# Financial Development and Agricultural Growth in Iran An Application of Time-Frequency Analysis

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**Abstract**
Considering importance of agriculture in developing countries, policymakers have always emphasized on agricultural growth as prerequisite of nationwide economic growth. Meanwhile, the relationship between financial development and the growth of the agricultural sector has been the subject of several studies leading to different results. Therefore, the present study aims to create new insight into this subject by applying new analytical method. This study applies continuous wavelet and time-frequency domain analyses. Since financial development has a wide range of dimensions, this study uses credit growth, number of ATMs and spatial distribution of Agriculture Bank's branches as financial development measures. It was found that agricultural growth leads to credit growth both in the short and long run. We could not find any association between number of ATMs and agricultural growth. However, spatial expansion of Agriculture Bank in the short run was positively affected by sector growth as well as in the midterm.

**Keywords:** Agricultural Growth, Financial Development, Wavelet Analysis, Iran.

**JEL classification:** Q14, C22

## 1. Introduction

As the oldest productive activity, the agricultural sector has been of special importance in the development process of different countries in different periods. Studying the development process of nations indicates that the development of the agricultural sector is essential as one of the most important economic sectors or even beyond as a necessary prerequisite for the realization of sustainable development. In the present era, agriculture has a special and privileged position as one of the major production activities in most countries of the world, especially in developing countries. Developing this sector is important in various aspects including food supply, providing raw materials for the agro-industries, and foreign earnings. Therefore, examining the relationship between agricultural growth and macroeconomic variables is of great importance to policymakers and economists. Accordingly, like other sectors of the economy, the relationship between financial development and agricultural growth in the theoretical and experimental fields is ambiguous. Thus, not a definite result was achieved in the related studies. Shahbaz et al. (2011) found a one way causality from financial development to the agricultural growth. Since bank loans and improving investment activities are effective in the growth of the

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agricultural sector and its subdivisions and thus the growth of its value-added by reducing financing constraints and increasing savings. Besides, King and Levin (1993) reported that the causal relationship is directed from financial development towards economic growth. Accordingly, financial development contributes to the process of investment and economic growth through creating and expanding financial institutions, instruments, and markets because financial development results in selecting the best investment projects and financing the implementation of large projects by equipping small financial resources. Also, it can expand and diversify the financial instruments, and it is possible to receive innovation rewards for new methods. Sial et al. (1990) found that off-farm capital and forming cooperatives are needed to provide the necessary facilities to change technology since most models are beyond the reach of smallholder farmers based on the investor's technical knowledge. Therefore, it is expected that the financial markets in this sector will have an appropriate input to help the process of transition and accelerate the development of agriculture, and the granted facilities are used as a key factor for modernizing and adopting new technologies. Similarly, Gerschenkron (1962) reported that the financial system plays a key role in the market for allocating resources to higher productivity schemes which play an important role in value-added growth. Also, some studies have focused on supply-leading for the financial system, i.e. creating financial institutions and supplying assets create the entrepreneurs' demand in new sectors and their motivation to grow. This view holds that supply-leading (or supply management) has two functions. First, financial resources are transferred from the traditional sectors, which have no growth or their growth is low, to the new and progressive sectors. Second, new funds are provided to entrepreneurs, leading to opening new horizons before their eyes. It cannot be stated that financing the supply-leading is a prerequisite for sustainable economic development; however, it is an opportunity to stimulate real growth with financial instruments and plays a more important role in the early stages of growth. Gerschenkron argues that the backwardness of one economy compared to the other ones in a period focuses more on what is called supply-leading financing. However, Robinson (1982) argues that the financial sector follows firms, i.e. the economic growth is the reason for the demand for financial services. Accordingly, financial issues are the answer to the demands of the non-financial sector and do not create economic growth. Such a view emphasizes the demand for financial services, in which creating new financial institutions, their assets and liabilities, and related financial services in response to the demand for these services by investors and savers in the real economy is called supplying demand-following. Accordingly, the evolutionary development of the financial system is the result of a process of economic growth, which indicates that economic growth is the reason for financial development and the impact is directed from economic growth to financial development. This approach is well-known in demand-following literature.

Lucas (1988) believes that financial issues do not determine economic growth. Additionally, the financial market conditions and the agricultural sector in developing countries such as Iran weaken the links between financial development through credit expansion and the growth of the agricultural sector. Determining the effects of the spatial distribution of production, specific spatial factors, and exogenous shocks on revenues add to the complexity of the work of financial institutions in identifying the situation of customers. The existence of such factors and out of control conditions affect the evaluation results and represent the level of activities less than optimal. Therefore, it is very costly for financial institutions to be aware of the situation of borrowers. As a result, lenders feel threatened and adjust the level of risk (probability of default) due to not being fully aware of the risk of borrowers' activities. Thus, lenders may expose lenders to moral hazard by taking opportunistic measures to make a profit. In addition, the agricultural sector in developing countries is facing serious problems due to the lack of efficient financial markets. Such markets cannot provide the financial resources needed to invest and develop the sector. Various factors have led to the lack of formal financial intermediation and the poor performance of agricultural development banks. Inadequate macroeconomic policies, dual sectoral policies between rural-urban and non-agricultural agriculture, the perception of non-profitability and structural weakness of agricultural financial institutions and markets, and inefficient government interventions in such markets have led to the underdevelopment of financial intermediation for the agricultural sector (Gonzalez-Vega & Graham, 1995).

Like other developing countries, agriculture has long played an important role in production and employment in Iran. Considering the special conditions of Iran's economy due to international sanctions, the agricultural sector can have a significant impact on macroeconomic variables such as economic growth. In Iran's economy, providing facilities at preferential rates in one sector as the policy of cheap credit has been considered as the most important approach of the government to solve the problem of financing the agricultural sector during recent decades. However, low-interest rates on bank facilities in the agricultural sector have greatly limited the achievement of approved credit targets by reducing banks' incentives to finance this sector. In addition, a cheap credit policy with increasing demand for credit has led to non-price quotas of banks in the credit distribution, resulted in more accessibility of wealthy farmers to the credit, relying on collateral and depriving the smallholder farmers of receiving their required credit. Therefore, the cheap credit policy failed to perform well and resulted in self-defeating the sector's financing and distributional balance in rural areas. This situation is modeled in the study conducted by Chaudhuri and Gupta (1986).

Based on the above-mentioned issue,

Agriculture is a fundamental production activity in many countries of the world, especially the developing ones. The high importance of this sector can be attributed to the role it plays in providing the food needed by the society, creating employment, providing raw materials for various industries and providing currency and financial sources for other economic sectors. In Iran's economy, due to the unfavorable dependence of the economy on the export of petroleum products, attention to this sector becomes doubly important. The probable advantages of the agricultural sector include the natural production of some agricultural products, not needing any complicated technology and expertise, not needing any large foreign exchange capital, and the quick return of the money. As a result, examining the factors influencing this sector provides important implications for policymakers.

Financial development is one of such factors by which some controversial issues are raised in its related literature despite its impact on other sectors of the economy. As mentioned above, no consensus related to the impact of financial development on agricultural growth still exists despite the range of theoretical and experimental studies. Considering that the lack of consensus on the relationship between financial development and agricultural growth is related to the lack of attention to analyzing the time-frequency domain and its change in the context of the time, the present study aimed to provide new insights into the relationship between financial development and value-added growth in the agricultural sector through adopting a new approach to wavelet analysis. As a result of using such a method, it is possible to delineate the causal relationship dynamically and its changes over time-based on intensity and direction, short-term, medium-term, and long-term, and finally, time-frequency analysis. Furthermore, considering different dimensions of financial development, credit growth, number of ATMs, and some branches of the

Agricultural Bank have been used as measures of financial development. To this aim, the present study is organized as follows. The research innovation is clarified by reviewing the related literature. Then, methodologies are introduced. Finally, the results are presented and concluded by summarizing and presenting policy proposals.

## 2. Literature review

Generally, considering the purpose of the present study, the existing studies in this field are divided into two sections. First, researchers seek to discover the causal link between agricultural growth and financial development. Second, assuming a one-way causal relationship, the researchers are looking for examining how financial development affects the growth of the agricultural sector. The most important studies conducted in both categories are reviewed. It is worth noting that bank loans are mainly used as an indicator of financial development.

### *2-1. Investigating the causal relationship between financial development and agricultural sector growth*

As empirical studies conducted in economics, causal methods based on vector auto-regression have been widely used in this field. Shahbaz et al. (2013) examined the causal relationship between financial development and the growth of Pakistan's agricultural sector through Granger causality during 1970-2011. It was found that a two-way causal relationship existed between both variables. Besides, Adu et al. (2013) found that the impact of financial development on the agricultural sector depends on the choice of index and each dimension of financial development had a different impact on growth. El-Rasoul (2020) used the vector auto-regressions method and the Toda-Yamamoto causality test to examine the relationship between financial development and the growth of the agricultural sector in Egypt during 1995-1997. Based on the result, bank credit resulted in increasing production in the agricultural sector in the long run. The results of the causality test indicated that a two-way relationship between financial development and value-added growth in the agricultural sector. Using the fully modified ordinary least squares (FMOLS), Chandio (2020) found that long-term financial development boosted China's agricultural production during 1989-2016.

### *2-2. Investigating the effectiveness of financial development on the growth of the agricultural sector*

Fathi et al (2009) examined the short- and medium-run relationship between financial development and growth of the agricultural sector in the Iranian economy during 1953-2005. The results of applying the vector auto-regression method indicated that a two-way causal relationship between development and the agricultural sector in the long run. Also, financial development is not the reason for the growth of the agricultural sector in the short run.

Chisasa and Makina (2015) used the Johansen cointegration method to examine the impact of bank lending on production in the agricultural sector in South Africa during 1970-2011. It was found that increasing credit is associated with a decreased production in the short run; however, the effectiveness of such a variable is reported as positive in the long term.

Olaniyi (2017) used the vector auto-regression distribution lag method to examine the impact of financial development on the growth of the agricultural sector in Pakistan during 1981-2014. The results indicated that financial development has a positive and significant impact on the growth of the agricultural sector in the long run.

Oliynyk-Dunn (2017) investigated the impact of financial development on the growth of agricultural value-added in Ukraine during 2004-2013. The results of the regression estimation indicated that financial development has no significant impact on agricultural production growth.

Tekilu et al (2018) reported that the impact of financial development on economic growth is not significant in Ethiopia during 1975-2016. Osabohien (2020) indicated that the growth of this sector increases by applying the Autoregressive Distribution Lag method while increasing credits in the agricultural sector. In addition, Florence and Nathan (2020) used the same method to examine the impact of agricultural credit on the growth of that sector in Uganda. The results indicated that financial development does not affect the growth of the agricultural sector.

Although time series methods were used in most studies, some focused on panel data-based methods. For example, Anwar (2015) examined the impact of credit on the agricultural sector in the Indian economy. The results of using the Least Square Dummy Variable (LSDV) method indicated that credits had a positive impact on various sectors of the Indian economy including agriculture during 2001-2009.

**2-3. A summary of experimental studies**

Some points should be considered in summarizing the previous studies

1) The relationships used in the research were mainly in the form of single equations. This important issue is associated with endogenous problems and incorrect results.

2) As mentioned, the results of the report are ambiguous and not homogeneous. For this purpose, some researchers have used nonlinear approaches to present a new analysis. Selecting the transfer variable is considered as one of the major challenges in this regard. The results will vary depending on whether the variable is agricultural growth or financial development. In addition, there is the problem of endogeneity in such patterns.

3) In most studies, researchers focused on time-frequency analysis. Further, they have neglected the possibility of changing cause and effect relationships.

The present study aimed to solve such problems by applying continuous wavelet conversion tools as follows.

1) The relationship between agricultural sector growth and financial development is examined as pairwise, without raising problem of endogeneity.

2) The analysis is performed simultaneously in the time-frequency domain and the existing dynamics between the relationships are revealed.

**3. Methodology and Data**

This study presents a novel wavelet analysis to evaluate the relationship between Growth and Financial Development in Agricultural Sector in Iran. Wavelet analysis is considerably different from most of the conventional mathematical methods such as time-domain methods including correlation analysis and Granger causality, which is not able to recognize short-run and long-run relationships between time series, and frequency domain methods such as Fourier analysis, which fails to find how such relationships change over time. In addition, expanding time series into a time-frequency space is possible by which the local and casual relationship can be read off intuitively. Therefore, it is more appropriate for evaluating whether the relationship changes across frequencies over time simultaneously. Further, a wavelet analysis plays a significant profit over the well-known Fourier analysis, especially when the time series under work are locally stationary or non-stationary (Jiang et al, 2015).

Similar to the previous studies (Torrence and Compo, 1998 and Grinsted et al., 2004), our wavelet method includes multi-resolution analysis and feature extraction in which wavelets are defined as follows.

$$\psi_{u,s}(t) = \frac{1}{\sqrt{s}}\psi\left(\frac{t-u}{s}\right) \tag{1}$$

Wavelets are supposed be the square-integrable function, i.e. $\psi(.) \in L^2(\mathbb{R})$. In Eq. (1), $1/\sqrt{s}$ indicates the normalization factor ensuring the unit variance of the wavelet, $\|\psi_{u,s}\|^2 = 1$. $u$ is considered as the location parameter which can determine the exact position of the wavelet, and $s$ shows that the scale dilatation parameter of the wavelet and defines the way of stretching the wavelet . Accordingly, the higher scale refers to more stretched wavelet which is suitable for detecting lower frequencies.

The Morlet wavelet is considered as an analytic or complex wavelet within a Gaussian envelope with good time-frequency localization. Formally, the Morlet' wavelet is given as follows

$$\psi^M(t) = \frac{1}{\pi^{1/4}} e^{i\omega_0 t} e^{-t^2/2} \tag{2}$$

Where $\omega_0$ indicates the central frequency of the wavelet. In addition, we set $\omega_0 = 6$ following Grinsted et al. (2004), Rua and Nunes (2009), and Barunik et al. (2011). This selection of value for $\omega_0$ can create a good balance between time and frequency localizations. According to Agiar-Conraria et al. (2008), the Morlet wavelet is centered at the point $(0, w_0/2\pi)$ in the time-frequency domain. Further, they reported that almost exclusive uses of the discrete wavelet transform is considered as one feature of using wavelets to economics, which is difficult to understand since the same type of analysis may be done more easily and straightforwardly by applying the continuous wavelet transform. Following Rua and Nunes (2009), the continuous wavelet transform is as follows.

$$W_x(u,s) = \int_{-\infty}^{\infty} x(t) \frac{1}{\sqrt{s}} \overline{\psi(\frac{t-u}{s})} dt \tag{3}$$

Specifically, $W_x(u,s)$is calculated by projecting the specific wavelet $\psi(.)$ on the selected time series. The ability of decomposing and then reconstructing the function $x(t) \in L^2(\mathbb{R})$ are considered as the main advantages of the continuous wavelet transform as follows.

$$x(t) = \frac{1}{C_\psi} \int_0^{\infty} \left[ \int_{-\infty}^{\infty} W_x(u,s) \psi_{u,s}(t) du \right] \frac{ds}{s^2}, \quad s > 0 \tag{4}$$

It is worth noting that the energy preservation of the selected time series is regarded as the main feature of the wavelet transform, which is used for analyzing the power-spectrum which determines the variance as follows (Hathroubi and Aloui, 2016):

$$\|x\|^2 = \frac{1}{C_\psi} \int_0^{\infty} \left[ \int_{-\infty}^{\infty} |W_x(u,s)^2| du \right] \frac{ds}{s^2} \tag{5}$$

**3.1. The wavelet coherence**

Based on the Fourier spectral approaches, wavelet coherency (WTC) is defined as the ratio of the cross-spectrum to the product of the spectrum in each series and can be behave as the local relationship between two time series based on time and frequency. Accordingly, the wavelet coherency means the ratio of the cross-spectrum to the product of the spectrum in each series (Aguiar-Conraria et al., 2008). Thus, we define the WTC of two time series is defined as follows based on Torrence and Webster (1999):

$$R_t^2(s) = \frac{\left|S(s^{-1}W_{xy}(u,s))\right|^2}{S(s^{-1}|W_x(u,s)|^2)S(s^{-1}\left|W_y(u,s)\right|^2)} \tag{6}$$

Where S means a smoothing operator. Regarding the study of Aguiar-Conraria and Soares (2011a), the present study focused on the wavelet coherency instead of the wavelet cross spectrum since the wavelet coherency represents the advantage of normalization by the power spectrum of the two-time series (Tiwari et al, 2014).

**3.2. The cross wavelet phase angle**

Negative and positive correlations cannot be recognized because the wavelet squared coherence ranges between zero and one. The phase difference is used for solving this problem. The phase difference provides important information on the causal relationship by lead – lag interactions, the value of which for the two time series x and y is as follows:

$$\phi_{x,y} = tan^{-1}\left(\frac{\mathrm{T}\left\{W_n^{xy}\right\}}{\mathrm{R}\left\{W_n^{xy}\right\}}\right), with \phi_{x,y} \in [-\pi,\pi] \quad (7)$$

Where $\Im$ and $\Re$ are considered as the imaginary and real parts of the smoothed cross-wavelet transform, respectively. In the present study, the values of $\phi_{x,y}$ are interpreted in terms of angular arrows. Fig.1 displays the phase difference analysis.

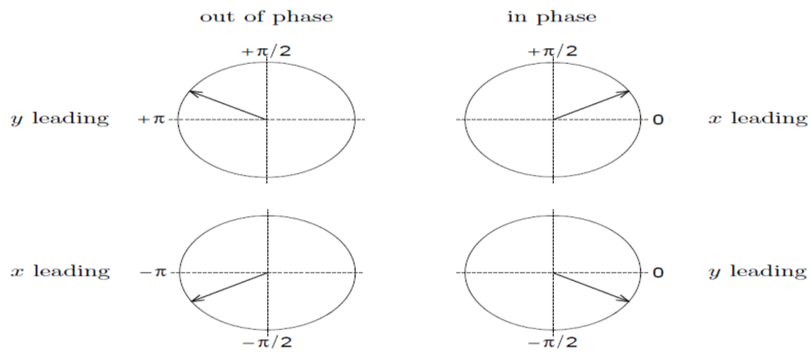


**Figure 1**. Phase-differences and their interpretation (Rösch and Schmidbauer,2016)

Based on a phase-difference of zero, the time-series move together at the specified time – frequency. The series move in phase if$\phi_{x,y} \in \left(0,\frac{\pi}{2}\right)$However, the time series x leads to y. if $\phi_{x,y} \in \left(-\frac{\pi}{2},0\right)$ , then it is y leading to a phase-difference of π (or -π) which indicates an anti-phase relation. y is leading if $\phi_{x,y} \in \left(\frac{\pi}{2},\pi\right)$. Time series x is leading when $\phi_{x,y} \in \left(-\pi,-\frac{\pi}{2}\right)$ (Aguiar-Conraria and Soares, 2011b).

## 4. Results

### 4-1. Descriptive Statistics of the Variables

In the present study, three variables were used as the indicators of financial development. The mentioned variables are the growth of credits granted by Agricultural Bank to this sector, the number of ATMs and branches of Agricultural Bank. Based on the maximum available data, the periods for the above variables, seasonal data, and annual data are 1979-2017, 2007:01-2018:02, and 1985 - 2018, respectively. The data of value-added growth of the agricultural sector and the growth of loans granted to the agricultural bank to this sector were used during 1979-2017.
Table (I) presents the descriptive statistics of the variables used in the research.

**Table I. Descriptive Statistics of the Variables**

| | Agricultural Growth (%) | Credit Growth (%) | Number of ATMs | Number of Agriculture Bank's Branches |
|---|---|---|---|---|
| **Mean** | 5.33 | 25.95 | 30407 | 1411 |
| **Median** | 4.6 | 26.69 | 29777 | 1812 |
| **Maximum** | 62.24 | 74.3 | 55425 | 1927 |
| **Minimum** | -27.04 | -29.41 | 8214 | 306 |
| **Std. Dev** | 12.71 | 19.61 | 15044.07 | 636 |
| **Skewness** | 1.96 | -0.07 | 0.15 | -0.87 |
| **Kurtosis** | 12.37 | 3.88 | 1.75 | 1.94 |

**4-2. Wavelet Analysis**

As shown in Figures (2-4), the horizontal axis of time, the vertical axis to the left of the time scale (per years), and the vertical axis to the right indicate the wavelet correlation coefficient. When the time scale increases, the analysis is performed in the long term and examines the fluctuations in the short run. The scales of 0-4, 4-8, and more than 8 years were considered for the short-, medium-, and long-term interpretations, respectively. As the right vertical axis indicates, the white and black colors indicate the strength of strong correlation and low correlation of time series, respectively, which is possible to be measured in any time situation at any scale, as shown in Figures (24).

The random values replace the actual values obtained from the conversion in time series conversion due to the oscillation of the wavelet moment. It leads to a skewed conversion error, known as the Edge Effect, which increases while increasing the conversion scale. Areas of the spectrum where the edge effect peaks are called code of influence. The results obtained from the time-scale analysis of wavelet converters in the edge regions are unreliable and cares should be taken in interpreting the results (Torrance and Campo, 1998). For this purpose, the interpretable spaces in Figures (2-4) are delimited by a thin black line in the form of a parabola. Besides, only the areas which can be interpreted are surrounded by bright black lines in such parabola. Such areas are the statistically reliable range of estimates at 95% confidence intervals obtained by Monte Carlo simulations. The direction of the angled arrows indicates the leading variable and is interpreted as in Figure (1). Accordingly, the results of research enable analyzing time-frequency range, as well as the correlation degree in the form of quasi-three-dimensional shapes, and provide a comprehensive image of the structural changes of time series. As mentioned, Figures (2-4) are related to the wavelet correlation space and the phase difference between the growth of the agricultural sector and the growth of credits, respectively, and the number of ATMs and branches of the Agricultural Bank, respectively.

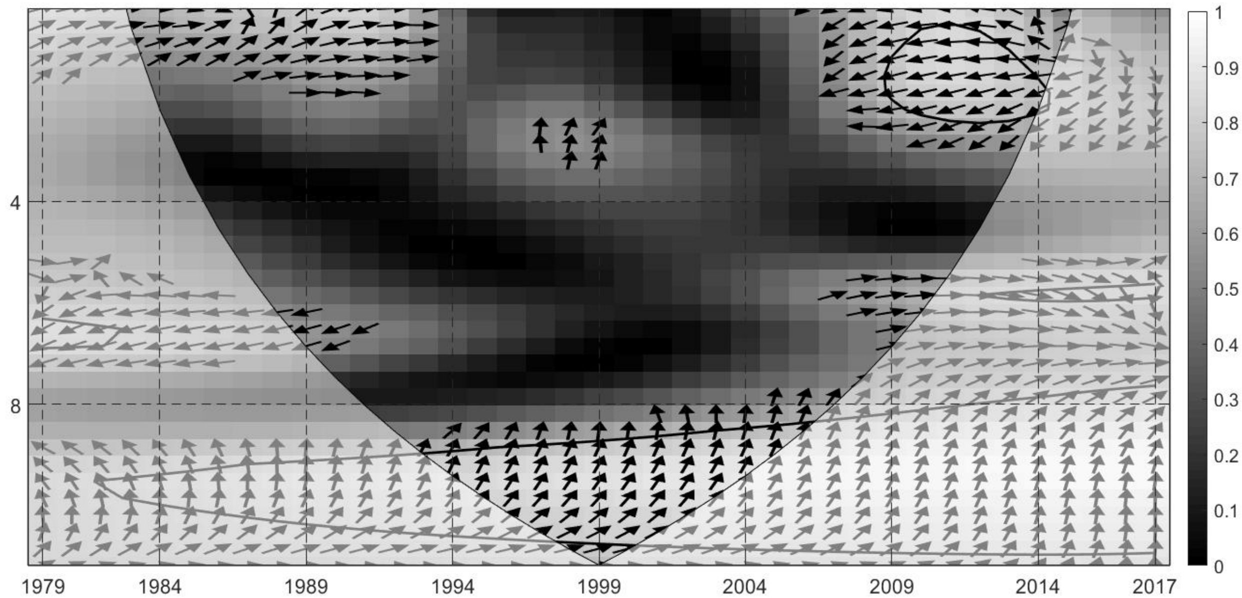


**Figure 2.** Wavelet correlation space and phase difference between agricultural sector and credit growth

In the short run (less than 4 years), the causal relationship is observed in contrast to the severe phase with a coefficient of approximately 0.85 from the growth of the agricultural sector to the financial development so that the credits decreases (increases) as the agricultural sector increases (decreases). Time-frequency analysis indicates that such a relationship occurred during 2009-2013, which indicates that increasing the credit cannot affect the growth of the agricultural sector in the short run. Besides, the need for financial resources decreases when the value-added growth improves. However, policymakers have failed to stimulate production through a change in credits in the short term because the value-added growth is leading and credit growth is following. In the medium term (4-8 year horizon), no significant relationship was observed between both variables. Therefore, Lucas's (1988) view that financial development is not related to growth in Iran's agricultural sector in the medium term is true. Additionally, granting credit is considered as a means to transfer income to farmers, without meeting their capital needs. A stable and strong relationship is observed from the growth of the agricultural sector to financial development (credit growth) in the long run so that the wavelet correlation coefficient is approximately 0.8. Therefore, the demand-following view is valid for the agricultural sector in Iran in the long term, based on the following financial development from the growth of the real sector.

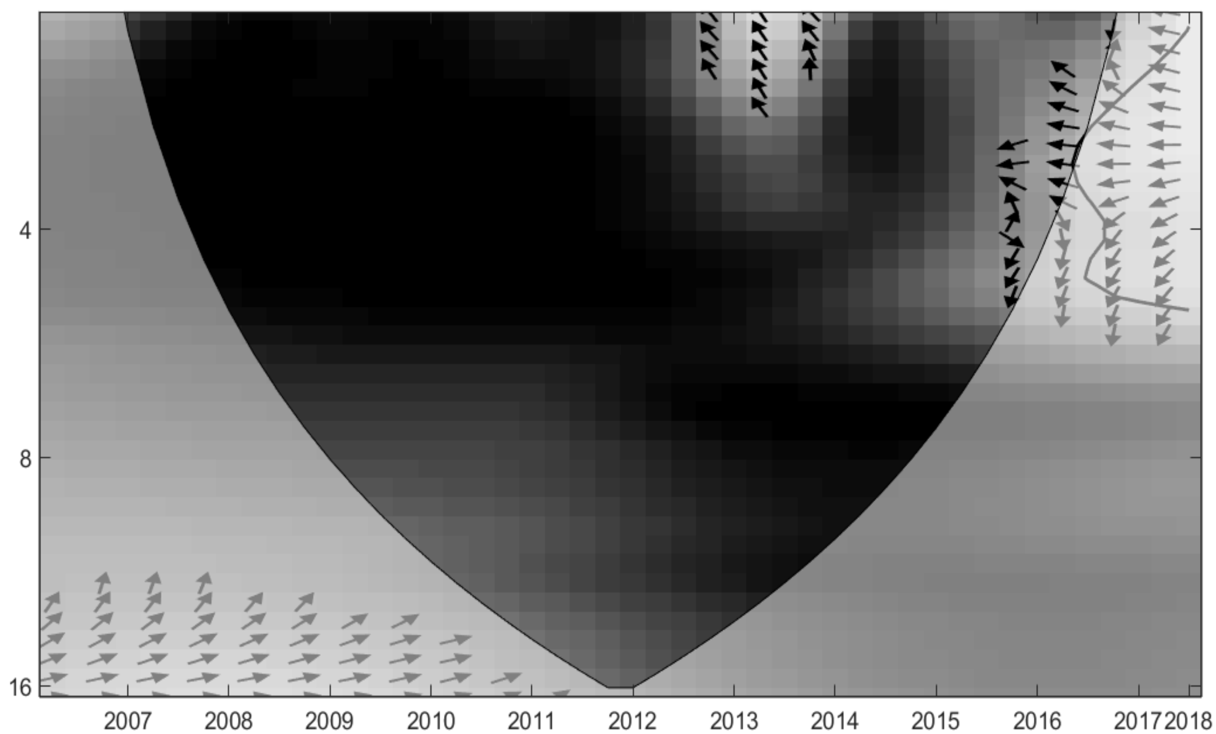


**Figure 3.** Wavelet correlation space and phase difference between agricultural sector growth and the number of ATMs

As shown, no relationship exists between the growth of value-added in the agricultural sector and the number of branches. Therefore, there is no relationship between the growth of value-added in the agricultural sector when the index of the number of ATMs is considered for financial development.

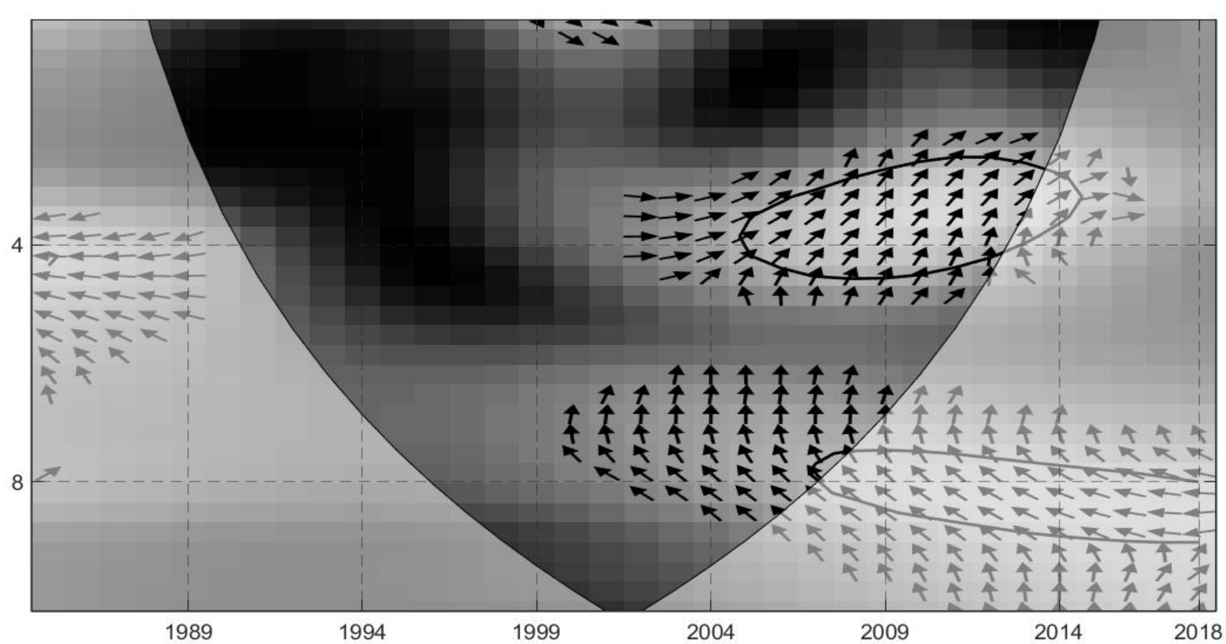


**Figure (4).** Wavelet correlation space and phase difference between the growth of the agricultural sector and the number of branches of the Agricultural Bank

As shown, the relationship between the growth of value-added in the agricultural sector and the number of branches of the Agricultural Bank varies in different horizons and over time so that the value-added growth is considered as a leading variable in the short term (less than 4 years) and medium term (between 4-8 years). Therefore, the number of branches of the Agricultural Bank in the country increased when the growth of the agricultural sector increased. No significant and strong relationship was observed between both variables in the horizons of more than five years. Compared to credit growth index, the results are different compared to those in Figure (2). Therefore, it is necessary to distinguish between different indicators in defining financial development.

Regarding the result, it is noteworthy that in developing countries, especially in Iran, specialized agricultural banks and agricultural financial institutions have been required to lend for agricultural activities, and this has led to the formation of the idea that giving loans to agriculture is a special activity. This attitude has been created because the tendency of other financial intermediaries to enter this sector has decreased. In these countries inappropriate macroeconomic policies such as applying sectoral policies like price control, trade policies and government investment priorities has caused distortion in the allocation of resources through financial intermediation. In addition, financial market bottlenecks, such as the inflexibility of these markets and incomplete information, prevent the optimal allocation of resources. Lack of infrastructure and communication tools and the void of a properly formed connection with other markets causes dispersion and multiplicity of markets and thus restricts the flow of information and increases risk. Therefore, financial development has been unable to affect the volume of investment and due to the non-optimal allocation of financial resources without taking technical, economic, financial and market considerations into account, has not been able to increase the efficiency of investment and consequently the efficiency of financial instruments. And therefore has not had a significant effect on the growth of the agricultural sector. In addition, weak management of the banking system, inefficient distribution of banking facilities and credits, government interference in the banking system and inefficiency of financial institutions in the properly providing resources are also involved as a result.

## 5. Conclusion

Since agriculture is considered as one of the most important sectors in developing countries, achieving sustainable growth is emphasized by economists, planners, and policymakers active in the field of agriculture. Accordingly, the factors affecting the growth of the agricultural sector were examined in numerous studies. Further, the interaction between the agricultural sector and financial development was emphasized in several studies. However, no significant findings were obtained in theoretical and empirical studies. Theoretically, there are two main approaches, upon which agricultural growth or financial development is leading for some reasons. In the experimental section, studies have reported one-way, two-way causality and lack of relationship. Accordingly, the relationship between agricultural sector growth and financial development in the time-frequency domain was examined by applying a new approach to continuous wavelet conversion. Considering the wide dimensions of financial development, credit growth, the number of ATMs and branches of Agricultural Bank were used as indicators of financial development. It was found that credit growth follows that of the agricultural sector in the short (less than 4 years' horizon) and long terms (more than 8 years' horizon). In addition, no significant relationship was observed between both variables in the medium term (4-8-year horizon), i.e. the theory of supply management in the Iranian economy is irrelevant. Furthermore, if the number of ATMs is considered as an indicator of financial development, there is no significant relationship between agricultural sector growth and financial development. However, the results are different when the number of branches of the Agricultural Bank is used as an indicator of financial development. In fact, the change in the growth of the agricultural sector positively affects the number of branches of the Agricultural Bank in the short and medium-term. Additionally, both variables had no significant relationship with each other. Accordingly, the policy of monetary expansion is not accompanied by the growth of value-added of this sector by increasing the credits of the agricultural sector, while its indirect effects such as rising inflation, credit tightening, the reaction of economic agents in response to expansionary policies, etc. result in creating significant damages to the growth of the agricultural sector.

According to the obtained results, it can be construed that credits have been led toward imports instead of being directed to the production sector which is also due to inflation in the Iranian economy. If the condition for the optimal use of production factors is not provided, bank credits alone cannot achieve the goals of agricultural development, and its quantitative increase should be accompanied by solving the structural problems of this sector. Therefore, it is necessary to pay attention to the comparative advantage of products in different regions of the country and to plan for land management accordingly. Because Iran has a good diversity in terms of climate, which has also affected the quality of products and as a result, has favored the country to some extent.

Currently, granting bank facilities is considered as the main way of financing the agricultural sector. The results indicated that revising this policy and taking advantage of capital market capacities are considered as alternative ways. To this end, it is proposed to encourage and support establishing large agricultural units and the possibility of financing through the capital market. In addition, some revisions and reforms should be made to make the credits and financial development on the value-added of the agricultural sector in allocating credits for the Agricultural Bank. It is possible to approach the formation of capital in the agricultural sector by allocating funds by reducing administrative barriers to the demand for credit in the agricultural sector.

The lack of effect of the number of ATMs, as a representative of financial development and electronic banking, on the value-added growth of the agricultural sector is considered as one of the research results, which can be related to the inefficiency of the banking system in the proper use of services and the lack of comprehensive education. Therefore, it is suggested that the development of strategic plans in the framework of the country's electronic infrastructure and providing appropriate legal frameworks along with public education and culture building be considered to affect such dimensions of financial development.

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