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Bank Credits and Investment Growth of Agricultural Sector in Iran

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Abstract

This study were examined relationship between bank credits and investment growth of agricultural sector in Iran during the period of 1982-2011 by auto regressive distribution lag bounds test approach. Basically, the growth investing of the agricultural sector in Iran is related to oil revenues, bank credits, value added of agriculture sector and capital stock. The results confirm the existence of a long-run relationship between variables in model. In addition, according to the results, bank credit is the most significant variable in explaining the growth investing, so that increases access to it will encourage growth investment of the agricultural sector in Iran. The estimations show that elasticity of bank credits, oil revenues, stock investment and value added are 0.103, 0.015, 0.049 and -0.058 in the agricultural sector respectively.

Keywords:
Bank credits, Growth investing, Oil revenues, Iran, ARDL

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INTRODUCTION

Agriculture sector is the most important sector in terms of value added and Gross Domestic Production (GDP) in Iran. Despite agriculture has a large share in GDP and value added, it has allocated the little share of investment in Iran (Shakeri and Mousavi, 2009). In Iran, about 14 percent of GDP and 90 percent of food is produced by the agricultural sector, while 23 percent of the total workers are active in this sector. Also, data shows a small share of agriculture investment in Iran (Shakeri, 2004). Both uncertainty and irreversibility are associated with the investment and challenging problem for decision makers. The production uncertainty is depended on investment uncertainty.

In discussing the problem of uncertainty in the process of agricultural product, production risk, and price risk are appropriate examples of production and the marketing risk (Sonka and Patrick, 1984).

The second challenge for decision makers is the reversibility or irreversibility of the decision to be made and the costs associated with this challenge. Investing in precision agriculture involves many sunk costs, i.e. costs that cannot be recovered. Sunk costs include soil testing, purchasing computer and mechanical technology, and information search time. While some of these costs can be recovered in part many are not recoverable at all, such as soil testing. Hence, while the investment decision may be reversible many of the costs are not recoverable. Capital as more restriction factor of agricultural production have high important. In that it's providing increase efficiency production factors such as labor and land.

Compensate for this defect and increase of investment in this sector supports and funding required is essential and must be a dynamic interaction between economic and economic productive sectors, in order to be warranty for continued growth and investment is this section.

Capital in agriculture is financed from three sources: farmers or the private sector savings, government budget and credit of the banking system. Low income of capitation level lead to low private saving, on the other hand, the frequency of government goals causes spent funds for purposes of investment in agriculture severely restricts. Also, negative attitude to the agricultural sector to increase the restriction. In regard to restriction of these two sources, bank credit and facilities play particular role in changing the production technology and modernization of Iran's agriculture sector. Credit facilities as long term investment is one of the important factors in agricultural production. Governments often intervene in agricultural credit markets by providing guarantees to banks for loans, by setting up credit institutions specific to agriculture and by subsidizing credit to agricultural producers. Seasonal agricultural products create gap between receives and payments of agriculture. Therefore, farmers need to past incomes and savings or receive bank credits to pay for current costs and investment in agriculture (Sameti and Faramarzpour, 2005). Governments in all transition countries have introduced credit subsidies in some form or another. Moreover, in most Central and Eastern European Countries (CEECs) the use of credit subsidies has increased since transition began (OECD, 1998). In Poland, the Czech Republic, and Hungary credit subsidies accounted for more than 1.5% of agricultural output value in 1997. Governments would be better advised to allocate these funds for investment in public goods or infrastructure that could have a greater impact on stimulating the long-term development of the agricultural sector.

Governments have often supported the introduction of credit subsidy programs during transition based upon a number of, sometimes flawed, arguments, the provision of credit at 'preferential interest rates' to agricultural producers directly reduces their interest costs, which, if the collateral problem is addressed as well, may increase farmers' access to capital and incentives to make long-term investments. Also, they would therefore be better advised to focus their scarce financial resources on other policy initiatives which would provide a positive return. Specialized agricultural credit institutions specialized credit institutions for agriculture can be found in different forms across the world: credit cooperatives, state-owned agricultural funds and mutual or development funds.

Agricultural credits markets work imperfectly even in countries with a developed market economy and government intervention in the market is widespread. The simultaneous reform of the CEE agricultural sectors and restructuring of their banking sector has created additional problems for financing agriculture. For most banks, financing agriculture is a high risk activity because of low profitability in the sector, high nominal inflation, problems with collateral because of uncertain property rights and ineffective land markets, and the lack of well established relationships between them and new producers. Low farm profitability is a key factor in agricultural and rural finance problems, restricting the demand for and supply of, credit in transitional economies. Hence, interventions solely aimed at correcting the inefficiencies of rural financial markets may not be sufficient to stimulate a flow of financial resources into the agricultural Sector unless profitability improves and restructuring progresses as well. The credit situation is improving in some transition countries due primarily to two factors: (a) the improved profitability in agriculture since 1995, and (b) the emergence of institutional innovations, such as leasing, contracting, etc. The finance situation remains most problematic in those countries which have postponed reforms and have continued to use the banks to channel subsidized credits and loans to the large scale farms with heavy government discretion in loan allocation and widespread use of state guarantees. The result has been low repayment, reduced incentives for farm restructuring, accumulation of bad debts, government budget deficits, and, in some cases, collapse of the agricultural banks (Swinnen and Gow, 1999). Therefore, role of bank credit seem very important. In regard to formal financial institutions due to risk factor in back capital in long-run unwilling to pay credit to agriculture sector, thus banks including agricultural bank pay debt with profits very low. According to the arguments expressed, this study examines relationship between bank credits and investment growth of agricultural sector in Iran during the period of 1982-2011 by ARDL bounds test approach.

MATERIALS AND METHODS

The following investment in the agriculture sector model for Iran, the investment in the agriculture sector is determined by the oil revenues, bank credit allocated to the agriculture sector, value add agriculture sector, stock investment in the agriculture sector and dummy variable:

$$IAG_t = a_0 + a_1 INO_t + a_2 CRA_t + a_3 YA_t + a_4 CPA_t + a_5 D68_t + e_t \quad (1)$$

where a_0 is a drift component, IAG is the Investment in the agriculture sector, INO is the Iran's oil revenues, CRA is the Bank credit allocated to the agriculture sector in, YA is the Value added agriculture sector, CPA is the stock investment in the agriculture sector. All values are in 1997 constant prices, D68t is a dummy variable with a value 1 for before the war 1989, and is 0 otherwise and μt is the white noise error term. For model estimate we were using annual time series data for the 1982-2011. Also, all data in billions of Iran (IRR) and obtained from central bank of Iran (CBI). For investigating the long-run equilibrium (cointegration) among time-series variables, several econometric methods are proposed in the last two decades. Univariate cointegration examples include Engle and Granger (1987) and the Fully Modified OLS procedures (FMOLS) of Phillips and Hansen (1990). With regard to multivariate cointegration, Johansen (1988, 1991) and Johansen and Juselius (1990) procedures and Johansen (1996) full information maximum likelihood procedures are widely used in empirical research. We use in this study the ARDL bounds testing approach to examine the cointegration relationship between Investment in the agriculture sector and credit bank allocated to this sector. The ARDL modeling approach was originally introduced by Pesaran *et al.* (1996) and later extended by Pesaran *et al* (2001). The ARDL cointegration approach has numerous advantages in comparison with other cointegration methods. Firstly, unlike other cointegration techniques, the ARDL does not impose a restrictive assumption that all the variables under study must be integrated of the same order. In other words, the ARDL approach can be applied regardless of whether the underlying repressors are integrated of order one [I(1)], order zero [I(0)] or fractionally integrated (Odhiambo, 2009). Secondly, it can be applied to studies that have finite samples unlike the Engle and Granger (1987) approach, which suffers from considerable small sample bias (Mah, 2000). Thirdly, another important advantage of the bounds test procedure is that estimation is possible even when the explanatory variables are endogenous, and is sufficient to simultaneously correct for residual serial correlation (Tang, 2004 and 2005). Fourthly, the ARDL technique generally provides unbiased estimates of the long-run model and valid t-statistics even when some of the regressors are endogenous (Harris and Sollis, 2003). The ARDL model used in this study can be expressed as follows:

$$IAG = a_0 + \sum_{i=1}^{n} b_i \Delta IAG_{t-i} + \sum_{i=0}^{n} c_i \Delta INO_{t-i} + \sum_{i=0}^{n} d_i \Delta CRA_{t-i} + \sum_{i=0}^{n} e_i \Delta YA_{t-i} + \sum_{i=0}^{n} f_i \Delta CPA_{t-i} + gD68_t + \lambda_1 IAG_{t-1} + \lambda_2 INO_{t-1} + \lambda_1 CRA_{t-1} + \lambda_4 YA_{t-1} + \lambda_5 CPA_{t-1} + \mu_t \quad (2)$$

where, Δ is the first difference operator. The parameters b, c, d, e and f are the short-run coefficients and λs are the corresponding long-run multipliers of the underlying ARDL model. The ARDL model takes the error correction term into account in its lagging period. The error correction and autoregressive lag analyzes fully cover the long-run and short-term relationships of the tested variables. Since the error correction term in the ARDL model does not have restrictive error corrections, ARDL is an Unrestricted Error Correction Model (UECM) (Wang, 2009).

A general error correction presentation of Eq2 if formulated as follows:

$$IAG = a_0 + \sum_{i=1}^{n} b_i \Delta IAG_{t-i} + \sum_{i=0}^{n} c_i \Delta INO_{t-i} + \sum_{i=0}^{n} d_i \Delta CRA_{t-i} + \sum_{i=0}^{n} e_i \Delta YA_{t-i} + \sum_{i=0}^{n} f_i \Delta CPA_{t-i} + gD68_t + \eta EC_{t-1} + \varepsilon_t \quad (3)$$

where η is the speed of adjustment parameter and EC the residuals that are obtained from the estimated cointegration model of Eq2. The null hypothesis of no cointegration among the variables in Eq.1 is:

H_0: $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$

H_1: $\lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq 0$

The bounds testing procedure is based on the joint F-statistic for cointegration analysis. The F test used for this procedure has a non-standard distribution.

Thus, Pesaran and Pesaran (1997) and Pesaran *et al.* (2001) report two sets of critical values for a give significance level. One set of critical values assumes that all variables included in the ARDL model are I(0), while the other is calculated on the assumption that the variables are I(1). If the computed test statistic exceeds the upper critical bounds value, then H_0 hypothesis is rejected. If the F statistic falls into the bounds then the cointegration test becomes inconclusive. If the F-statistic is lower than the lower bounds value, then the null hypothesis of no cointegration cannot be rejected (Odhiambo, 2009). Also in the UECM, the long-run coefficients are the coefficients of the one-lagged explanatory variables (multiplied by a negative sign) divided by the coefficient of the lagged dependent variable (Bardsen, 1989). The respective long-run oil revenues, bank credit, value-added and stock Investment coefficients are - $(\lambda 2/\lambda 1)$, - $(\lambda 3/\lambda 1)$, $(\lambda 4/\lambda 1)$ and $(\lambda 5/\lambda 1)$. These Coefficients can be interpreted directly as elasticity. They are the focal point of our empirical analysis.

RESULTS AND DISCUSSION

Stationary test

Although the bounds test for cointegration does not require that all variables be integrated of order 1, it is important to conduct the stationary tests in order to ensure that the variables are not integrated of order 2. In fact, the F-test would be spurious in the presence of I(2) because both the critical values of the F-statistics computed by Pesaran and Pesaran (1997) and Pesaran *et al*. (2001) is based on the assumption that the variables are I(0) or I(1) (Bardsen, 1989). To determine the order of the series, we conducted six different unit root tests. We used the Augmented Dickey and Fuller (1979) (ADF), Phillips and Perron (1988) (PP), Elliot *et al.* (1996) Dickey-Fuller GLS detrended (DF–GLS) and Point Optimal (ERS–SPO), Kwiatkowski *et al.* (1992). (KPSS), and Ng and Perron (2001)

Table1: Stationary test of variables on level and first difference–KPSS test

Series	No trend	Trend
IAG	0.487**	0.186**
ΔIAG	0.306	0.087
INO	0.183	0.148**
ΔINO	0.313	0.080
CRA	0.494**	0.167**
ΔCRA	0.431***	0.143***
YA	0.686**	0.149**
ΔYA	0.316	0.170**
CPA	0.684**	0.179**
ΔCPA	0.426***	0.175**
Asymptotic critical values-(Ng-perron, 2001, table1)		
5%	0.463	0.146
10%	0.347	0.119

*p<0.1, **p<0.05, ***p<0.001

MZα (NP) tests. To conserve space, we do not- discuss the details of the unit root tests here (see Maddala and Kim (1998) for a review of ADF, PP, KPSS, and DF–GLS; and Ng and Perron (2001) for more on NP). The results of the stationary tests on level and first-differenced variables based on the Kpss and Ng–Perron tests are presented in Tables 1 and 2. The results reported in Tables 1 and 2 show that in the level or first-difference all variables were confirmed to be stationary. It is, therefore, worth concluding that all the variables used in this study are not I (2).

Cointegration test

The first step for testing the null of no cointegration, we must decide about the order of lags on the first-differenced variables. The lag lengths are determined by following the suggestion of Pesaran and Pesaran (1997). Since we have the limited of observations, we searched the lag space for a maximum of 3 lags and computed F-statistic for Eq2. The computed F-test statistic for each order of lags is presented in Table 3.

The critical value at table 3 indicates that for , the computed F-statistic is significant at 95%. It is not significant for at 90% and for , it is significant at 90%. The results show the existence of a long-run investment in the agriculture equation clearly.

Given the existence of a long-run relationship, in the next step we used the ARDL cointegration

Table 2: Stationary test of variables on level and first difference–Ng-perron test

Regressor	Ng-Perron test statistics (not trend) a				Ng-Perron test statistics (with trend)			
	MZa	MZt	MSB	MPT	MZa	MZt	MSB	MPT
IAG	0.687	0.250	0.363	14.522	-3.477	-1.088	0.313	22.342
ΔIAG	-11.777**	-2.319**	0.196**	2.487**	-11.331	-2.329	0.206	8.299
INO	-4.001	1.405	0.351	6.131	-6.855	-1.797	0.262	13.339
ΔINO	-15.093**	-2.743**	0.182**	1.640**	-15.102***	-2.747***	0.182***	6.036***
CRA	6.474	22.299	3.444	1631.7	-41.184*	-4.368*	0.106*	3.086*
ΔCRA	-0.858	-0.619	0.721	26.202	0.904	0.933	1.032	235.141
YA	2.486	2.698	1.085	104.32	-8.549	-1.778	0.208	11.547
ΔYA	-15.146**	-2.718**	0.179**	1.744**	-14.858	-2.722	0.183***	6.154***
CPA	-9.039***	-1.675***	0.185***	4.260***	-57.953*	-5.249*	0.090*	2.187*
ΔCPA	-0.930	-0.395	0.424	13.335	-3.309	-1.199	0.362	25.777
Asymptotic critical values-(Ng-perron, 2001, table1)								
1%	-13.80	-2.580	0.174	1.780	-23.80	-3.420	0.143	4.030
5%	-8.100	-1.980	0.233	3.170	-17.30	-2.910	0.168	5.480
10%	-5.700	-1.620	0.275	4.450	-14.20	-2.620	0.185	6.670

*p<0.1, **p<0.05, ***p<0.001

Table 3: F-statistics for testing the existence of a long run investment in the agriculture equation

Order of lag	F-statistic
1	F(5,19)= 5.22**
2	F(5,17)= 3.61
3	F(5,15)= 4.20*

Notes: the relevant value bounds are obtained from table C1.iii (with an unrestricted intercept and no trend; with four regressors) in pesaran et al. (2001). They are 2.72-3.77 at 90% and 3.23-4.75 at 95%. *denotes that the F-statistics fulls above the 95% upper bound.

Table 4: Estimated ARDL models, long-run coefficients and elasticity, and short-run error correction model

Panel A: The long-run coefficient Dependent variable IAG			
Regressor	**Coefficient**	**t-statistic**	**Elasticity**
INO	0.019	1.854***	0.015
CRA	0.132	4.057*	0.103
YA	-0.074	-2.477*	-0.058
CPA	0.063	2.042**	0.049
constant	2558.6	3.037*	
Panel B: The error correction model Dependent variable ΔIAG			
Regressor	**Coefficient**	**SE**	**t-statistic**
ΔIG(-1)	-0.309	0.133	-2.323*
ΔINO	0.02	0.012	1.716
ΔCRA	0.179	0.046	3.839*
ΔYA	-0.037	0.053	-0.688
ΔCPA	0.294	0.079	3.703*
ΔCPA(-1)	-0.116	0.094	-1.222
EC(-1)	-0.226	0.094	-2.341*
$D68_t$	337.027	220.028	1.532
constant	490.688	257.296	1.91**
$\bar{R}^2$ = 0.61			
DW = 2.22			

*p<0.1, **p<0.05, ***p<0.001

method to estimate the parameters of Eq.2 with maximum order of lag 1 (for determine the lag lengths SBC were utilized). The long-run results are reported in Panel A of Table 4. These results present where the oil revenues, bank credit and stock investment in the agriculture sector display the expected signs, and they are significant at the level 10%, 1% and 5%, respectively. Also, Panel a related to the variables elasticity's that is 0.015, 0.103 and 0.049, respectively. Namely a percentage change in each of these variables, investment in agricultural sector 1.5, 10.3 and 4.9 percent increases. Value-added the agriculture sector not display the expected sign but it is significant in the level 1%. The results error correction model is reported in Panel B of table 4. Adjusted R^2 is 0.61 for the model, suggesting that such error correction models fit the data reasonably well. Also, the computed F-statistics reject the null hypothesis that all regressors have zero coefficients. Importantly, the error correction coefficient carries the expected negative sign and is highly significant.

The adequacy of this ARDL model is checked through a set of specification, diagnostic and stability tests. The diagnostic tests examine serial

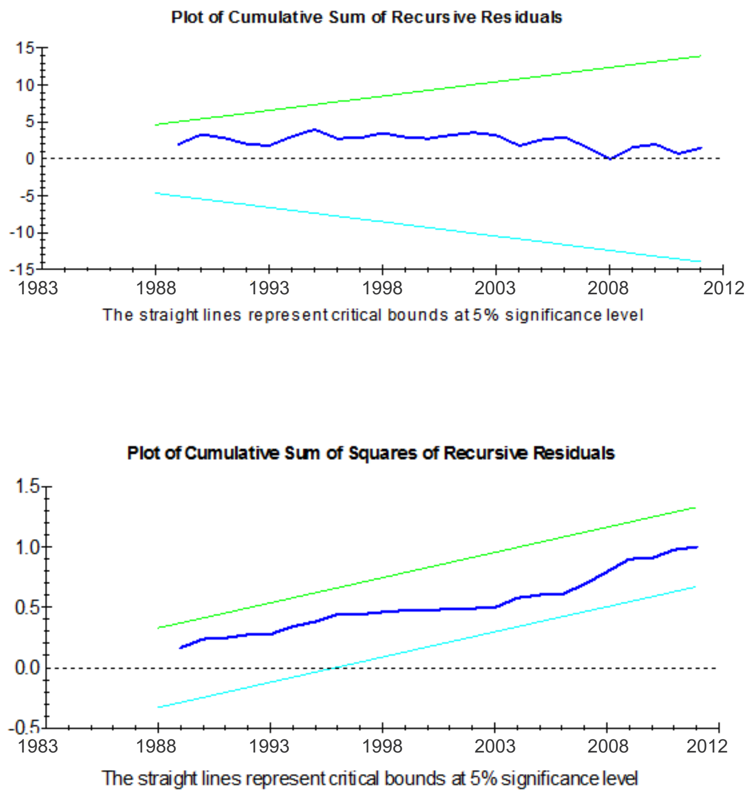

Figure 1: Plots of CUSUM and CUSUMSQ statistics for coefficient stability

correlation using the Lagrange Multiplier test of residual serial correlation (LM test), functional form by employing Ramsey RESET test using the square of the fitted values, normality based on a test of skewness and kurtosis of residuals, eteroscedasticity based on the regression of squared residuals on squared fitted values. Also check whether there is collinearity between the patterns variables of the principle of component test (PC) used. The diagnostic tests reveal no evidence of misspecification and additionally, we find no evidence of autocorrelation. To test for structural stability we utilize the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ). Figs.1 plot CUSUM and CUSUMSQ statistics for Eq 2. the results clearly indicate that the estimated coefficients are confined within the 5% critical bounds of parameter stability.

CONCLUSIONS

In this paper, we examine the relationship between bank credits and investment growth in the agricultural sector of Iran using the autoregressive distributed lag (ARDL) approach developed by Pesaran and Pesaran (1997) and Pesaran *et al*. (2001). Generally, the investment growth in the agricultural sector of Iran is related to oil revenues, bank credit, value-added agriculture sector and stock investment in this sector. The results from table 4 show that the oil revenues, bank credit and stock investment in the agriculture sector display the expected signs and elasticities related to these variables are 0.015, 0.103 and 0.049 respectively.

Namely a percentage change in each of these variables, investment in agricultural sector 1.5, 10. 3 and 4.9 percent increases respectively. On the other hand value-added the agriculture sector not displays the expected sign and elasticity related to this variable is -0.058. This means that, low efficiency in this sector cause to the development within sector don't occurrence and the capital of this sector is transferred other economic sectors. Therefore our results show that, since the bank credit is the important variable affective in explaining the investment growth in Iran, so that increases access to it will encourage growth investment of the agricultural sector in Iran.

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