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Agricultural Impact on Economic Growth in Iran Using Johansen Approach Cointegration

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Abstract

In this article we review the role of agriculture on economy growth in Iran using Eviews 7 software, and some other techniques available for evaluating econometrics. In order to do so first we try to evaluate the stationarity of the pattern variables using the ADF (Augmented Dickey-Fuller) test and after that we estimate the VAR pattern. After this step, the long run and equilibrium relation between these variable were prompted using the Johansson cointegration test and according to this fact, the long run relationship was estimated. The results were totally as expected in the theories in Iran and the added value variables in agriculture, services, mine and industry and oil sectors had a positive relationship to economical growth. The economy growth rate is 0.03 percent per agricultural added value growth, and among these variables the effect of services sector is much more than the other variables, and agriculture's contribution to economic growth is negligible. Then we have reviewed the growth response to the shocks from the pattern variables using the IRF (Impulse Response Function) and VD (Variance decomposition) norms. Moreover with estimating the ECM (error correction model) model the equilibrium coefficient was calculated as 0.67 which means a good rate in adjusting the economy growth.

Keywords: Agriculture, Economical Growth, Iran, Johansen approach Cointegration, ECM Model

Introduction

The main reason why mankind is interested in agriculture is to obtain their primary needs. The most ancient cultures in the world were made in the regions where agriculture activities were available in their vicinity. In fact any other economy sectors were born due to their necessity in the agriculture sector. For example the need for agriculture tools and need for products exchange played major roles in advancing the industry and services sectors. Although after the industrial revolution and the gradual removal of the economy-political feudalism system, the industrial sector and capital factor gained the most importance in the production field, nowadays the agriculture sector is the main axis for economy growth and development.

Some advantages of the agriculture in comparison to mining and industry sectors like creating employment chances, increasing the revenue by exporting the products and lowering the revenue costs due to the production of the same needed products in the country and decreasing the imports, producing some strategic products, producing the needed data especially for industry and services sectors and creating the chance for other sectors to use its benefits are the main way agriculture is so important to national economy.

Although in the past century lots of efforts are made to develop Iran's industry, yet we find the agriculture to be the main branch in the economic activities among the citizens. Since the Islamic revolution agriculture was known as the main axis for development.

This survey consists of six part. The second part covers the available theories and the third part is allocated to the previous researches, in the fourth part besides introducing the variables we will estimate

some models. The research's results are presented in the fifth section, and the suggestions are available in the sixth section and the survey is finished with references and computational appendixes.

Materials and Methods

Theories

Johnston and Mellor (1961) have introduced five Inter Sectorial Linkages about the role of agriculture in economic growth which have later become the main basis for other researches. They are including the Forward and backward Linkages of agriculture to other sectors:

- Providing the food
- Offering workforce (especially for Industry sector)
- Providing market for industrial productions
- Supplying savings
- Enabling the foreign income

In order to provide a theoretical framework for the methods used in this research, we can refer to Johnston & Mellor (1961) and Delgado (1993). According to this survey, the following model is considered.

$$LGDP = \beta_0 + \beta_1 LAVA + \beta_2 LSVA + \beta_3 LIVA + \beta_4 LOVA + u_t \quad (1)$$

In this function, LGDP, LAVA, LSVA, LIVA and LOVA are respectively the Gross Domestic Product logarithm (Economic growth), and the value added logarithm in agriculture, services, industry and mining and oil sectors.

Previous researches

In this section some of the researches made regarding to this article's subject is provided for further applications.

Foreign researches

There have been many studies about the role of agriculture in economic growth. And Kuznets (1964) has designed a simple model to determine the agriculture's contribution to gross domestic production.

Ghatak & Ingersant (1984) have demonstrated that according to Solo model the agriculture contributions to development is regressive and it has a very low impact in the ending stages of the development; the gross production proportion between the non-agriculture sector and agriculture sector is highly dependent to the country's development degree, and it is a bit higher in developed countries and the growth rate in non-agriculture sectors are higher than the agriculture sector's.

By reviewing the relationship between agriculture sector and economy, Erh-cheng (1988) came into this conclusion that agriculture has a great positive impact on economic growth through influencing the Total Factor productivity.

Steven (1999) made a four phase numerical simulation model to review agriculture's sector growth on other economy sectors in Ethiopia. The sectors reviewed in his model are as followed: Agriculture, Services, traditional Industry and modern Industry. Then Steven calculated the macroeconomic growth coefficients in Agriculture, Services, traditional Industry and modern Industry sector by shocking the incomes, and used the estimation model. The results of his studies indicate that the agriculture sector has the highest growth coefficient after industry sector.

Domestic researches

Fat'Hi (1993) also reviews Iran's agriculture sector role during 1974-1990 using the Kozentes formula. According to these results, it was indicated that, unlike the usual, the agriculture sector growth rate unlike other sector's growth rate, was increasing. Samadi (1999) also confirmed this fact.

Hadji Ebrahimi and Torkamani (2003) tried to review the role of agriculture in Iran's economic growth and the results showed that service sector's value added, private sector's investment in agriculture, government's investment in agriculture, oil sector's value added and technology developments had a positive and meaningful relation and terms of trades had a negative meaningful relation to agriculture sector's value added.

Results and Discussion

As it is mentioned this article reviews the agricultural impact on economic growth in Iran. In order to do the data analysis and estimations we have used Eviews 7. First we will introduce the variables and model structures and after that we will go on with estimating the moulds.

Variables

This mould variables are as followed:

GDP= Gross domestic product with stable price 100=1376 (Billion Rials)
AVA= Agriculture value added with stable price 100=1376 (Billion Rials)
SVA= service sector value added with stable price 100=1376 (Billion Rials)
IVA= Industry and mining sector value added with stable price 100=1376 (Billion Rials)
OVA= Oil sector value added with stable price 100=1376 (Billion Rials)

These variables are extracted from Islamic republic of Iran's central bank statistics for 1959 to 2010.

Mould structure

According to researches done by Johnston & Mellor (1961) and Delgado (1993) the following mould is taken into consideration.

$$Log(GDP) = \beta_0 + \beta_1 Log(AVA) + \beta_2 Log(SVA) + \beta_3 Log(IVA) + \beta_4 Log(OVA) + u_t \quad (2)$$

In other words this mould is as followed.

$$LGDP = \beta_0 + \beta_1 LAVA + \beta_2 LSVA + \beta_3 LIVA + \beta_4 LOVA + u_t \quad (3)$$

In the above function, LGDP, LAVA, LSVA, LIVA, LOVA are respectively logarithms for gross domestic product (economic growth), value added logarithm for agriculture, services, industry and mining and oil sectors.

The stationarity test for the variables

One necessary step in estimating the regression mould and avoiding the false regression is to test the stationarity of these variables using the ADF[1] test, and the results are provided in table 1.

Table 1. Results for variable's stationarity test

Variable	ADF[۲] Statistic	Critical values
LGDP	-3.93	-3.56 -2.92 -2.59
LAVA	-5.67	-4.15 -3.50 -3.18
LSVA	-4.27	-3.56 -2.92 -2.59
LIVA	-4.30	-2.61 -1.94 -1.61
LOVA	-5.65	-4.15 -3.50 -3.18

Source: Test results

According to these results all the variables were stationary during the first difference, and they are alright. But it is needed to assure that there is long run and equilibrium relationship between these variables.

Reviewing the variables cointegration

Now considering the variable's stationarity, we will estimate the vector auto regression model (VAR). In order to do so according to guidelines and AIC, SC, HQ, FPE, LR factors, the optimum interrupt is chosen

1. Augmented Dickey-Fuller (ADF)

and the optimum lag for VAR model is equal to 1. After this step we have to check the variables' cointegration in the specified interrupt, and according to Trace and Max-Eigen statistics the variables' cointegration was detected. Over all we can say the long run and equilibrium relation between the variables is established. And this relationship with the help of cointegrating vector is resulted as followed[13].

$$LGDP = + 0.035LAVA + 0.399LSVA + 0.317\ LIVA + 0.270\ LOVA \qquad (4)$$
$$(0.054) \qquad (0.073) \qquad (0.082) \qquad (0.024)$$

Analyzing dynamics in VAR model

To analyze dynamics in this model, we use Impulse response function (IRF) and Variance decomposition (VD). So we compute and review these two functions.

Impulse Response function (IRF)

This criteria indeed reviews the responses of other variables by shocking each variable with the amount of one deviation point. In fact we can call it the dynamic increasing coefficient which will show the variables' responses for shocks whether from the variable itself or from the other variables. As it is demonstrated in diagram 1, the economic growth's response to agriculture value added is negative up to fifth period but from then on it is positive, and it is close to 0 during all this time.

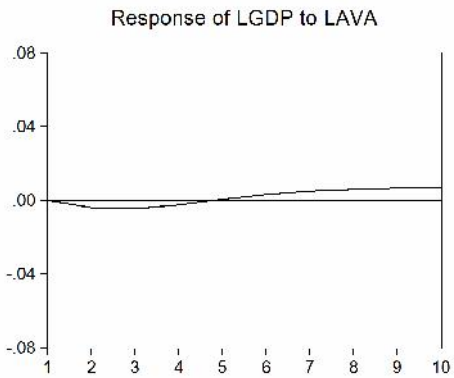

Diagram 1. The economic growth's response to agriculture sector's value added

The response of this variable to service sector value added is also demonstrated in diagram 2 and it is positive.

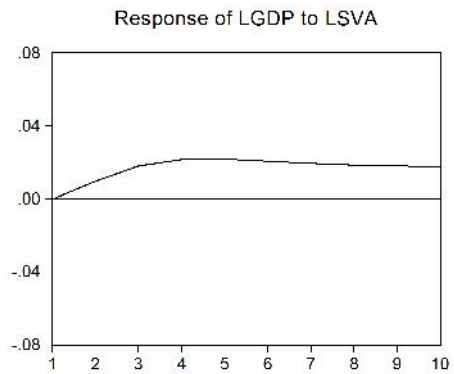

Diagram 2. Response of economic growth to service sector value added

In diagram 3 the response of economic growth to industry and mining sector value added is positive up to period 3.5 and it will be negative from then on.

1. Source: Test results

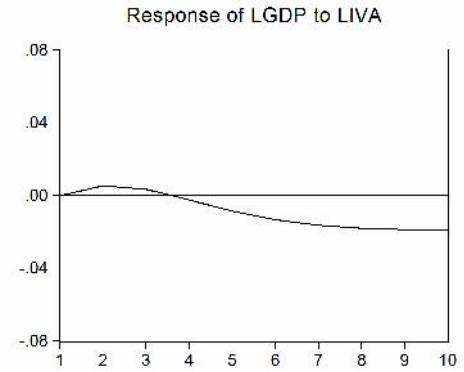

Diagram3. The response of economic growth to industry and mining sector value added

The economic growth response to oil sector value added was positive up to period 2.5, and it started to go negative from then on, which is illustrated in diagram 4.

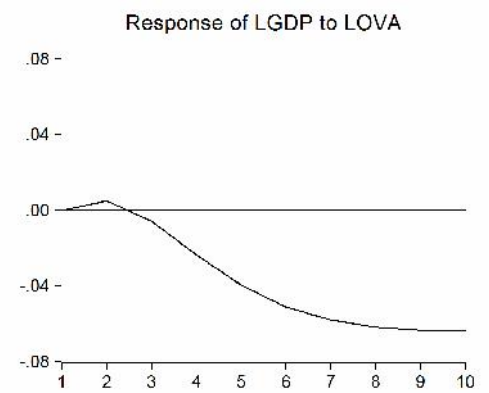

Diagram 4.The economic growth response to oil sector value added

Variance decomposition (VD)

The other criteria which is really helpful in checking the dynamics on this mold and finding the relative importance of each variable to justify the variation in a variable or the others, is Variance decomposition.

According to the results, the oil sector's relative contribution to economic growth is highest in Iran, and the agriculture sector has the lowest relative contribution to this fact.

Vector Error correction mold (VECM)

In this mold we will review the move from short term fluctuations to long run and equilibrium. So each short term fluctuation is related to its long run value for different variables. In applied econometrics the error correction mold is available only when the variables are convergent. So the resulted equilibrium coefficient in this mold will show how well these fluctuations move to long run stationarity. In this survey the economic growth adjustment rate is 0.67 which means %67 of the fluctuations will be corrected in short term. And this indicates high speed in economic growth error correction.

Conclusion

According to the computations done and the explanations made in this model, the following results are available:

1-The variables of this model were stationary in the first difference and they were confirmed to be true using the Johansson test for cointegration, as well as the presence of long run and equilibrium relation between the variables.

2-The results were totally compatible as expected to be in Iran. And the value added variables for Agriculture, service, industry and mining and oil sectors' relationship with the economic growth rate was positive.

3-Considering the fact that this mold is a linear logarithm regression, the resulted coefficients show the elasticity of economic growth towards the independent mold variables.

4-The value added coefficient for agriculture sector is 0.03, which means in case all other variables are fixed, and the agriculture's value added is raised by one percent, the economic growth will increase with 0.03 percent. Which in comparison to other factors, services sector has greater effects on the economic growth, and agriculture's contribution to economic growth is negligible.

5-Considering the results of IRF and VD criterias, the relative contribution of agriculture sector's value added in Iran's economic growth is pretty low, in comparison to value added for other sectors contribution.

Suggestions

The relative growth of the population, the importance of agriculture sector for other economic sectors, employment and having greater revenue through exporting on one hand, and the variety in planting variable plants and products because of climate diversity in Iran, access to the sea, productive lands, pastures and forests and available task force on the other hand makes this important to focus on this sector, especially in Iran. The present study revealed that despite what is said here, the agriculture sector's contribution to national economy was not considerable during 1959 to 2010 and the low contribution of this sector is to gross domestic production is suggesting this fact. It seems that the main reason is the relative shortage of investment in this sector. Therefore it is suggested to provide better arrangements to attract more investment in this sector. Tax breaks, production incentives (as subsidy), low profit bank loans with careful monitoring, providing scientific and technical advices, development of agro-industrial complexes, development of processing industries for agricultural products and domestic and foreign marketing for the products will be the most appropriate solutions to develop agriculture sector and optimal use for available capacities.

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