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ORIGINAL ARTICLE

Financial Market Development and Agricultural Economic Growth in Iran

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ABSTRACT

Financial market plays a crucial rule in economic development process of Iran. It capitalizes entrepreneurs to undertake new investments or adopt new technologies. It helps smooth consumption by providing working capital and reduces poverty in the process. Following the revaluation in 1979 the government adopted various policies, which encourage farmers to improve their productivity and food self sufficiency has been a national priority. This paper investigates the relationship between development in financial market and agricultural GDP growth in Iran over the period 1979-2005. An econometric model *(VAR)* was applied to examine the objective of the study. The required Data for this study were extracted from the State Bank of Iran and Iranian Statistical Yearbook, 1980-2005.

Key words: Financial Markets; Agricultural Economic growth; Causality; Iran

Introduction

In the past, growth in the agricultural sector emanated mainly from expansion of area under cultivation and transition from low value to high value agricultural activities. Policy Reforms in Iranian agriculture were arguably the most comprehensive changes adopted during recent two decades. During the early period after revolution in 1979, the policy concentration was on the attainment of rapid growth in national economy to consolidate the economic base of the country upon which the socio-economic objectives were to be achieved. Following the 1979 revolution, replacement of the traditional interest based credit system with an Islamic credit system was one of the fundamental changes in Iran To ensure an adequate flow of credit, financial institutions reform was made to increase budgetary allocations. Credit for agriculture is channeled at below market interest rates, through Agricultural Bank, the major supplier of rural credit (80%). The Bank has disbursed in 2001 approximately 1 million credit facilities amounting to 10.7 trillion rials (14% of agricultural GDP for the same period). Of this amount, 34% was in the form of payments for special projects approved and provided for by the government. About two-thirds of the total credit to the sector is granted to farmers engaged in field crops and horticulture. With a growing recognition of the importance of agri-business activities to promote development in the sector, there has been an increasing trend in the facilities offered to agricultural related industries and services.

The government also adopted an economic model combining the objectives of food self sufficiency with those of liberalization and private sector promotion.

A Five-Year Socio-Economics Development Plans for reconstruction were launched, which aimed at increasing production, raising productivity in key economic sectors and promoting the non-oil export sector. Economic liberalization was pushed forth in the context of a national structural adjustment program which included correcting price distortions, floating the foreign exchange rate and promoting the private sector. During this period, Iran's agriculture expanded at strong growth rates, and the Plan's ambitious quantitative objectives

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were achieved to a large extent. A great number of theoretical and empirical studies have explored the sources of economic growth at both national and provincial levels (Yazdani 2001, Bell 2001, Chandavarkar 1992, Chow and Li, 2002 Carter 1988, and Chen and Feng, 2000) and ongoing debate is mainly concerned with which source, factor accumulation or productivity improvement, is the key growth-driving factor. However, unfortunately, the role of financial development in economic growth has till recently often been ignored. Christopoulos and Tsionas (2004) reviewed studies are subject to limitations such that the capital formation is the only additional growth-determining variable incorporated in the framework. Schumpeter (1991) points out the role of financial intermediaries in mobilizing funds, evaluating and selecting projects, managing risk, monitoring entrepreneurs and facilitating transactions as the critical elements in fostering technical innovation and growth. Under the assumption that the size of a financial system is positively correlated with the supply and quality of financial services, Gerdin (2002) documents a positive correlation between the financial development and productivity.

Obviously, there is no general consensus among economists on the relationship between financial development and economic growth in agricultural sector. A large body of empirical studies, support the point of views that financial development may raise savings rate, stimulate investment, avoid premature liquidations of capital, reduce the cost of external finance, enhance the efficiency of capital allocation and insure more productive technological choices (Bech et al 2000, King and Levine 1993, Amable and Chatelain 2001).

In general, theoretical models and empirical analyses have provided conflicting predictions and implications about both the impacts of financial development on GDP growth and the repercussions of overall financial development on sector performance.

This paper aims to examine the relationship between financial development and economic growth in agricultural sector in Iran. The study attempts to answer these questions empirically and try to shed some light on the roles of financial development as well as other conditional variables in determination of GDP growth in agricultural sector.

Method and material

There are growth theory models that consider credit sources as a source of growth, Edwards (1993). Development in credit market creates incentives for farmers to improve productivity and results a growth in their GDP" Lal and Rajapartirana (1987). The study is to test the causal relationships between Iran's agricultural economic growth and financial development in credit market. The model is designed to study trade ratio, real per capita GDP and physical capital stock. We specify growth in agricultural sector and financial development relationships as:

$$Y = f(K, R, Z) \quad (1)$$

$$FD = h(Y,R) \quad (2)$$

Where, Y is the real per capita agricultural GDP,
K is the real per capita physical fixed capital formation,
R is the real interest rate measured by the bank deposit rate deflated by the inflation,
Z is the vector of other decisive growth determinants
TR is trade ratio measured by the total values of agricultural exports and imports in year t as a share of GDP,
FD is the indicator of financial development,

Besides measures of GDP growth and financial development, our model also includes an array of conditioning information to control other factors associated with either agricultural economic growth or financial development, which are real interest rate *(R)* measured by the bank deposit rate deflated by the inflation, physical capital stock (*LnK*) by the natural logarithm of real per capita fixed capital formation and trade ratio (*TR*) by the total values of exports and imports of agricultural products in year *t* as a share of GDP.

Theoretically, financial development affects economic growth of agricultural sector indirectly. Besides, economic theory does not postulate any direct effect from physical capital stock and international trade to financial development. Under the hypothesis that the size of financial intermediaries is positively related to the provision and quality of financial services, Bank Credit Ratio (*BCR*) was used as the indicator of financial development, which equals the values of domestic credit by banking institutions divided by *GDP*. Besides *BCR*, we also consider in the robustness test Deposit Liabilities Ratio *(DLR)*, a traditional measure of financial development that equals the ratio of total deposit liabilities of agricultural bank to GDP. Conventional analysis shows that the effect of *R* on savings depends on the relative strength of income and substitution effects. It is also proposed that real interest rate is positively correlated with savings in developing countries, asserting

that the positive substitution effect dominate the negative income effect.

The vector autoregressive model*(VAR)* is used in modelling multivariate relationships. A *VAR* has two dimensions: the length, or order, *p,* of the longest lag in the auto regression; and the number, k, of variables being jointly modelled. Suppose that the level of Y_t can be represented as a non-stationary *p*-th order vector auto regression equation:

$$Y_t=\alpha+\lambda_1 Y_{t-1}+ \lambda_2 Y_{t-2}+\ldots+ \lambda_{p-1} Y_{t-p+1}+ \lambda_p Y_{t-p} + \varepsilon t \quad (3)$$

According to *Hamilton (1994),* the multivariate *VAR*(*p*) model can be shown as:

$$\Delta Y_t = \gamma + \theta_1 \Delta Y_{t-1} + \theta_2 \Delta Y_{t-2} + \theta_3 \Delta Y_{t-3} + \ldots.+ \theta_{p-1} \Delta Y_{t-p+1}+ \rho Y_{t-1} + ut \quad (4)$$

Where, Y_t = [LnY, BCR, LnK, *R*, TR] (or Y_t = [LnY, DLR, LnK, *R*, TR] in the robustness test) is a 5 × 1 vector of the first-order integrated variables;

$\theta_s = -[\lambda_{s+1} + \lambda_{s+2} + \ldots + \lambda_p]$for s = 1, 2, …, p – 1 and $\rho = -\lambda(1)$; θ_i are 5 × 5 coefficient matrices; ε_t is a vector of normally and independently distributed error terms. Johansen (1988) and Johansen and Juselius (1990) derive the trace test and maximal eigen-value test to identify the existence and number of distinct co-integrating vector in the VAR framework and Osterwald-Lenum (1992) tabulates appropriate critical values. If there exist $r(0 < r < 5)$ co-integrating vectors, it implies ρ is rank-deficient, then ρ can be decomposed as: $\rho = \pi\gamma$, where $\pi_{(5\times r)}$ and $\gamma_{(r \times 5)}$. Thus, Eq. (4) can be re-written as:

$$\Delta Y_t= \alpha+ \theta_1 \Delta Y_{t-1}+ \theta_2 \Delta Y_{t-2}+\ldots+ \theta_{p-1} \Delta Y_{t-p+1}+\pi\gamma\ Y_{t-1}+\varepsilon_t \quad (5)$$

Where, the components of π are the error correction coefficients indicating the speed of adjustment towards long-run equilibrium and the rows of γ can be interpreted as the distinct co-integrating vectors. Pesaran and Shin (2002) suggest identification of co-integrating vectors through tests of $r^2 + k$ ($k \geq 1$) restrictions, where r^2 is the just-identifying restriction proposed by Johansen (1991) and k is the over-identifying restriction. Each vector requires at least r restrictions and one of them should be the normalization restriction. Restrictions must be based on economic theory so that the identified co-integrating vectors could be interpreted as economically meaningful long-run relationships. For an illustration, we assume that there are two co-integrating vectors in our VAR model, which are normalized as economic growth in agricultural sector and financial development relationships, respectively. Following Pesaran and Shin (2002), we need at least five theoretical plausible restrictions on γ vector in order to find out long-run relationships among variables:

$$\begin{pmatrix} \Delta \mathrm{LNY}_t \\ \Delta \mathrm{BCR}_t \\ \Delta \mathrm{LNK}_t \\ \Delta R_t \\ \Delta \mathrm{TR}_t \end{pmatrix} = \begin{pmatrix} \pi_{11} & \pi_{12} \\ \pi_{21} & \pi_{22} \\ \pi_{31} & \pi_{32} \\ \pi_{41} & \pi_{42} \\ \pi_{51} & \pi_{52} \end{pmatrix} \begin{pmatrix} 1 & 0 & -\gamma_{13} & -\gamma_{14} & -\gamma_{15} \\ -\gamma_{21} & 1 & 0 & -\gamma_{24} & 0 \end{pmatrix} \begin{pmatrix} \mathrm{LNY}_{t-1} \\ \mathrm{BCR}_{t-1} \\ \mathrm{LNK}_{t-1} \\ R_{t-1} \\ \mathrm{TR}_{t-1} \end{pmatrix}.$$

Two normalization restrictions are straightforward, i.e., the coefficients of LNY(γ_{11}) and BCR(γ_{22}) take a value of unity in the first and second vector, respectively. Theoretically, financial development affects GDP growth indirectly. Besides, economic theory does not postulate any direct effect from physical capital stock and international trade to financial development. Thus, the other three restrictions are generated by setting the coefficient of γ_{12} to zero in the first co-integrating vector and setting the coefficients of γ_{23} and γ_{25} to zero in the second co-integrating vector. In addition, in order to identify meaningful co-integration vectors, Wickens (1996) points out that the error correction coefficients (in this case, π_{11} and π_{22}) must be statistically significant and their signs must be negative.

After identifying co-integrating vectors, we test causality between financial development and GDP growth. Johansen and Juselius (1992) point out that a test of zero restrictions on π is the test of weak erogeneity while Hall and Milne (1994) further show that weak erogeneity in a co-integrated system equals the long-run causality. If the null hypothesis $\pi_{12} = 0$ is rejected, then the GDP growth vector is not weakly exogenous with respect to the financial development vector implying financial development does cause economic growth in the long run. Likewise, if the null hypothesis $\pi_{21} = 0$ is rejected, then the financial development vector is not weakly exogenous with respect to the economic growth vector implying economic growth does cause financial development in the long run. If the null hypothesis $\pi_{12} = 0 \cap \pi_{21} = 0$ is rejected, it implies a bi-directional causality relationship between financial development and economic growth in the long run.

Results and discussion

The examination of long-run relationship among financial development, growth in agricultural GDP and other key growth factors is carried out in three steps. Since a *VAR* framework depends on the time series characteristics of the dataset, we initially investigate the order of integration of the variables using standard tests for the presence of unit roots. Next, the number of co-integrating vectors is tested using the Johansen maximum likelihood approach while the economically meaningful co-integrating vector is identified through tests of over-identifying restrictions. Finally, causal relationship between financial development and GDP growth is evaluated through tests of weak erogeneity. Additionally, we substitute *BCR* with *DLR* to our multivariate *VAR* framework to test the robustness, and provide discussions of our results.

Tests of unit roots revealed that most of the series were are non-stationary. The first differences of variables (i.e. *LnY, BCR, LnK, TR* and *R*) are tested to be stationary. We have decided to treat *R* as *I*(1) since economic theory does not postulate a time trend in the real interest rate. Thus, we have concluded that all series are integrated of order one, or *I*(1).

Supposing all variables are integrated of order one, the existence and number of co-integration vectors through trace test was examined. The results are reported in table1.

Table 1: Trace test for Co-integrating Vectors

Null Hypothesis	Alternative Hypothesis	Statistic value	Critical value (95%)
$r = 0$	$r = 1$	80.6**	68.52
$r \leq 1$	$r = 2$	59.61**	47.21
$r \leq 2$	$r = 3$	24.05	29.68
$r \leq 3$	$r = 4$	11.12	15.14

r indicates the number of co-integrating vector. ** indicates rejection of the null hypothesis at 5%.

The trace test indicates that there exist two co-integrating vectors in *VAR* model set. Based on the system specification and framework illustration described above, we normalize the first co-integrating vector as the GDP growth relationship and the second one as the financial development relationship. In order to find out long-run relationships between GDP growth, financial development and other key growth factors, we need at least five parametric restrictions on γ vectors in the co-integrating space to generate one over-identifying restriction. Two normalization restrictions are straightforward, i.e., the coefficients of LnY(γ_{11}) and *BCR*(γ_{22}) take a value of unity in the first and second vector respectively. The third restriction is generated by setting the coefficient of financial development (γ_{12}) to zero in the first co-integrating vector, since endogenous growth literature and empirical studies show that financial development plays an indirect role in the process of agricultural GDP growth through investment level and investment efficiency. *Beck (2002)* built a theoretical model with financial and trade sectors to explore the possible causal link from the level of financial development to trade in manufactures. Moreover, we implement bivariate Granger casual test with the lag length determined by the *Hendry* General-to-Specific modeling strategy and find no evidence against the null hypothesis that international trade does not Granger-cause financial development, proxied by either *BCR* or *DLR*. Besides, economic theory does not postulate any direct effect from physical capital stock to financial development either. Thus, the other two restrictions are generated by setting the coefficients of γ_{25} and γ_{23} to zero in the second co-integrating vector. The results of over-identifying restriction tests of co- 5% level, * significant t 10% level

The first co-integrating vector shows that LnY is a positive function of *LnK* and *TR,* which is consistent with the theoretical predictions and empirical results in the sources-of-Iran's-growth literatures. A positive coefficient on *R* indicates the indirect productivity effect of real interest rate on economic output. Since both *LnY* and *LnK* are measured in logarithm, the coefficient of *LnK* is elasticity. A greater than unity coefficient of LnK shows increasing returns, which is not consistent with the neoclassical model.

The second co-integrating vector shows that long-run financial development is a positive function of *LnY*, which is consistent with the theoretical predictions and most empirical studies of the finance-growth nexus literatures. However, the effect of *R* on financial development is negative. The error correction coefficient of the financial development vector is also statistically significant and correctively signed, and its magnitude shows the speed of adjustment of financial development toward its long-run equilibrium. A reasonable explanation to interpret this negative interest rate effect might be that the investment channels other than bank deposit are either very few or too risky in Iran.

Finally, the causality test between financial development and GDP growth was applied. The results are reported in table2. The null hypothesis of $\pi_{12} = 0$, which indicates weak erogeneity of the agricultural GDP growth vector with respect to the financial development vector is not rejected, implying that financial development does not cause GDP growth in the long-run. On the contrary, the null hypothesis of $\pi_{21} = 0$, which indicates weak erogeneity of the financial development vector with respect to the growth vector is

rejected at 1% significance level, implying that GDP growth does cause financial development in the long-run. Thus, our results show that there exists a unidirectional causality relationship from GDP growth to financial development.

Table 2: Causality Test under the Co-integration Model

The causality from BCR to LnY H0: $\pi_{12} = 0$ (LnY is weakly exogenous to BCR)	Statistics
Chi-square (2)	0.118
The causality from LnY to BCR H0: $\pi_{21} = 0$ (BCR is weakly exogenous to LnY)	12.33
Chi-square (2)	

** , indicates rejection of the null hypothesis at 5%.

The result of causality tests provides very little support to the view that financial development is a leading factor in the process of GDP growth. However, it is consistent with the paradigm that finance is of little importance and only responds passively to economic growth (e.g., Chandavarkar, 1992, Lucas, 1988 and Robinson, 1952), and a few empirical literatures (e.g., Deidda and Fattouh, 2002 and Demetriades and Hussein, 1996). Our conclusions corroborate exactly the observation of Robinson (1952) that financial development primarily follows GDP growth and the engines of growth must be sought elsewhere.

Conclusion

In this study the long-run relationships among financial development, growth and other key growth factors were empirically examined in Iran's agricultural sector. Also the causality between financial development and GDP growth was evaluated. The robustness of our empirical results has been tested using different indicator of financial development. Overall, we found that financial development, capital stock, international trade and real interest have significantly impact on agricultural growth. However, there exists only a unidirectional causality from GDP growth to financial development, findings that depart distinctively from those in most empirical studies. Hence, our findings have an important implication of policy recommendation. If credit market continues to distort the allocation of capital, then economic growth in agriculture might not be sustained.

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