INVESTIGATING THE JOINT RELATIONSHIP BETWEEN BANK CONVENIENCES AND VALUE ADDED OF AGRICULTURE SECTOR IN IRAN

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ABSTRACT

The agriculture sector in one hand provides food and other humans’ needs for survival and on the other hand in many countries it possesses the highest share in employment and GDP. Of the most effective factors on value added of the agriculture sector is methods of financing and endowment of bank conveniences identified as one of financing methods. Accordingly, the present paper aims at study of the relationship between bank conveniences of the agriculture sector and value added of the agriculture sector in Iran within years 1967 – 2010. To do this, the Granger causality and Toda and Yamamoto causality tests are used for investigating causality relationships between variables. Also, Auto Regressive Distributed Lag (ARDL) test as well as microfit software is applied for investigating co-integration between two variables. The obtained results indicated that there is no casual relationship between bank conveniences of the agriculture sector and value added of the agriculture sector.

KEYWORDS: Value added, Agriculture sector, Bank convenience, ARDL test, Granger causality, Toda and Yamamoto causality

INTRODUCTION

One factor for encouraging movement from oil-reliant economy toward non-oil economy is considering non-oil economic sectors and development of them. In this regard, during recent
decades due to supporting economic sectors, endowment of conveniences to the economic sectors has been changed as an instrument for growth and development of sectors by technical banks. On the other hand, taking into consideration Iran’s climate and human resources, it seems that development of the agriculture sector can work as an effective instrument for economic development of Iran. The agriculture sector is one of critical economic sectors of Iran that satisfies approximately 13% of GDP, 25% of non-oil experts, 20% of employment and providing about 93% of food materials and production of many other raw materials of other industries. In this regard, variables that lead to increase of valued added of the agriculture sector can indirectly bring about the increase of Iran’s economic growth. Of the most important issues related to the agriculture sector is financing that most often has been known as a confining factor of economic growth in this sector that requires presenting of various solutions for it. The endowed conveniences to the agriculture sector also is one way of financing and variables that can indirectly and through increase of rate of value added of the agriculture sector benefits the country economy. Therefore, since monetary policies are among the most vital means of macro economy and being familiar with quality of their effectiveness is a big job in national and regional planning and development, as a result, in the current research the relationship between bank conveniences and value added of the agriculture sector in Iran is investigated. In the following sections, first the review of literature, the research data and methodology will be discussed. Then, in last two sections the obtained findings and results will be presented.

Theoretically, financing and investment in the agriculture sector from different aspects cause acceleration of economic growth and development. Meyer (1990) reasoned that thanks to practicality of agricultural activities, financing and investment in this sector can create new employment opportunities and decrease rate of unemployment. Also, due to establishment of most of agricultural activities in rural areas, financing and investment in the sector reduce immigration of the rural or minimize at least rate of immigration from villages to cities.

Moreover, financing and investment in this sector, with regard to the relative advantage of products lead to increase in production of the agriculture sector and consequently maximizes exporting agricultural products. This in turn, will compensate dearth of foreign exchange earnings to some extent. Investment in the agriculture sector will also contribute to growth of other economic sectors as well. Since, it has tight relationship with other economic sectors. Therefore, increase of investment in the agriculture sector enhances rapid economic growth of these sectors and indirectly assists to improvement of employment in Iran. On the other hand, increase of value added of the agriculture sector leads to increase of the country earning and as a result, accessible resources will increase for endowment of conveniences to this sector.

So far, several studies have been done on relationship between bank conveniences and value added of the agriculture sector. In following some foreign and domestic studies in this regard will be discussed. Freeman et al (2009) by use of the self-adjust regression model of Broun Zet investigated on effective factors on access to conveniences and its impact on agricultural
products of Utopia and Kenya. In this study, variables like sex, number of family members, age, job records, gross income, and amount of debt were considered as the effective factors on access to credits of the agriculture sector.

Maqbool and Michael (2012) examined productivity of financial markets in increase of agricultural products of Punjab farms in Pakistan by use if vector auto regressive (VAR) method. The obtained results indicates that the lent bank credits have a positive effect on agricultural products, Khosravi ( 2010) studied the relationship between distribution of bank credits with major economic and social variables of the agriculture sector in Fars province with a questionnaire. The results showed that within years 1988 – 2008 the credit granted to the agriculture sector has followed an ascending procedure and the given credits were more non-duty and short-time that this issue indicates banks direction toward funding ongoing costs that has no significant effect on increase of production in this sector. Agha Nasiri (2012) investigated on the process of capital formation and the agriculture sector financing during the development programs. According to this research , the most important sources of capital formation in the agriculture sector within these programs are (total machinery and buildings), including private sector investment, development funds from the general budget of the country and that part of banking sector funds (including specialized banks, commercial banks and credit institutions) which are allocated for investment in the agriculture sector. The obtained results indicate that although during recent years injection of financial resources to the agriculture sector has resolved many financial needs of this sector, gradually through supplying required infrastructure of the sector and capital accumulation besides lack of a significant change in management and technology, the rate of capital return has faced with a considerable decrease.

METHODOLOGY

1. Granger causality test

For measurement of casual relationship between two variables, the causal models are used. The most well-know causality test in literature of econometrics is Granger causality test. Granger (1986) used from this fact that future cannot be a cause of past and stated that if current values of \( y \) can be predicted by use of past values \( x \) with more preciseness than when pas values \( x \) are not used, in this case, then, \( x \) is called Granger causality of \( y \). the bivariate figure of the Granger causality is the same as follows:

\[
y_t = \alpha + \sum_{i=1}^{p} \alpha_i y_{t-i} + \sum_{j=1}^{q} \beta_j x_{t-j} + u_t
\]

\[
x_t = b + \sum_{i=1}^{p} \gamma_i x_{t-i} + \sum_{j=1}^{q} \delta_j y_{t-j} + v_t
\]

(1)

H0 in the Granger model is that in the first regression \( x \) is not the Granger causality of \( y \), if for \( j = 1, 2, 3, \ldots, q \), the statement \( \beta = 0 \) is true. For the second equation, also \( y \) is not the Granger causality of \( x \), if for \( j = 1, 2, 3, \ldots, s \), there is \( \delta = 0 \).
Geweke (1984) stated that validity of this test depends on rank of VAR and degree of reliability of variables. If variables are unreliable the test validity decreases. Granger (1986) said that this causality test in form of the above equations is valid only when variables are not co-integrated. So, at first reliability of variables then their co-integration should be determined. If variables are integrated in level 1 but not co-integrated, it could be possible to apply the above VAR on first-order difference, then perform the test. With this test, short-term causality is assessed. Moreover, In 1988 Granger stated that in case of any co-integration between two variables, Granger causality will be among them at least in one direction.

Generally, although the co-integration test determines presence or absence of Granger causality among variables, but the direction of causality is impossible to be defined. Engle and Granger in 1987 announced that if two variables x and y are co-integrated, always an error-correction model will exist in between. Therefore, for evaluation of Granger causality among variables a vector-error correction model can be utilized.

If the research variables, for example, are integrated in level as well as co-integrated, using a vector error correction model for examination of the relationship, the Granger causality among variable due to elimination of part of error correction, maximizes variance of regression equation, as a result the desired Wald statistic becomes skewed. This problem brings some incorrect judgment about direction of the casual relation. The error correction model says that changes in dependent variable are a function of deviation from long-time balance relation (that is stated by part error-correction) and changes of other variables are explanatory. This model that connects short-time and long-time behavior is expressed as below:

\[ \Delta y_t = C + \sum_{i=1}^{k} \beta_i \Delta y_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta x_{t-1} + \rho ECT_{t-1} + u_t, \]

\[ \Delta x_t = C + \sum_{i=1}^{k} \gamma_i \Delta x_{t-1} + \sum_{i=1}^{k} \mu_i \Delta y_{t-1} + \eta ECT_{t-1} + v_t, \]

This model is for times that two variables are I(1) and co-integrated. In the above relations \( \rho \) and \( \eta \) are short-time adjustment coefficients. In relation (2) the Granger causality can be examined through following procedures:

a. By use of t-test in case of significance of coefficients of error correction lag
b. Using F or Wald test in case of significance of total lags per each explanatory variable.
c. Using F or W test in case of significance of total lags per each explanatory variable with coefficient of error correction.

In addition to determination of the Granger causality direction among variables, model of vector error correction makes possible to distinguish between short-time and long-time causality. Insignificance of sum of explanatory variable lags show lack of short-time causal relationship. In the present research, a second causality model naming Toda and Yamamoto introduced in 1995 was used.
2. Toda and Yamamoto causality test

In 1995 Toda and Yamamoto introduced a simple method in form of estimation of an adjusted VAR model for evaluation of the Granger causality. They reasoned that this method is valid even in presence a co-integrated relation among variables. In this simple method, first, number of optimal lags of VAR model \(k\) must be determined by use of measures like Akaike and Schwarz –Bayesian must be determined. The highest degree if integration \(d_{\text{max}}\) of the variables can be specified using common tests. Then, a VAR model with \((k + d_{\text{max}})\) number of lags is created. The process of choosing lag is valid when \(k + d_{\text{max}} \leq k\). If we consider the below bivariate model and assume that \(d_{\text{max}} = 2\), then:

\[
\begin{pmatrix}
  x_t \\
  y_t
\end{pmatrix} = \begin{pmatrix} a_1 & a_2 \end{pmatrix} \begin{pmatrix} \begin{pmatrix} x_{t-1} \end{pmatrix} \\
\begin{pmatrix} y_{t-1} \end{pmatrix}
\end{pmatrix} + \begin{pmatrix} \begin{pmatrix} a_{11} & a_{12} \end{pmatrix} \begin{pmatrix} x_{t-2} \end{pmatrix} \\
\begin{pmatrix} a_{21} & a_{22} \end{pmatrix} \begin{pmatrix} y_{t-2} \end{pmatrix}
\end{pmatrix} + \begin{pmatrix} e_{1t} \\
  e_{2t}
\end{pmatrix}
\]

Where, \(\begin{pmatrix} e_{1t} \\
  e_{2t}
\end{pmatrix}\) is vector of disturbance terms and a sort of white turbulence.

In this method for test of assumption” y is not Granger causality of x”, constraint is tested. The used statistic test is Wald that has asymptotic \(\chi^2\) distribution with degree of freedom equal to number of H0 constraints. The used statistic test regardless of x and y are reliable in any degree of freedom, co-integrated or non-co integrated are valid. Zapata and Rambaldi (1997) considered advantage of this method in no need to being informed about co-integration characteristic of variables for doing this test. Since before doing Granger causality test in form of equations (1) and (2) we need doing some pre-tests like reliability and co-integration, they are discussed in following. For testing reliability of variables the generalized Dickey Fuller test is used and for examination of co-integration among variables and computation of probable long-run relationship the auto regressive with distributed lags (ARDL) method is applied.

3. Auto Regressive Distributed Lag (ARDL) method

Due to estimation of the long-run relationship among variables of a model, Engle and Granger (1987) developed a two-stage strategy. First the equation \(y_t = \beta x_t + \varepsilon_t\) is estimated via ordinary least squares (OLS) , then after examination of the variables static , variables \(x_t, y_t\) as well as getting certain that integrated is of degree one I(1), static of disturbance terms \(\varepsilon_t\) of the above equation is assessed. Lack of any unit root in residues resulted from the above regression proves presence of a long-run relationship among variables and the estimated coefficients in the above regression indicate co-integrated vector or in other words long-time parameters of the model. Generally speaking, applying the co-integration method of Engle –Granger shows lots of limitations such as in small sample sizes the obtained estimations are biased. Also, limit distribution of least squares estimators is not normal; therefore, testing the hypothesis via ordinary static is invalid. Moreover, Engle-Granger method is based on the assumption of existence of a co-integration vector and in condition where there is no more than one con-
integration vector, using this method causes in productivity. However, in spite of these limitations in using Engle-Granger method, some other methods can be used (Tashkini, 2005). Several studies have utilized Johansen technique for determination of long-run relationship among the variables. However, in recent investigations an alternative method to ARDL is developed. This method has certain privileges compared to the Johansen technique. First, the ARDL model is statistically more productive for determination of co-integration relation in small samples, though the Johansen technique needs larger sample size in order to be valid. The second advantage of ARDL method is that, while other co-integration methods require all variables to be highly convergent, the ARDL method can be applied when variables are $I(1)$ and $I(0)$. Therefore, the ARDL method prevents from problems of preliminary tests with standard methods of co-integration that involve classification of variables into two $I(1)$ and $I(0)$ categories (Pesaran et al, 2001).

since the first stage in any technique of co-integration is determination of degree of convergence among variables and the results of this stage depends on this problem that what test should be used, different test may lead to different and sometimes paradoxical results (Bahmani, 2004). Or instance, application of the traditional tests of unit root like adjusted Dickey-Fuller test (ADF) may incorrectly concludes that there is unit root in the series, however, in fact the time series around a structural break in the model is reliable (Perron, 1997). Thus, when we are uncertain about characteristics of the unit root of data, via ARDL method it would be possible that different variables in the stages of estimation of long-term relation have different number of optimal intervals, though models on the basis of Johansen technique this is rare to happen. The ARDL model is stated in general through the following equations:

$$ ARDL(p,q_1,q_2,\ldots,q_K) $$

$$ \phi(L,p)y_t = \sum_{i=1}^{k} \beta_i(L,q_i)x_{it} + \delta \omega_i + u, $$

$$ \phi(L,p) = 1 - \phi_1L - \phi_2L^2 - \ldots - \phi_pL^p $$

$$ i = 1, 2, \ldots, k $$

$$ \beta_i(L,q_i) = 1 - \beta_1L - \beta_2L^2 - \ldots - \beta_{q_i}L^{q_i} $$

Where,

$L$ represents lag operator and $\omega$ is a $s \times 1$ vector of determinant variables such as intercept, artificial variables, time, and other external variables with constant lags. Optimal lag in this method is determined based on Akaike and Schwarz –Bayesian standards. Long-time sensivity in the estimation method of long-run relationships, the selected ARDL can be extracted from the following relations (Pesaran and Pesaran, 1997).

$$ \sigma_i = \frac{\beta_{i0}^\wedge + \beta_{i1}^\wedge + \ldots + \beta_{iq_i}^\wedge}{1 - \phi_1^\wedge - \phi_2^\wedge - \ldots - \phi_{q_i}^\wedge} $$

And the long-run relationship of co-integration is shown as below:
In this equation, the constant factor or intercept is computed as follows [18]:
\[
\hat{\theta}_i = \frac{\hat{\beta}_0}{1 - \phi_1^\hat{} - \phi_2^\hat{} - \ldots - \phi_p^\hat{}}
\]

Pesaran and Shin (1996) in empirical researches like the present study use the ARDL method in two stages the same as below.

Stage 1: this stage is for ascertaining from availability of co-integration and long-run relationship and is performed in a bivariate model.

\[
\begin{align*}
\Delta x_t &= \alpha_0 + \sum_{i=1}^{k} b_{i1} \Delta x_{t-i-1} + \sum_{i=1}^{k} c_{i1} \Delta y_{t-i-1} + \sigma_1 x_{t-i} + \sigma_2 y_{t-i} + \varepsilon_{it} \\
\Delta y_t &= \alpha_0 + \sum_{i=1}^{k} b_{i2} \Delta y_{t-i-1} + \sum_{i=1}^{k} c_{i2} \Delta x_{t-i-1} + \omega_1 y_{t-i-1} + \omega_2 x_{t-i-1} + \varepsilon_{2t}
\end{align*}
\]

In the first equations of relation (8) that variable x is the dependent variable, H0 which assumes there is no long-run relationship between variables \( H_0 : \sigma_1 = \sigma_2 = 0 \) is tested versus the counter variable \( H_1 : \sigma_1 \neq \sigma_2 \neq 0 \) by use of statistic F we call it \( F_X(Y) \). Asymptotic distribution of this statistic without considering level of co-integration of the independent variables is not standard. As a result Pesaran and Shin (1996) presented critical values based on number of available variables in the model and existence and non-existence of intercept or time trend of production. These critical values include two columns that one is calculated with assumption all variables are \( I(0) \) and two with assumption that all variables are \( I(1) \).

If the computed statistic exceeds from the highest limit of the critical values provided by Pesaran and colleagues, H0 is rejected. If the calculated statistic is smaller than the limit, H0 is not rejected and finally if the computed statistic is within range of critical values, an end condition of variables for concluding becomes important. In some occasions the result is unpredictable and hard to be inferred. In case of rejecting H0 and acceptance of long-run relationship, the second stage that is selection of a proper ARDL and estimation of long-time coefficients initiates (Pesaran and Shin, 1996).

4. Data and variables

The population consists of the whole country of Iran. The required data for the present research were prepared by the Central Bank. Library method was used in order to collect the information in addition to available sampling method. The statistical information was for 1967-2010. The data were analyzed using econometric methods and Microfit 4 software. The research variables are:
LADA: logarithm of value added of agriculture sector (LADA) in billion Rilas and with fixed price for base year of 1997

LCAS: logarithm of bank facilities and credit institutions residues to the non-governmental sector of agriculture in billion Rials

**FINDINGS**

This section presents the obtained results, the research mode, achieved important, advantages of the model compared to the previous researches and description of explorations. Table 1 shows the results related to the adjusted Dickey-Fuller test. As it can be seen, all variables under study are converging to the first class.

**TABLE 1: RESULTS OF ADJUSTED DICKEY-FULLER TEST (ADF)**

<table>
<thead>
<tr>
<th>variable</th>
<th>Optimal lag</th>
<th>Value of test statistic</th>
<th>Value of test statistic</th>
<th>Critical value</th>
<th>Critical value</th>
<th>result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SBC</td>
<td>Without lag</td>
<td>With trend</td>
<td>Without trend</td>
<td>With trend</td>
<td></td>
</tr>
<tr>
<td>LADA</td>
<td>1</td>
<td>-1.2632</td>
<td>-2.8869</td>
<td>-2.9358</td>
<td>-3.5247</td>
<td>I(0)</td>
</tr>
<tr>
<td>DLADA</td>
<td>0</td>
<td>-8.3661</td>
<td>-8.5736</td>
<td>-2.9378</td>
<td>-3.5279</td>
<td>I(0)</td>
</tr>
<tr>
<td>LCAS</td>
<td>1</td>
<td>-0.88203</td>
<td>-2.2895</td>
<td>-2.9358</td>
<td>-3.5247</td>
<td>I(0)</td>
</tr>
<tr>
<td>DLCAS</td>
<td>0</td>
<td>-6.0049</td>
<td>-6.1927</td>
<td>-2.9378</td>
<td>-3.5279</td>
<td>I(0)</td>
</tr>
</tbody>
</table>

For a full identification of the correct form of Granger causality test appropriate with the data, first any possible co-integration relationship between the variables must be examined. Table (2) presents results for ARDL test. It should be mentioned that due to emphasis Bahmani and Goswami (2003) gave to significance of this test toward number of selective lag, choosing optimal lag by use of common standards that is, Schwarz Bayesian Criterion (SBC) was performed. However, thanks to the annual nature of the data and limited observation, maximum number of lag is defined 1.

**TABLE 2: TEST RESULTS OF LONG-RUN RELATIONSHIP BY ARDL METHOD**

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Independent variable</th>
<th>Test statistic</th>
<th>Critical bound with intercept</th>
<th>Critical bound without intercept</th>
<th>Long-run relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td></td>
<td></td>
<td>Low value</td>
<td>High value</td>
<td></td>
</tr>
<tr>
<td>LADA</td>
<td>LCAS</td>
<td>0.94689</td>
<td>4.934</td>
<td>5.764</td>
<td>No</td>
</tr>
<tr>
<td>LCAS</td>
<td>LADA</td>
<td>1.2131</td>
<td>-</td>
<td>-</td>
<td>No</td>
</tr>
</tbody>
</table>
In Table 2, in cases where estimation of equations is not intercepted, the critical value without intercept is used. Moreover, since all of the variables are I(1), high values of limits presented by Pesaran et al. became a measure for conclusion. Therefore, no vague and unclear condition would happen. According to the presented results in Table 2, existence of long-run relationship (co-integration) between variables is confirmed. Now, with considering the results of reliability and co-integration tests, the correct form of Granger causality test in accordance with the research data is initiated.

### TABLE 3: TEST RESULTS OF GRANGER CAUSALITY BETWEEN NON-INTEGRATED VARIABLES

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Independent variable</th>
<th>Optimal lag based on criterion</th>
<th>LR statistic</th>
<th>Probability p-value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLADA</td>
<td>DLCAS</td>
<td>0</td>
<td>1.5975</td>
<td>0.809</td>
<td>DLADA ≠ DLCAS</td>
</tr>
<tr>
<td>DLCAS</td>
<td>DLADA</td>
<td>0</td>
<td>1.0374</td>
<td>0.904</td>
<td></td>
</tr>
</tbody>
</table>

As it was mentioned earlier, the result of causality test is sensitive toward selection of number of lag. In a way that “if length of selected lag is shorter than actual lag, removing proper lags will cause biasness and if duration of the selected lag exceeds the length of actual lag, extra lags in the VAT model leads to efficient estimation”. Cheng and Lai(1997) reasoned that due to this sensivity it is suggested to use SBC measure. Since it saves number of lags and less degree of freedom are lost and it fits small size samples (Pesaran and Shin, 1996).

The presented results in Table 3 indicate lack of Granger causality relationship of bank credits and value added of the agriculture sector in 5% error of measurement. In following, the results of Toda and Yamamoto causality test are presented in Table 4. The important point here is that the results obtained by Granger causality test are similar to Toda and Yamamoto test results.
### TABLE 4: TEST RESULTS OF TODA AND YAMAMOTO CAUSALITY TEST

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Independent variable</th>
<th>Maximum stability based on test</th>
<th>Optim lag of VAR model based on the criteria</th>
<th>Length of test lag</th>
<th>Test statistic</th>
<th>Probability</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLADA</td>
<td>DLCAS</td>
<td>ADF 1</td>
<td>SBC 1</td>
<td>Toda and Yamamoto</td>
<td>W 1..638</td>
<td>0.587</td>
<td>DLADA $\neq$ DLCAS</td>
</tr>
<tr>
<td>DLCAS</td>
<td>DLADA</td>
<td>ADF 1</td>
<td>SBC 1</td>
<td>Toda and Yamamoto</td>
<td>W 2.7617</td>
<td>0.251</td>
<td>DLCAS $\neq$ DLADA</td>
</tr>
</tbody>
</table>

### CONCLUSION

Because of importance of the agriculture sector in its large share in GDP, employment of a large portion of labor force as well as providing food needs of the country, financing has been always taken into serious consideration. Credit sources of banks have been one of this sector financing. Therefore, in the current research the relationship between bank credits of agriculture sector and its value added in Iran within years 1967-2010 was investigated. For having a more clear-cut insight about such relations, after review of the related literature a casual analysis was utilized. First, by doing reliability test, degree of integration among variables was determined, and then by use of ARDL test, the variables co-integration was examined. According to the integration and co-integration results, a proper framework for Granger causality test was selected. Finally, the Toda and Yamamoto test was performed. The obtained results of both tests proved lack of any causal relationship between bank credits, agriculture sector and value added in Iran. In this regard, in developmental planning in this sector, it is recommended that special attention is given to some problems outside financing and investment areas like knowledge and technology, management, problems related to land and smallholder structure in the country, considerable dependency of the agriculture sector to rainfall, and problems of market and trade. It is clear that without such concerns the process of financial injection only results to a more limited returns and will questioned justification of finical development.
REFERENCES


