Factors Affecting Public Sector Investment in Agriculture in Iran: The Usage of Unrestricted Error Correction Model

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Abstract: Agriculture in Iran is the greatest economical sector after petroleum and services sectors which has devoted about 20 percent of national gross production and main share of non- petroleum exports, so that, this section development has determinate role in economical growth. Investment in agriculture section is one of factors which due to increase in demand for food and other agriculture products can cause to develop production and more employment in agriculture section. Therefore, in this section, it has been tried that Long- term effect of parameters such as petroleum incomes, investment stock, value-added, national income and inflation rate on state or governmental investment by use of conditional ARDL pattern is in frame of Pesaran and Shin (It applies for time series and variables can be I (0) or I (1)), this is studied for 1356-1386 periods. The results of this study showed that there is Long-term relation between governmental investment, petroleum incomes, investment stock, value-added, national income and inflation rate. On the other hand, governmental investment has the most and least sensitive to Value-added and petroleum income, respectively.
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Key words: Governmental investment, ARDL model, error correction model, elasticity.

INTRODUCTION

Agriculture section is one of the most important sections in Iran economy. It is done about one-quarter of gross domestic production and foreign exchange incomes resulting from non-petroleum goods exports and country employment and to meet needs about 80 percent of society food needs via this section on one hand, it is created evolution in this section about high population growth, continuous increase in food demand and increasingly need in various economical section to agriculture products, so that it can increase in quantity and variety of different products in short time (Hazhbar kiani & Jhonvislo 1379). In addition, 43% of country population live in village, so the living of many of them is related to this section. Hence, agriculture section is considered as development axis (Kiani rad & Koopahi 1379). Generally, among investment in agriculture section has important role and specific place. The investment in agriculture section, due to increase in demand for food and other agriculture products, can cause to develop production and employment. In fact, increase in demand cause to enhance prices levels and increasing price levels cause to enhance motive for investing. Therefore, more investment is accompanied by production growth and more employment. Besides, prior and post relation of agriculture with other parts helps to develop production and employment in them. Most of agriculture activities are done in rural regions, thus investment development in agriculture section in frame of public and private investment can cause to create more occupational opportunity in rural regions, as a result it causes to prevent rural-people immigration to cities and increase in growth rate at agriculture section (Amini & Falihi 1377). On one hand, the study of changes trend in production and imports at agriculture section clear this fact which by existing increase in main agriculture products manufacture, it is also provided main share of agriculture products by imports. It is necessary to pay attention to agriculture section via the study of agriculture section share from total value-added and human resource employment and its comparison with investment share in this section of whole investment country. In respect to importance of agriculture section in economical growth and development and investment power to enhance agriculture products manufacture and to develop this section, the investment has typical importance in it (Hazhbar kiani & Jhonvislo 1379). In Iran, the subject of invest and investment is accompanied by tremendous problems because of server dependence to petroleum incomes and its price unstable and to be high risk, in this reason investment in various sections such as agriculture one has had server fluctuation. In agriculture section, the problems related to investment have been more obvious due to existing structural bottlenecks and lack of financial equipments of most beneficiaries. In respect to this point that agriculture section has important role in domestic gross production and employment and it

provides necessary population needs, but unfortunately, investment growth was not optimum in last decades and its share has been 5.9 percent from investment in national economic during two last decades. Although, it has been low the ratio of investment to domestic gross production in mentioned period and on the average it was about 16.5 percent, but this ratio has been 3.9 percent on average in agriculture section. In another words, it is returned only 3.9 percent of value-added sum in agriculture section as investing to it. While this ratio has been estimated about 24.6 and 15.4 percent for services and industry section, respectively in respect to investment importance in agriculture section and its effect on macro-economic variables, it is important to identify effective factors on it (Hojati 1380). One of important production elements in investment economy is fund and it is consisted of some aspect that it is obtained income from it, and it is stated based on money. It usually applied fund or capital term by term of capital goods, commonly. Sometimes it is known fund as capital money or property capital.

The concept of investment economy with its business concept which is applied in daily conversation has many differences. Economical investment in whole economy just includes expenses which increase capital goods stock such as factories, technical equipments and or consumption goods stock. The title of investment is called for expenses which are applied to create factories and completely new equipment or increase in existing factories capacity or increase in goods stock.

The study of public investment procedure in agriculture section and its transgression challenges.

Table 1 shows investment rate of governmental section in agriculture section, each section share and growth rate from 1376 to 1386 by fixed prices in 1376.

The challenges in the agricultural sector investments include:

1- To be low rate of capital revenue in agriculture section which it is resulted in decrease in investment trend in this section in respect to keep low agriculture products prices.

2- Lack of foreign exchange and rial credits to form capital in this section.

3- Not to be provided financial, economical and technical equipments to attract foreign investment.

4- Lack of investment and essential financial resources to create and extend conversional industries and technical units.

5- Not to be recognized reforming instruments and conducting government to conduct private section resources and bank regime in direction of production investment and lack of it's continuous.

6- Lack of encouragement regime for private section partnership and to commerce production in agriculture section.

7- Lack of supportive elements such as investment insurance in agriculture section.

Table 1: Investment in the agricultural sector during the period 1386-1356 (billions of rial)

The share of public investment	Growth rate of public investment	public investment in agriculture section by fixed prices in 1376	The total investment	year
82.2	-3.6	2718.7	3306	1376
76.9	-16.9	2257.1	2933	1377
70.2	56.6	3536.6	5034	1378
124.3	54.4	5462.5	4393	1379
66.1	-39.5	3301.3	4991	1380
145.5	163.1	8688.7	5968	1381
195.02	45.7	12666.9	6495	1382
149.03	-6.5	11831.6	7939	1383
200.2	57.5	18645.5	9309	1384
169.1	-21.8	14568.0	8613	1385
201.09	21.2	17666.0	8785	1386

Source: Management and Planning Organization, a time series of economic statistics - and the central bank's balance sheet

Review on studies:

Bagheri & Torkamani (1379) have studied situation and relation between private and public investment in agriculture section using coaggregation test. The results of estimation for this study private investment showed that state investment, bank credits, prices index and state investment with one pause over private investment is effective and also there is one long-term balance relation between function variables by use of coaggregation test and the important result of this study is the positive effect of state investment on private investment.

Salimi far & Ghavi (1381) showed that there is significant relation between effect of granted credits of bank net on private section investment by estimate private section investment pattern as function of public section investment, domestic gross production, loans and grant credits of bank net.

Khaledi et al (1387) studied the effective elements on rural poverty and agriculture economy growth with emphasis to agriculture section investment by use of statistic in period of 1350-1382 and via seemingly unrelated equations (SURE). The result of this study showed that although investment in agriculture section has been accompanied by economical growth in this part; but, it has not been superficial the rate and distribution of revenue resulting from this growth. It is seemed that agriculture economical growth revenue is not

directed towards the rural poor people. Hence, in addition to control inflation rate and to improve revenue distribution resulting from economical growth of agriculture section, it must be noticed capital injection to agriculture section in order to support the poor people as typical in policies of investment development in this section.

Yousefi & Aziz nejad (1388) have studied the effect of domestic gross production variables, state investment, inflation rate and role of organizations such as security, ownership rights, rules and regulations, official invalidity and social security on Iran private investment during 1363-1383 years. The results showed that while domestic gross production and substructures have had positive effect on private investment, but the most important inhibition of private investment in Iran has been related to law and rights problems, lack of investment security, ownership rights and invalidity.

Ghali (2000) has studied the relation among private and public investment by method of error correction and they have concluded that in long-term, public investment has negative effect on private investment and economical growth, but in short-term it has negative or no effect on private investment and growth respectively.

Emran et al (2003) have studied the effect of economical freedom on private investment in India via estimation of investment function as method of self-regression (ARDL). The results showed that there is positive and significant relation between freedom and private investment.

Petrick (2004) has analyzed state credits about farmers investment behaviour including credit ration in Netherlands, this analysis was done by help of information economic evaluation analysis resulting from farmers families, in statistical analysis, it was determined that borrower reputation is not only prepare rent land but also the effect of ration which has credit. The estimation of one investment equation showed that access to subsidization has important role in determine farmers' investment behaviour statistically; in various features, the relation of credits ration about margin credit effect on investment was less than one. This demonstrates that credit is sometimes used as something except production investment. Besides, investment volume has reverse relation with agriculture land size. Governmental policies, which are used to promote production investment and efficiency, must emphasize to grant loan as high amounts without discrimination about small lands.

Mizutani & Tanaka (2005) have studied the effect of public substructure on private section production and effect of economical policies on investment in public substructures. Their used information in this research is panel data related to 46 departmental domains in Japan in 1975, 80, 85, 90 & 95 years. They have applied coincident equations system consisted of private section production function, function to form public capital, governmental public investment function and regional public investment function. In this research, public capital is defined as sum of capital stock in transportation, seaport and airport, agriculture and national security sections. The results of these research shows that public capitals have effect on production efficiency in private section, and there is one complementary relation between regional or local and national governments investments. Political elements are not so effective on governmental investments in public section and national government supports to create public substructure result in local governments' investment.

Research Method

In order to study existence of long-time relation and to obtain this relation for governmental investing in Iran agriculture section during 1356-1386 periods, it has been used the usage of unrestricted error correction model (ARDL) given by Pesaran and Sheen (1995).

They (1999) showed that ARDL pattern give consistence estimations from long-time coefficient which are normal as the asymptotic and regressors can be I(0) or I(1). Also Inder (1993) showed that these patterns are useful for small samples (limited) and alternatively it is suggested that unrestricted error correction model (UECM) enters dynamic to estimate of short and long time coefficients. Pesaran (1997) and Inder (1993) separately showed that to enter dynamic may correct regressors in ARDL and UECM. At last, it is prevented to create false regressions and unreliable estimations (Ghorbani et al 1386).

As mentioned, the main advantage of Pesaran & Shin method is that pattern variables can be I(0) or I(1); it means that there is no longer need to be I(1) for all pattern variables. Besides, this pattern isn't suitable for small samples. So that Pesaran & Sheen (19995) divide ARDL approach in two stages.

In the first stage of convergence existence, we use F-test in order to study to be significant variables and then we use Pesaran & Sheen table (1996). We compare that statistic with two critical values. Its reason is that we must apply unit root test, because according to Evatera (2004), if pattern variables aren't I(2), then F- statistic related to Pesaran & Sheen test doesn't have credit because this test is done under this theory which these are variables of I(0) or I(1). Hence, it must be done unit root test about Pesaran & Sheen ARDL so that it is be sure

that none of pattern variable are if this statistic is larger than high critical value, then it will be accepted convergence and if this statistic is smaller than lower critical value, then it will be rejected convergence existence (Bahmani oskoyi 2002).
Second stage includes estimation of equation and determination of estimate coefficient by use of ARDL method.
First: we apply two zero hypothesis (there isn't convergence state) and mutual hypothesis for convergence among variables.

$$H_1 : \delta_1 \neq 0, \delta_2 \neq 0, \delta_3 \neq 0, \delta_4 \neq 0$$
$$H_0 : = \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$$
$$H_1 : \theta_1 \neq 0, \theta_2 \neq 0, \theta_3 \neq 0, \theta_4 \neq 0$$
$$H_0 : = \theta_1 = \theta_2 = \theta_3 = \theta_4 = 0$$

Then it is tested hypothesis by obtaining statistic, and we decide. So in second stage, we apply ARDL method to estimate investment equation.
Second: there are four criteria to determine numbers of optimum pause which include: 1- Square criterion, 2- Akaike criterion (AIC), 3- Schwarz Bayesian (SBS) and 4- Hannan-Quinn criterion (HQC).
We choose one of these for criteria and estimate them by determine number of pauses. We basically try that there wouldn't be serial correlation (there isn't significant relation between disturbance components) in Diagnostic statistics (Static statistic); form of variance in identical function means that there are identical variances in various and different samples. To be normal suppose that disturbance components have normal distribution which we study it via error period and diagram and determine that are there above problems in data, as a result we solve them via different methods and finally we estimate real variables value (Bahmani oskoyi 2002).

ARDL method has been delivered by Pesaran et al (1996) to determine co-summation relation between variables. In this method, in spite of Yoohanson idea, it isn't needed to know degree of variables co-summation in model. Meanwhile, it is also determined number of sum vectors. In this method, to study co-summation relation between Xt and Yt variables, his estimated two equation types. The equation, which is dependent to Xt variable, is as follow:

(1)

$$\Delta x_t = \alpha_1 + \sum_{i=1}^{k} b_{i1} \Delta X_{t-i} + \sum_{i-1}^{k} c_{i1} \Delta Y_{t-i} + \sigma_1 X_{t-1} + \sigma_2 Y_{t-1} + \varepsilon_{1t}$$

Where Δ is difference function such as X as dependent variable, Y as dependence vector ، ε_1 as distribution term, t as time and K as the number of Akaike coefficient (AIC), Schwarz Bayesian (SBS), Hannan-Quinn (HQC) or R^{-2}. The coefficients of α_1 , b_{i1} , c_{i1} , σ_1 and σ_2 are estimation able parameters.
X of equation which Yt is dependent variable is as follow:

(2)

$$\Delta Y_t = \alpha_2 + \sum_{i=1}^{k} b_{i2} \Delta x_{t-i} + \sum_{i=1}^{k} c_{i2} \Delta y_{t-i} + \omega_1 x_{t-1} + \omega_2 y_{t-1} + \varepsilon_{2t}$$

Where, Y is dependent variable, X is dependent variable and ε_2 is disturbance term. The coefficients of α_2 ،b_{i2} ،c_{i2} ،ω_1 and ω_2 are estimation able parameters. The rest symbols have the same definition in relation (1).

In relation (1), Xt variable is dependent one, zero hypothesis is based on lack of long-term relation among variables.
We test (H0: $\sigma_1 = \sigma_2 = 0$) against opposite hypothesis (H1: $\sigma_1 \neq \sigma_2 \neq 0$) by use of F-test which we call FX (xy). But distribution of this F statistic, regardless I(0) or I(1) or to be independent variables model, is not standard. In this reason, Pesaran et al (1996) have given suitable critical amounts in respect to independent variables in model and existence or lack of width from origin or time trend. These statistics include two complexes (column). One complex has been calculated by propose these variables I(0) and another one by propose I(1) for all variables. If calculated F-statistic exceed from upper limit of critical amounts domain given by Pesaran et al, then we will reject zero hypothesis based on lack of long-term relation between variables. In this state it can be deduced that there is one-way causality relation from Xt variable to Yt one. If calculated F-statistic is less than lower limit in this domain, then we couldn't reject zero hypothesis and in this state, there isn't causality relation between variables. If calculated F-statistic is located inside critical amounts domain, it will be deduced in certain result. This procedure must be repeated for another equation.

Generalized Dicky-Fuller test:

In this method, it is used first-degree differential terms with pause or auto-regression AR(p) to solve the correlation problem. The number of pauses are determined based on this point that disturbance term, u_t time series doesn't have serial correlation. This test can be stated as follow:

$$\Delta y_t = c + \beta_t + \alpha y_{t-1} + \sum_{i=1}^{p-1} \alpha_i \Delta y_{t-i} + u_t \qquad u \approx iid\left(o, \delta^2\right)^2$$

$$H_0 : \alpha = 0$$
$$H_1 : \alpha \prec 1$$

In this test, H_0 hypothesis implies existence of unit root and opposite hypothesis shows series stand. Therefore, if calculated t-statistic absolute value is larger than critical absolute value, this means to reject H_0 hypothesis (existence of unit root). It is worth to point out that to select form (having time procedure and width from origin) and also suitable pause to test ADF in results are effective, so that increase in pause numbers will result in decrease test power; because, on one hand, it is increased the number of estimated parameters, and on the other hand, it is decreased the number of useful observation and therefore, Test power is also decreased by decrease in freedom degree.

Discussion and Conclusion:

It has been considered governmental investment pattern as follow general form:

SIA=F(ROG, SI, VA, Y, P)
SIA: Governmental investment in agriculture section
ROG: Petroleum incomes
SI: Capital stock with one pause in agriculture section
VA: Value-added
Y: National income
P: Inflation rate

It was used generalized Dicky-Fuller test to study governmental investment stability in agriculture section. It has been give ADF as it results in table (1). As table information show that all variables except petroleum incomes are in instability level and their first degree difference is stable. In another words, these variables of sum pattern is I(1) degree.

Table (1): Results ADF test

ADF	Variable first-order differencing	ADF	variable
-4.14	DSIA	-0.41	SIA
		-2.97	ROG
-3.74	DSI	-0.79	SI
-3.78	DVA	-0.74	VA
-3.25	DY	-0.43	Y
-4.762	DP	-0.81	P

Critical value of ADF statistic at 5% level: -2.97

It was conducted F-test in order to study long-term relation among governmental investment in agriculture section, petroleum income, capital stock with one pause, national income and inflation rate which its results are demonstrated in table (3).

Table (2) shows upper and lower limits of critical amounts in 1% and 2.5% significant level, respectively which are given by Pesaran & Sheen (1996), thus because F-statistic is more than upper limit in 1 and 2.5 percent level, so it is rejected hypothesis of lack of long-term relation among pattern variables. In another words, there is long-term relation among governmental investment in agriculture section, petroleum income, capital stock, value-added, national income with one pause and inflation rate. It has been reported estimation results of long-and short-term coefficient by method of OLS in table (2). It has been determined optimum pause length in respect 2 Schwarz Bayesian test.

Table (2): Results F test for the existence of long-term relationship

At 97.5%level		At 99% level		F-statistic
I(0)	I(1)	I(0)	I(1)	
3.05	4.26	3.51	4.78	7.03

Source: Research Findings

Table (3): The pattern of public investment in agriculture to UECM

variables	Coefficient	t-statistic
C	52.316	2.291**
$DROG_{t-1}$	-0.190	-0.780
$DROG_{t-2}$	-0.373	-1.273
DSI_{t-1}	0.837	2.409**
DSI_{t-2}	0.472	0.895
DVA_{t-1}	3.910	2.834**
DVA_{t-2}	3.488	3.042***
DY_{t-1}	-0.331	-0.471
DY_{t-2}	-0.417	-0.546
DP_{t-1}	-1.190	-1.584
DP_{t-2}	0.195	0.389
SIA_{t-1}	-1.228	-4.218***
ROG_{t-1}	1.011	4.292***
SI_{t-1}	1.525	2.864**
VA_{t-1}	-2.127	-1.387
Y_{t-1}	1.629	2.228**
P_{t-1}	1.472	3.454***

* Significant at 10% level, **Significant at 5% level, ***Significant 1% level

The result of table (3) show that governmental investment in long-term is effected by itself with one pause. In another words, one previous period investment has negative and significant effect on governmental investment. Petroleum income, national income and capital stock in long-term have positive effect on governmental investment and are meaningful or significant statistically. Value-added is in significant statistically, but has negative effect on governmental investment, inflation rate has also positive and significant effect on state investment in long-term, so that the agriculture section institutions have mostly subside, therefore increase in inflation on their price is not so effective so increase in price cause to increase in profit from investment in agriculture section and also motivation for investing.

Table (4): Results of the estimation elasticity's

Variables	Elasticity
ROG	0.82
SI	1.24
VA	1.73-
Y	1.32
P	1.19

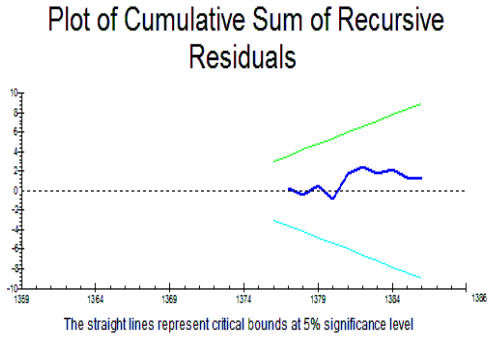
Based on information in table (4) it is observed that strengths of variables in petroleum income, capital stock with on pause, national income and inflation rate equal to 0.82, 1.24, 1.32 and 1.19 respectively, assuming the other conditions constant, if the rate of these variable increase as one percent, then the rate of governmental investment increase as 0.82, 1.24, 1.32 and 1.19 respectively. Also governmental investment decrease in as amount of 1.73 by one percent increase in value-added, also the results of table show that governmental investment has the most sensitive relative to value-added, so that one percent increase in value-added causes to decrease in 1.73 percent in governmental investment.

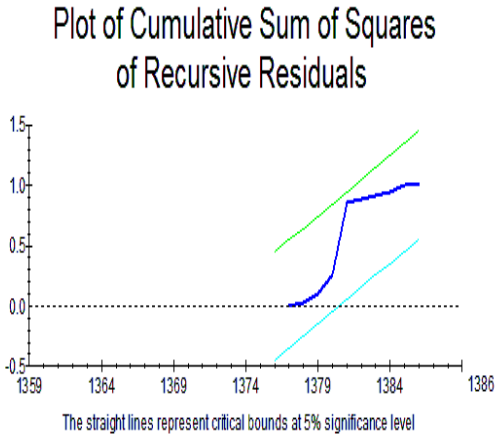
It was used Ramsey's reset test in order to study absent or present affirmation error, the results of test showed absent of affirmation error in pattern. Self-correlation test showed that there isn't self-correlation disturbance between terms. It was used cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) Braven et al (1975) in order to study estimated parameters stability.

In this test, in spite of some tests such as Chaw, it is not necessary to determine structural break point. Diagram 1 and 2 showed the result of this test.
There two diagrams show that estimated parameters in pattern are stable.

Estimation of long-term relation in public section investment by estimator of error correction model (ECM):

We enter long-term function the rest terms with one pause to short-term functions to study error correction model.





Governmental investment function short-term model in agriculture section is as follow:

$$\Delta(SIA)_t = 0.01 + 0.51\Delta(ROG)_t + 0.06\Delta(SI)_t + 1.17\Delta(VA)_t + 0.19\Delta(Y)_t + 0.13\Delta(P)_t - 0.69ECM(-1)$$

T: (0.25) (4.27) (0.31) (1.66) (0.52) (0.42) (-3.46)

$$R^2 = 0.77$$

$$F = 13.25$$

$$D.W = 2.00$$

$$\overline{R}^2 = 0.71$$

It is explained 0.71 percent of short-time changes of dependent variable by independent variable in this estimated equation, and term coefficient of error correction shows that it is

corrected 0.69 percent of lack of balance in next period in each one and modification is toward long-term.

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Resources:

1- Amini, A. & N. Faihi. 1377. The study of investment situation in agriculture section. Plan and Budjet Magazine. 33: 95-119.
2- Bagheri, M. & J. Torkamani. 1379. The study of situation and relation between private and public investment in agriculture section by use of co-cumulative test. Complex of Articles in Third Conference of Iran's Agriculture Economy. University of Ferdosi in Mashhad. 775-797.
3-Hojati, M. 1380. Agriculture development and investment security. Agriculture Economy and Development Magazine. 9(1): 7-13.
4- Khaledi, K., S. Yazdani, & A. Haghighat nejad shirazi. 1387. Study of Iran's rural poverty and determination of effective elements on it by emphasize to investment in agriculture section. Iran's Economical Researches magazine. 35(2): 205-228.
5- Salimifar, M. & M. Ghavi. 1381. Banks facilities and private investment in Iran. Iran Economical Researches Magazine. 13(4): 135-170.
6-Ghorbani, M., A. Shokri, & M. Motallebi. 1386. Application of in limited error correction pattern to determine effectives elements on private investment in Iran. Knowledge and Development Magazin (Scientific-Research). 20(1): 111-124.
7- Kiani rad, A & M. Kopahi. 1379. Analysis of state or public investment in agriculture section and its anticipation for 1379-83 periods. Agriculture Economy and Development. 32(4): 103-116.
8- Hazhbar kiani, K. & M. Alizadeh. 1379. The study of effective elements or private section investment in Iran agriculture by use non-linear least- squares method. Development and Agriculture Economy. 29(1): 45-73.
9- Yusefi, M. & S. Aziznejad. 1388. The study of determinal elements in private investment in Iran by method of self-explanation. Economical Research Magazin. 1(1): 79-100.
10- Bahmani-Oskoee, M. & N.R. CHiwing. 2002. Long-run demand for money in Hongkong an appilication of the ARDL model. International Journal of Business and Economics. 2: 75-97.
11- Emran, M. SH., A.M. Imam, & SH. Forhad. 2003. After the license Raj economic liberalization and aggregate private investment in India. Economics Working Paper at WUSTL. 1-30.
12- Ghali, K.H. 2000. Some methodological comments on public investment and private capital formation in a vector error correction model of growth. Applied Economics. 7: 581-583.
13- Mizutani, F. & T. Takana. 2005. Productivity effects and determinants of public infrastructure investment, 45th congress of the European regional science association.
14- Petric, M. 2004. Farm investment credit rationing and governmentally promoted credit access in Poland: a cross-sectional analysis. Food Policy. 29: 275-294.

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