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# The Effect of Financial Development on Income Inequality in the Iran's Economy Using Non-linear Cointegration Technique

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## Abstract

Different theories have different predictions about the relationship between financial development and income inequality that leads to two broad categories of thought with two conflicting theoretical hypotheses. This study examines the effect of financial development on income inequality in the Iran's economy by using a Threshold Error Correction Model (TVECM) form 1971 to 2013. The results of TVAR.LR test show that the model has only one threshold. The results of the TVECM.Seo and TVECM.HS tests represent a threshold cointegration between the variables. Also, the results of Threshold Error Correction equation indicate that before reaching the threshold value, an increase in financial development causes increases in the Gini coefficient. But after reaching the threshold value, financial development reduces income inequality (decreases Gini coefficient) in the Iran's economy.

**Keywords:** Financial Markets, Income Inequality, TVECM, Nonlinear Cointegration, Iran's Economy

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## Introduction

System based on a market economy at the macro level is based on four markets. These markets include goods market, labor market, money market and capital market. Two markets of four markets (money and capital markets) are in relation to the financial sector. Financial component (or system) is composed of markets, institutions, products and financial instruments. In fact, it is supplement of real economy. Financial development is expansion of the financial sector of the economy. Financial development is a multifaceted concept that in addition to the expansion of the banking sector involves other aspects such as the development of non-bank financial sector, monetary sector and monetary policy, banking regulation and supervision, financial openness, institutional environment and development of the stock market. Optimal functioning of the economic system depends on the presence of both real and financial sector that are efficient, complete, powerful and monitored. Activity of these two together is a necessary and sufficient condition for an optimal economic system. So failure in one of two sections will have a negative effect on the function of other sectors. Therefore, long-term and stable equilibrium are obtained when the two parts of the economic system with its internal communication should be efficient in terms of equilibrium (Kim and Lin, 2011).

In many countries, there is a gap between the lower and upper society and income inequality is at an extensive level. The main cause of the unequal distribution is not merely considered due to differences between labor efficiency in the various groups. Unequal distribution of income is, in fact, due to the unequal distribution of wealth. The concentration of wealth in the hands of a limited group of economic and political elite has enabled them to develop their human capital and its next generation can have a greater share of national production. Financial sector development and expansion of financial instruments and intermediaries are ways that can be controlled by the concentration of wealth and will provide more opportunities to people who have less opportunities to invest in their human capital, to increase their share of national product.

Some economists argue that the effect of financial development on income inequality depends on the degree of financial development of a country. They believe that an optimal threshold of development of financial markets is essential to reduce income inequality. Financial development can have profound effects on access to credit and financial services for the poor. Proponents of financial development suggest that financial development increases a better access to credit for borrowing a given level of deposits (Kim and Lin, 2011). Now the question is: what is the effect of financial development on income inequality in Iran?

Financial system with more efficiency provides better financial services and thereby enables economy to increase GDP growth rate. Thus, the role of financial intermediaries and financial markets will be more attractive. On other hand, if the financial system is in a state of some specific groups, development of this market could exacerbate income inequality. Thus, the relationship between financial development and income inequality can be a nonlinear relationship in a country. The main issue of this research is the effect of financial development on income inequality in the Iran's economy with respect to other variables such as inflation, income per capita, government expenditure, and trade openness.

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In the second section, theoretical framework will be reviewed. In this section investigated Greenwood and Jovanovich's model and Banerjee and Newman's (1993) linear hypothesis. Third section investigated literature review. In the section 4 introduces data. Section 5 econometrics model will be reviewed. In the sixth section estimated econometrics model. The last section summary and conclusions as well.

## Theoretical Framework

With attention to changes in financial markets, the concept of financial development was considered in decades after 1970s. Different theories have different predictions about the relationship between financial development and income inequality that lead to two broad categories of thought with two conflicting theoretical hypotheses: The reverse U hypothesis belongs to Greenwood and Jovanovich (1990) and linear hypothesis to Banerjee and Newman (1993) and Galor and Zheira (1993).

### *Greenwood and Jovanovich's reverse U hypothesis*

First group of theories suggests a reverse U-shaped relationship between financial development and income distribution. Greenwood and Jovanovich (1990) discussed relationship between financial development and inequality in the context of an endogenous growth model. They suppose an economy that includes a chain of individuals in the interval of $(0,1)$. A person who has a wealth $K_t$ in period t, make a decision for the allocation of wealth between consumption $C_t$ and investment $I_t$ as in the following. $K_t = C_t + I_t$. Maximization condition for its lifetime expected utility is as follows:

$$MAX\left\{E\left[\sum_{t=0}^{\infty}\beta' U(C_t)\right]\right\}: \text{with discount rate } \beta \in (0,1) \qquad (1)$$

There are two technologies in this economy. The first is the indication of a relatively low but certain return for each unit of capital γ and other one is the high risky rate of return but with higher value of expectancy, which can be expressed by a technology shock and in form of$\theta_t + \varepsilon_t$. $\theta_t \in (\overline{\theta}, \underline{\theta})$ represents total shock and $\varepsilon_t \in (\overline{\varepsilon}, \underline{\varepsilon})$ is unusual shock with $E(\varepsilon_t) = 0$. Lower limit of combination shock is assumed to be positive.

Development of financial intermediaries with a collection and analysis of information from a large number of projects, that somehow led to the discovery of total shock $\theta_t$, can have overlapping information friction related to the risk investment. Development of financial intermediaries through integration, exchange and sharing of risks helps the smooth process of unusual shocks.

In addition, according to Townsend (2006), on the ground that there are fixed costs of market entry (γ) for participation in financial market, the condition of costly entry has been used in model. Due to the entry cost each agent market will not be able to join immediately and participants in financial market are confined to only those agents whose wealth reaches to a certain threshold. So, in a certain period of time, all agents can be classified into two groups: the first is currently operating in the financial markets

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(participants) and the other one is not currently operating in the financial markets (non-participants).

For agents that are not currently operating in the financial markets, if it is decided that part of the portfolio is invested in risky technologies in time t, then investment output in the beginning of t+1 is as follows:

$$K_{t+1} = I_t[\emptyset_t(\theta_t + \varepsilon_t) + (1 - \emptyset_t)\gamma] \qquad (2)$$

This equation shows that the wealth of non-participants is largely influenced by uncertainty in unusual shocks. Also, for the agents that participate in financial markets, efficiency can be obtained per unit of capital that is supposed to be invested in the financial system. It is financial intermediaries who decide to invest in which project and how to allocate their funds. This is done based on an advanced data collection and analysis. Thus, the agents that invest some of their capital in the financial markets in time t, wealth in beginning of period can be written follow:

$$K_{t+1} = I_t\gamma(\theta_t) \qquad (3)$$

In equation (3), the returns function is described only with referring to the total shock θ because unusual shock ε has been adjusted by financial intermediaries. Greenwood and Jovanovich (1990) define $W(K)$ as a value function of an agent that is outside the financial market and $V(K)$ as value function of an agent that is inside financial market. Furthermore, we assume that $F(\theta)$ and $G(\varepsilon)$ denote the cumulative distribution function of θ and ε.

In period t, investment decision for agent that is currently outside the financial market (non-participants) will depend on maximization of the following function:

$$W(K_t) = max_{I_t} \int u(K_t - I_t) + B \int \max[W(K_{t+1}), V(K_{t+1} - 1)\ ]dF(\theta_{t+1})dG(\theta_{t+1})$$

$$S.T: K_{t+1} = I_t[\emptyset_t(\theta_t + \varepsilon_t) + (1 - \emptyset_t)\gamma] \qquad (4)$$

Also, for participants in financial markets, a similar equation can be written as:

$$V(K_t) = max_{I_t} \int u(K_t - I_t) + B \int \max[V(K_{t+1})\ ]dF(\theta_{t+1})$$

$$S.T: K_{t+1} = I_t\gamma(\theta_t) \qquad (5)$$

In the above equation, $V$ has been define without back to $W$ and for each type of capital equipment there is$V(K_t) > W(K_t)$. This suggests that for people who are in financial system, $K$ has more value than to those who are outside the system. So, when a person who gets into financial markets will never leave.

Theoretical models of Greenwood and Jovanovich (1990) suggest dynamics solutions for the relationship between finance and inequality. In the early stage of development when financial intermediaries are less developed, economy grows slowly. In the

intermediate stage of development along with the rapid economic growth and deep financial development, income inequality is increase. And at the stage of maturity, when a financial structure is highly developed and more agents have access to financial intermediation, the degree of income inequality will decrease and finally becomes stable.

Therefore, as Greenwood and Jovanovich (1990) predicted a reverse U-shaped relationship between financial development and income distribution, financial development in the early stages may increase income inequality. However, when the average level of income increases and more households have access to financial markets, inequality declines.

*Galor and Zheira (1993) and Banerjee and Newman's (1993) linear hypothesis*

Unlike the Greenwood and Jovanovich's reverse U hypothesis, other theories predict a negative linear relationship between financial development and income inequality. Galor and Zheira's (1993) model is a dynamic pattern of income distribution in an economy in which the investment is indivisible, agent are considered for the two periods and different generations are linked by inheritance. Economic agents either are as unskilled labor in each period of work or invests in human capital in the first time and in the second time are employed as a skilled workforce. Anyway, with shortcomings in the capital market, the chance and the opportunity to invest in human capital have been limited to the factors that have a large inheritance or to those whose funds needed for investment in human capital will have access to foreign credit.

Now, consider an economy with one consumable goods that can be produced through technology that needs either skilled people or unskilled people. Wages of skilled and unskilled workers are $ws$ and $wu$ respectively, and *ws* is larger than *wu*. An economic agent with wealth *y* lives in the two periods and only consumes $(c)$ in the second period and leaves for children a capital equal to the amount of $b$ that is calculated through $b = y - c$. $H$ is the fund for investment in human capital. Agents that have taken out loan should pay interest rate $i$ that is greater than $r$ when they are lent.

Suppose that the utility function of the agent is$U = c^a b^{1-a}$. So, to solve the maximum utility function with respect to the constraint $y = c + b$ optimum values are$b^* = (1-a)y, U^* = \theta y$.[1]

Thus, an agent that is inherited the value of X but it will not spent that on investment in human capital, utility ($U_U^*(x)$) can be written as:

$$U_U^*(x) = \theta[(X + W_u)(1 + r) + W_u] \qquad (6)$$

If an agent with legacy larger than the capital needed to invest in education (e.g.$X > h$) chooses to invest in human capital, his utility $u_{sl}^*$ is as follows:

$$u_{sl}^*(x) = \theta[(X - h)(1 + r) + W_s] \qquad (7)$$

[1] - $\theta = (a)^a(1-a)^{1-a}$

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Based on these equations, now we know that agents choose to invest in education if and only if$u_{sl}^{*} = u_{u}^{*}$. This condition can also be written as$W_s - h(1+r) \geq W_u(2+r)$. In addition, an agent whose legacy is $X < h$ and chooses borrowing to invest in human capital, his utility ($u_{sb}^{*}$) is as follows:

$$u_{sb}^{*}(x) = \theta[(X-h)(1+r) + W_s] \qquad (8)$$

Note that those who have to borrow for education choose investment in human capital if and only if$u_{sb}^{*} \geq u_{u}^{*}$. Based on the above equations, the critical condition can be written as follows:

$$X \geq f = \frac{W_u(2+r) - W_s + h(1+i)}{i-r} \qquad (9)$$

This shows that the only agents that have access to abundant legacy will invest in human capital and turned out to be skilled labor force while other agents remain unskilled.

Suppose $X_T$ represents the legacy received by the generated agent at time t. The legacy he leaves for his children can be written as follows:

$$b(X_t) = \begin{cases} (1-\alpha)[(X_t + W_u)(1+r) + w] & if \quad X_t < f \\ (1-\alpha)[(X_t - h)(1+i) + w_s] & if \quad f \leq X_t \leq h \\ (1-\alpha)[(X_t - h)(1+r) + w_s] & if \quad X_t \geq f \end{cases} \qquad (10)$$

These results have very important implications. This shows that the distribution of wealth is very important for the long-term income and income inequality will be permanent by intergenerational legacy. A polarization of wealth will be generated between the high-paying skilled labor and unskilled labor with low income in the long run. Wealthy families who have less education will have stable lower income. The development of financial markets cause broader and easier access to credit for poor households. As financial markets are developed, the credit constraints facing low-income agent decrease. This in turn helps to reduce income inequality. Similar predictions can be found in the Banerjee and Newman's (1993) model.

In both theoretical models a negative linear relationship between financial development and income inequality is predicted. Accordingly development of financial markets and financial intermediaries help improve the distribution of income through the elimination of shortcomings of capital markets and provide more opportunities for the poor people to take out loan and invest in human capital and profitable projects.

## Literature Review

The relationship between the financial sector and income distribution recently appeared more important than ever before and in the study of Claessens and Perotti (2007). They state that the effect of theoretical prediction of the financial sector on income inequality is not accurate. Some believe that the development of the formal financial

sector is in favor of the rich[1]. However, in most cases, the relationship between financial development and income inequality is negatively evaluated.

Beck et al. (2007) using a sample of 72 developing countries and developed countries during 1960 to 2005 have studied relationship between financial intermediaries development and the changes in income distribution. They concluded that in countries that have higher levels of financial intermediaries, income inequality declines more rapidly. Moreover, financial development reduces income inequality by improving the incomes of the poor.

Bittencourt (2006) in a study discussed relationship between financial development and income inequality in Brazil in the 1980s and 1990s using panel time series. The results showed that financial development and expansion of financial institutions in Brazil had a strong and significant effect on income inequality. But this does not mean that the poor people are able to benefit from the financial development; because factors such as rising inflation barrier draw back poor people from entering into the markets. The main result of the paper was that directing more resources toward the poor can reduced high inequality in Brazil and increase economic welfare without creating a diversion in economic performance.

Clark et al. (2006) using panel data for 83 developing countries and developed countries from 1960 to 1995 have studied the effect of financial development on income distribution. The results showed that the inequality is less in the countries that have more development of the financial sector and income inequality declines with market development and financial intermediaries. However, no evidence was found about an inverse U-shaped relationship between finance development and inequality.

Recent work by Kim and Lin (2011) is an exception. They examined the financial development and income inequality using threshold instrumental variable for 65 countries from 1960 to 2005. The results predicted that the impact of financial development on income inequality mainly depends on the country's stage of financial development. Benefits of financial development only occur when the country has reached a threshold of financial development. After this amount, financial development reduces income inequality. Policy implication of this study is that the minimum level of financial development is a prerequisite for reducing income inequality by development of financial mechanisms.

There are not many studies on this subject in Iran. On other hand, if the study is conducted, a linear relationship between the variables is considered. In other words, the linear cointegration is considered. Asari and colleagues' study (2009) is one of the few studies that investigated the effect of financial development on poverty and income inequality in member of OPEC countries during 1990 to 2004 using generalized moments (GMM). The results showed that financial development through economic growth can reduce poverty and inequality in the members of OPEC.

Tayyeb Nia et al. (2010) examined the impact of financial development on income inequality by using panel data in the Middle East and North Africa from 1990 to 2005.

[1]- Rajan

The results showed that financial development has reduced income inequality in those countries and the amount of this impact was so high that could alter the pattern of income distribution.

As the literature review suggests, Kim and Lin's (2011) study is the only one investigating the relationship between financial development and income inequality based on a non-linear model. In this study, we used the nonlinear model of Kim and Lin (2011) to estimate the relationship between the variables. But there is a major difference between the present study and study of Kim and Lin (2011). Kim and Lin estimated relationship between financial development and income inequality by threshold instrumental variable (TIV) method from 1960 to 2005 in 65 countries. The present study investigated and estimated the relationship between financial development and income inequality by threshold vector error correction model (TVECM) from 1971to 2011 in Iran's economy. But the most important weaknesses of Kim and Lin's study (2011) is that no examination was done on the variables in the model, the optimal number of thresholds, and threshold co-integration between the variables in the model with respect to threshold unit root. However, this study took into account these issues. Also, the present study used tests such as Hansen and Seo's (2004) nonlinear co-integration test and other tests to clarify relationship between variables that has not been used in any of the studies. In addition, in this study, the effect of financial development on income inequality in Iran was modeled to test two competing theories: One theory assumes a linear relationship and the other one is based on the assumption of linear relationship.

## Data

Criterion that has been used to measure financial development is ratio of value of shares traded on the domestic stock market to GDP.[1] An indicator widely used to indicate the degree of inequality is Gini coefficient. In this study, this index is also used. On the other hand, if we divide the sum of exports and imports to GDP, openness index is obtained.[2]

Statistics used in the estimation drew on statistical sources and reports published by the Central Bank of Iran, National Accounts of Statistics Center of Iran as annual time series from 1971 to 201٣.

## Econometric model

For data analysis, regression estimation method was used based on econometric modeling with the approach of co-integration and error correction model. Estimation methods and econometric analysis are often based on a linear regression equation. Another approach is to estimate and analyze assumption of the non-linear regression equation. In this approach, one of the methods is threshold regression. Accordingly, the threshold model is specified as follows:

$$Y = \theta_1' X_t + e_{1t} \qquad if \;\; q_t \leq \gamma \qquad (11)$$

[1] - Levine, 2000, McKibbin, 2007 and Ang, 2010
[2]- Frimpong. Marbuah, 2010

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$$Y = \theta_2' X_t + e_{2t} \qquad if \;\; q_t \geq \gamma \qquad (12)$$

In this model $q_t$ is threshold variable where it are divided the observations into two parts. In this study, Financial Development Index is used as the threshold variable. $Y$ is dependent variable (the Gini coefficient), $X_t$ is vector of independent variables including indicators of financial development, inflation, GDP, government expenditure and trade openness. $e_{it}$ and $\gamma$ are error term and value of threshold variable respectively. The above models show that as long as the threshold variable is smaller than the threshold value, regression equation would accord to function (11). When the threshold variable is larger than the threshold value, regression equation is function (12). Dummy variable $\mathrm{I_t}(\gamma)$ is defined as $\mathrm{I_t}(\gamma) = \{q_t \leq \gamma\}$ in that $\{.\}$ represents the sign of function. If $q_t < \gamma$ then $I = 1$, otherwise $I = 0$. considering $\mathrm{X_t}(\gamma) = \mathrm{X_t I_t}(\gamma)$, functions (11) and (12) are written as follows:

$$Y = \theta' X_t + \rho' \mathrm{X_t}(\gamma) + e_t \;, \qquad e_t \approx iid(0, \delta_t^2) \qquad (13)$$

In this relation, $\theta = \theta_2$ , $\rho = \theta_1 - \theta_2$ and $e = [e_{1t} \;\; e_{2t}]'$ is error term. θ, ρ and γ are parameters that must be estimated. After estimation of estimators and parameters, total squared error of the model is as follows:

$$S_1(\gamma) = \hat{\mathrm{e}}_\mathrm{t}(\gamma)' \hat{\mathrm{e}}_\mathrm{t}(\gamma) \qquad (14)$$

The value of threshold optimal is obtained as follows:

$$\hat{\gamma} = argmin S_1(\gamma) \qquad (15)$$

The residual variance of the model is as follows:

$$\hat{\sigma}^2 = \frac{1}{T} \hat{e}_t \hat{e}_t = \frac{1}{T} S_1(\hat{\gamma}) \qquad (16)$$

After calculating the $\hat{\gamma}$ coefficient vector $\hat{\theta} = \hat{\theta}(\hat{\gamma})$ and $\hat{\rho} = \hat{\rho}(\hat{\gamma})$ must be estimated. According to this step, equations (11) and (12) in the form of a double TAR model are written as follows:

$$\mathrm{Y_t} = \left(\delta_{10} + \sum_\mathrm{i} \delta_{1\mathrm{i}} \mathrm{X_{it}}\right) \mathrm{I}[q_t \leq \gamma] + \left(\delta_{20} + \sum_\mathrm{i} \delta_{2\mathrm{i}} \mathrm{X_{it}}\right) \mathrm{I}[q_t > \gamma] + e_t^* \qquad (17)$$

Threshold value γ can be obtained by estimating equation (17) to find the minimum sum of squared errors of estimation in a multi-step equation (Grid search).

Threshold value based on the theory can select each of the variables in this model. In this study financial development index is considered as marginal variable. According to the study of Hansen (2002) and Kapetanios and Shin (2006) LM test is used to check the assumption of marginal variable existence.

## Econometric estimation

Before estimating the model, to ensure the estimated coefficients of model, stationary tests for variables should be determined. Recent studies have indicated that traditional unit root tests, such as Dickey–Fuller test or Philips-Perron have very little explanatory power because they are based on the assumption of linear adjustment.[1] In contrast to this hypothesis that variables have threshold regime, in the present study stationary tests for variables have been done by using Beck - Ben – Carrasco's (BBC) (2004) model. [2]

Table 1: Result of unit root test BBC

| Variables | Test statistic | Critical value (95٪) | Result |
|---|---|---|---|
| Gini | 20.28 | 18.40 | Threshold regime |
| FD | 82.84 | 18.40 | Threshold regime |
| Open | 21.09 | 18.40 | Threshold regime |
| Infl | 38.2 | 18.40 | Threshold regime |
| IA | 64.5 | 18.40 | Threshold regime |
| Gs | 30.6 | 18.40 | Threshold regime |

Source: Findings of research

In Table 1 the variables are defined as follows:

Gini: Gini coefficient, FD: Financial Development Index, Open: economic openness index, Infl: inflation rate, IA: income per capita, Gs: Government Size.

According to Table 1 the results indicate that variables are not stationary and have threshold regime since test statistic is greater than the critical value. It was found that null hypothesis based on the unit root of variables is rejected. Therefore, the ordinary least squares method could not be used for estimation. In the second level, as the financial development index was considered as the threshold variable, we should examine whether this variable has threshold value or not? To check the threshold value we used TVAR.LR test proposed by Hansen (1999). In this test the three following hypotheses were examined:

1. Linear Vector Autoregressive (LVAR) versus one threshold Vector Autoregressive (1TVAR)

2. Linear Vector Autoregressive (LVAR) versus two threshold Vector Autoregressive (2TVAR)

3. one threshold Vector Autoregressive (1TVAR) versus two threshold Vector Autoregressive (2TVAR)

The results of this test are shown in Table 2. Results of the first hypothesis indicate that test statistic is greater than the critical value according to probability level. Consequently, null hypothesis of linearity among variables is rejected. The results of second hypothesis indicate that null hypothesis of LVAR is rejected. Therefore, we only

[2] The analysis is done in the software R.

have the third hypothesis. Results of the third hypothesis indicate that test statistic is less than the critical value according to probability level. Therefore, the null hypothesis is accepted based on one of the threshold values. Consequently, the model has only one threshold.

Table 2 the result of TVAR-LR test

| Hypotheses | Test statistic | Value of probability level (prob) | Result |
|---|---|---|---|
| $H_1$ | 42.86 | 0.00 | Rejected |
| $H_2$ | 64.86 | 0.00 | Rejected |
| $H_3$ | 1.17 | 0.79 | Accepted |

Source: Findings of research

Since financial development index has one threshold and model is not linear, in the third step by using TVECM-Seo's Test (2006) co-integration among the variables was considered. In the Seo's (2006) test null hypothesis is non-cointegration and the alternative hypothesis is threshold cointegration. The results of this test are shown in Table 3.

Table 3 The result of TVECM-Seo test

| Null Hypothesis | Test statistic | Value of probability level (prob) | Result |
|---|---|---|---|
| No Cointegration against Threshold Cointegration | 97.79 | 0.00 | Rejected |

Source: Findings of research

The results of Seo's (2002) test indicate that null hypothesis of non-cointegration is rejected and the alternative hypothesis is accepted. But it is possible that the null hypothesis of non-cointegration shows a linear co-integration. To avoid this problem Hansen-Seo's (2002) test based on Threshold Error Correction Model (TVECM) was used. In this method, linear co-integration hypothesis was tested against a threshold co-integration.

Table 4 the result of Hansen-Seo test

| Null Hypothesis | Test statistic | Value of probability level (prob) | Critical value (95٪) | Result |
|---|---|---|---|---|
| Linear Cointegration against Threshold Cointegration | 53.71 | 0.00 | 15.56 | Rejected |

Source: Findings of research

The result of Hansen-Seo's (2002) test indicates that null hypothesis is rejected. Thus, both tests verified a threshold co-integration between the variables. In the final step, because of threshold co-integration relationship between the variables, the coefficients are estimated using threshold error correction. But before the estimation of error correction model, the threshold value must be estimated. The threshold value is

determined using grid search method and sum of squared errors of the model. Considering the financial development index as a threshold variable, threshold value was estimated 0.017.

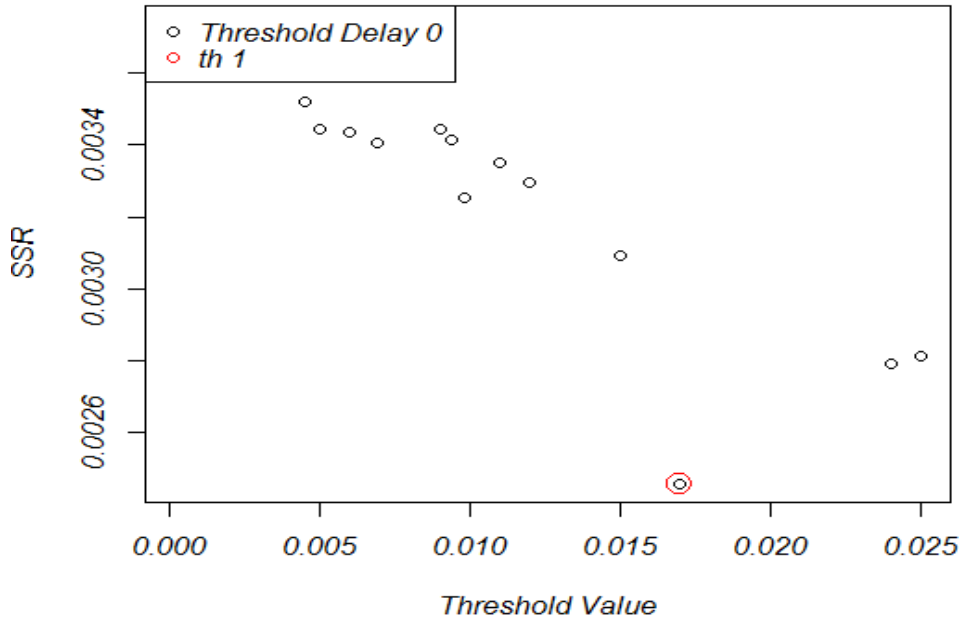


Figure 1 The results of the estimation of threshold value using a grid search
Source: Findings of research

The results of the threshold error correction equation with one threshold according to Seo's (2009) model were displayed in Table 5.

Table 4 the result of the threshold error correction equation

| variables | Estimation of threshold value | | SSR=0.0024 | $\gamma = 0.017$ |
|---|---|---|---|---|
| | $\gamma \geq 0.017$ | | $\gamma < 0.017$ | |
| | Probability level | Coefficient | Probability level | Coefficient |
| ECM | 0.00 | -0.85 | 0.03 | -0.79 |
| Intercept | 0.00 | 0.001 | 0.01 | -0.0006 |
| FD | 0.03 | -0.13 | 0.04 | 0.91 |
| Open | 0.04 | -0.02 | 0.00 | -0.03 |
| Infl | 0.03 | -0.003 | 0.002 | 3.25 |
| IA | 0.02 | -0.012 | 0.01 | 0.008 |
| Gs | 0.001 | 1.51 | 0.004 | -1.04 |

Source: Findings of research

Error correction model considers the role of equilibrium and long-run variables in the adjusted short-term fluctuations. In fact, the behavior of short term dynamic variables will be reviewed by error correction model. The existence of co-integration among a set of economic variables provide a statistical basis for application of the error correction models.

These patterns that short-term fluctuations in the variables are related to their long-run equilibrium values are, in fact, partial adjustment models that include stationary errors sentences from a long-term relationship, as the independent variable.

The results of the threshold error correction equation indicate that before achieving financial development index of 0.017 (threshold value), an increase in financial development indicator increases the Gini coefficient. In other words, before reaching threshold value, the extension of financial development increases income inequality in the society. In the early stage of development when financial intermediaries are less developed economy grows slowly. In this case, for reducing income inequality, bank credit allocated to the private sector should be increased. But after reaching the threshold value, financial development reduces income inequality (decrease in Gini coefficient). In the mature level (after threshold value) when there is high development in the financial structure and more agents have access to financial intermediation, the degree of income inequality will decrease and finally will be constant and stable. As a result, an optimal threshold level of development of financial markets is essential to reduce income inequality.

Threshold error correction coefficients are economically and statistically significant and indicate that speeds of adjustment before and after threshold value are 79% and 85% respectively. The adjustment speed will increase after reaching the threshold value and in each period 80 percent of non-equilibrium is adjusted in the next period.

Economic openness, before and after the threshold value, reduces income inequality (decrease in Gini coefficient). Consequently, economic openness as an indicator of globalization can has an impact on income inequality and is not sensitive to the threshold value.

Increasing in inflation rate and per capita income also has a significant effect on income inequality. However, these variables are sensitive to the threshold value. This means that before the financial threshold value rising inflation rate increases income inequality (increase in Gini coefficient). Because of limited financial markets, inflation reduces the purchasing power of incomes. Those with fixed incomes and all who can not raise their income consistently with rising prices are the real losers. But after reaching the financial threshold value due to the expansion of financial markets in society and the public participation, low inflation could expand production activities and reduce income inequality.

The large size of government negatively has a significant effect on income inequality before reaching to the threshold value; this means that increase in the government size increases income inequality. For this reason in order to reduce income inequality, government size must be smaller. After the threshold value, government size has no effect on income inequality.

## Conclusions

Financial sector development and the development of tools and financial intermediaries are the ways that can control the concentration of wealth and give more

facilities to people with less asset to invest in their human capital which eventually increases their share of the national production.

In this study, the effect of financial development on income inequality in the Iran's economy has been modeled in a specific way to make it possible to test two conflicting theories: One is based on the assumption of the linear relation and the other one is based on the non-linear relation. Results of the TVECM-HS test indicate that there are nonlinear co-integration between the variables. Results indicate that prior to reaching the threshold value, the extension of financial development increases income inequality in the society. After threshold value, the expansion of financial development reduces inequality. Economic openness and per capita income before and after the threshold value reduced income inequality.

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