sub>2</sub></i>	*0/056	0/016	3/39	0/002
<i>dLOI<sub>3</sub></i>	*0/071	0/047	1/51	0/019
<i>dDUM</i>	0/029-	0/052	0/56-	0/576
<i>dT</i>	*0/003	0/001	2/58	0/015
<i>Ecm (-1)</i>	*0/45-	0/137	3/26-	0/003

Source: Research results

\* Significant at 5% Level

The results showed that the estimated coefficient of short term variable interest rate effect and the real exchange rate, liquidity, price and volume have a positive effect on agricultural income. Oil revenue in the same period has no significant relationship with agricultural income, but the increase of oil revenues for three periods after that time have positive influence on farm income. Variable of has no effect in short term on agricultural income.

### 9. Conclusions and recommendations

By analysis of short and long run relationships between variables the beneficial results can be achieved. According to the achieved results, it seems that in short term, the prices of agricultural products are flexible and the farmers get benefit from the increase of agricultural products and the general level of prices in short term, but the agricultural sector will incur the loss. So that a percentage increase in prices of agricultural products, improves the 0.11% of agricultural income in the short-term as it's provided according to the supply in this Act.

The reviews of this research indicates a negative impact of interest rate on agricultural sector

in the short term and long-term. As rising 1% of interest rate, the agricultural income rate will decrease 0.12% in the same period and in long term rising 1% of interest rate; the agricultural income rate will decrease 0.15% in the same period. We can say that it's because the interest rate has impact on decisions of investment in this sector and by this leads to changes in agricultural costs. Rising the interest rate, increase the cost of borrowing money to farmers, the costs of operating expenses and capital expenditures for long-term investment, and reduces the farmers' income. Therefore it's recommended that the government and executive agencies provide loans with low interest rates for farmers. And also the decrease in interest rates leads to lower costs and opportunity cost of invested capital, borrowing in the short term and long-term loans to farmers.

Also based on the results the real exchange rate was recognized as a variable affecting the agricultural sector in the short term and long-term revenue. So that with the devaluation of national currency, the relative price of imported goods increases, the tendency for domestic commodity and its price will rise and improve farm income.



Improvement of the real exchange rate also improved export incentives and income improves. The present findings and the important role of exchange rates on agricultural exports, the government proposed to be the optimal policy such as exchange rate management to apply. So that the psychological need for increased production, exports and farm income provided. Because, it seems that the policy of exchange rate management in our country is performance policy providing that this rate is not fixed for the long term, in fact, based on economic conditions the inflation rate and other dominant conditions, the exchange rate market will approach to its real value in economy.

Considering to the reviews, we can conclude that the monetary volume as one tool of monetary policy is not neutral and the increase of cash flow in long term has negative relationship with the income of agricultural sector but in short term it can have positive effect on increase of agricultural income. In short term, the expansionary monetary policy leads to a rise in prices of agricultural inputs because in short term, the agricultural inputs do not react very quickly to increase the money supply. Therefore, farmers may think that because of inflation, raising the price of agricultural land and is profitable in the short term. But in the long run the price of other goods such as agricultural inputs and more flexible agricultural prices rise even more. The volume of farm cash income is negative in the long run.

Oil revenue in the long-term has positive relationship with income of agricultural sector. In long term, rising. But generally the agricultural sector benefits from lower oil revenues. Increasing oil revenues in the same period doesn't have a significant impact on the agricultural sector. But after three periods, it causes increasing the income rate. This may be an indication of delay in implementation of decisions in the agricultural sector and infrastructure projects in the agricultural sector. So, it does recommend paying attention and prioritizing more to the agricultural sector in order to benefit from the oil revenues.

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