

Analyzing the impact of financial repression policies and financial depth on macroeconomic variables in Iran: Simultaneous equations approach

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Abstract

One of the challenges facing economic sectors is providing the required financing and liquidity for fixed investments and current capital (working capital). The current study is aimed to expand such studies in another aspect of the role of financial markets in terms of their relationship with macroeconomic variables such as economic growth rate, unemployment rate, and exchange rate as vital economic variables. Considering the position of the financial system in the allocation and efficiency of financial resources, this study deals with the impact and importance of financial repression policies and financial depth in solving the problems of the unemployment rate, exchange rate, and economic growth rate in Iran with the simultaneous equations approach from 1971 to 2017. The results showed that financial repression and depth policies significantly affect macroeconomic variables (economic growth, unemployment rate, and exchange rate). Furthermore, it is indicated that the financial repression policy does not have a negative effect on economic growth and a positive effect on the unemployment rate; however, it has a positive impact on the exchange rate. In addition, this study unravels that the financial depth policy does not negatively and significantly affect economic growth. However, it positively affects the exchange rate and unemployment rate.

Keywords: Financial repression, Financial depth, Macro variables, Iran's economy
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1 Introduction

Before the 1970s, many economists believed that financial systems had only minor effects on investment in physical capital and, in effect, economic growth. In fact, until the early 1970s, it was assumed that saving was stimulated by income and that a minor increase in interest rate was required to encourage investment expenses [37]. However, in 1973, the dominant theoretical perspective was severely criticized. [9] designed and presented economic development models

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that intensified the financial liberalization and development of the economic growth rate. They have also emphasized some harmful effects of financial repression, interest rate ceiling, high legal reserve rate, direct credit policy, and discriminatory taxes on financial intermediaries in economic growth. The financial sector has a significant impact on the economic development of countries, so many researchers consider the financial market to be the groundwork for development along with other economic sectors. The stock market provides many benefits for investors and participants of this market. The impact of financial development on economic growth is one of the most critical issues raised in the economic growth literature, which has attracted many discussions [9].

In Iran's economy, during the past few decades, the financial system has suffered from many restrictions, including the mandated determination of bank interest rates. The government's intervention in the financial markets through determining the interest rate ceiling for bank deposits, high legal reserve rates, interference in the distribution of bank credits, etc., causes the bank interest rate to fall below the inflation rate. In effect, the real interest rate becomes negative. This is called financial repression in the economy. In recent years, the government and the central bank have suppressed the market with interventionist policies in the financial and money markets. According to Iran's economic conditions, determining the bank deposit interest rate is done by combining two theories of financial liberalization and development. Financial restriction and limited financial liberalization are recommended. In this method, contrary to the mandatory determination of the bank interest rate, the central bank has notified two rates as the ceiling and floor of the bank interest rate to the banks, which are the upper and lower bounds.

Then, according to their performance, banks can act freely and competitively between the ceiling and the interest rate floor and determine the appropriate interest rate. As a result, they adjust more quickly in economic cycles and maintain their financial resources [12]. The studies of developed and developing countries show the influence of financial markets on macroeconomic variables (such as economic growth, unemployment rate, and exchange rate).

According to economic literature and empirical studies, there are different views on the effect of financial markets and their relationship with macroeconomic variables. Although regarding the role of financial market development on economic growth, studies have been carried out on a large scale, studies at the level of other variables such as unemployment rate and exchange rate have yet to be done. One of the main characteristics of the financial markets of developing countries, including Iran, is the lack of deepening of the financial markets due to the non-competitiveness of this sector. In our country, in addition to the above feature, the structure of the financial market is such that the share of the money market is more significant in the scope of the financial market than the capital market [34]. The existence of an efficient financial system in economic activities, especially for industry, agriculture, and services, can be effective in the development process of these sectors. On the other hand, the lack of a developed financial market in the service of sustainable economic growth, especially for financing industrial projects, is one of the problems of our country's production, and the industrial sector solves the unemployment rate problem. That is why one of the challenges facing the economic sectors is providing the required financing and liquidity for fixed investments and current capital [17].

The main problem of this research is investigating the effect of financial repression and financial depth on macroeconomic variables. This present study is aimed to expand such studies in another aspect of the role of financial markets in terms of their relationship with macroeconomic variables such as economic growth rate, unemployment rate, and exchange rate as vital economic variables. Considering the position of the financial system in the allocation and efficiency of financial resources, this study deals with the impact and importance of financial repression policies and financial depth in solving the problems of the unemployment rate and exchange rate in Iran with the simultaneous equations approach from 1971 to 2017.

2 Literature review

Financial deepening refers to the increase of financial assets in the financial sector. [33] defines financial deepening as "enhancing the financial services tailored to all the levels in the society, thus increasing the availability and accessibility of financial services in an economy." Financial deepening is also the increase in the ratio of the money supply to the price index, which shows the high level of liquidity and more money in the economy. Therefore, there will be a high growth rate, economic stability, and more opportunities ahead of that economy. Therefore, financial deepening can lead to economic growth [35]. Financial deepening in financial institutions increases the mobilization, aggregation, and directing of savings in a collection of productive capital that increases economic growth [36]. At first, the financial sector faced financial repression, which significantly challenged the country's economic growth [33]. Suppression of financial institutions led to a decrease in the level of investment. As a result, it caused a lower investment level, leading to a slowdown in the economy's growth rate.

Financial repression led to little savings, and the little that was saved would not be allocated to those who could yield the best returns; therefore, it led to a slow economic growth rate [28]. There was a need to reform the financial sector

to strengthen the financial institutions and increase the resources available for financial intermediation [25]. Financial deepening refers to the ability of financial institutions to mobilize savings for investment purposes. The growth of savings levels in financial institutions provides the real structure of financial diversification. Financial deepening also includes the activities of financial institutions in the financial markets, which leads to access to financial tools and services; as a result, the level of savings and investment increases [38]. The development of the financial sector not only has a positive effect on the growth of the financial sector but also leads to the growth of the country's economy. On the other hand, financial deepening increases savings and improves capital allocation. At the same time, it reduces the amount of information asymmetry and allows controlling and managing the risks experienced in financial institutions. Financial deepening strengthens the financial system in a way that makes financial services accessible to all levels of society to improve the financial performance of financial institutions, which ultimately leads to economic growth [25].

After the Second World War, most countries focused on the category of economic growth and attempted to use economic growth as a factor to strengthen their policies. Despite much research on the relationship between financial deepening and development and economic growth, there have been very few empirical studies on the relationship between financial deepening and the unemployment rate. Meanwhile, the global financial crisis has caused the effect of various variables to be taken into account in reducing macroeconomic fluctuations. Experience has shown that shallow economic systems in countries with developing economies and low incomes cause households, companies, and the government not to have enough tools to deal with shocks, unforeseen events, and income fluctuations and are more affected by incoming shocks. Financial deepening causes the shocks to the economy to be more efficiently absorbed, the effect of these shocks on the economy is better repelled, and the economy will face less instability. One of the fundamental goals of every country is to achieve less unemployment with fewer fluctuations. Achieving sustainable economic growth, economic stability, and a lower unemployment rate is one of the main goals of every country.

If the existing economic platform and the future perspective hold out economic stabilization, the direction of long-term investment will be strengthened. Otherwise, the capital will be directed to the service, trading, and hoarding sectors, and the economic growth rate will decrease in the long term. The future perspective of this issue will effectively increase or reduce the unemployment rate and bring about fluctuations or stabilization in economic growth. The other group believes that financial deepening can increase the risk appetite of banks and financial institutions, which itself can lead to an increase in unemployment. In fact, contrary to the first group, which emphasizes the positive and effective relationship of financial deepening with the reduction of turbulence and its positive effect on economic growth, this group believes that deeper financial systems can bring about less stability and more risk in some parts of the economic factors. On the other hand, deeper financial systems reduce economic turbulence up to a certain point. At very high levels, such as in industrialized and developed countries, excessive financial deepening itself leads to turbulence in production, consumption, and investment. The results of these investigations demonstrate a U-shaped relationship between financial deepening and macroeconomic turbulence. According to these theories, firstly, the financial depth and the expansion of its related indicators will reduce the macroeconomic turbulence up to a certain point. Afterward, financial deepening will increase turbulence, decrease economic stability, and increase unemployment. Therefore, excessive financial deepening can be a factor in making economic turbulence and increasing the unemployment rate.

Also, making rational decisions in economic processes directly correlates with evaluating economic policies' performance. In addition, assessing economic policies also requires knowing the appropriate financial criteria and indicators. The impression of the financial structure on economic growth and development is unmistakable; economic schools have presented various policy packages to get an optimal financial structure. Some of these schools recommend applying interventionist and restrictive policies, such as setting interest rate ceilings for banks, obliging banks to grant credit facilities in sectors selected by the government, setting high legal reserve rates, and charging inflationary taxes from people, known as the policy of financial repression, in economic terms. On the other hand, many economists of the classical school, citing different reasons, point out the harmful effects of these policies and know financial repression as the cause of many economic deviations. In addition, they suggest the complete implementation of financial reforms to achieve economic growth and development.

They consider competition necessary for an efficient financial system and know the implementation of repressive policies as a negation of this importance. Therefore, the significance of this study is to understand the effect of the implementation of the financial repression policy on the Iranian economy, whether the implementation of this policy was positive or not, and the overall assessment of Iran's economic growth and unemployment rate according to the implementation of policies such as the financial repression policy. Along with the importance of currency fluctuations and their effect on economic risk and, as a result, the economic growth of countries, researchers show that with the development of financial markets, adverse fluctuations of economic variables can be reduced on growth. Some economists believe that the difference between developed and underdeveloped economies is not in advanced technology

but in active and widespread integrated financial markets. Studies show that developed financial markets control a considerable amount of the financial capital of the economy and assume an essential role in accelerating economic growth.

This category has a long history in economic literature. Although initial research was carried out in this field, with the expansion of neoclassical economic growth ideas, the financial system did not seem necessary, and this issue was not welcomed. That is why the neoclassicists emphasized that the primary way to achieve economic growth is through technology and exogenous factors. Early models introduced the technical accumulation index as the growth engine; thus, long-term growth occurred due to exogenous technologies in 1988. Lucas emphasized the role of financial indicators on economic growth. [20, 32] showed that the economists of developed countries repeatedly express their doubts about the part of the financial system or deny it. The skepticism might be concerned with the failure to reach definitive results about the effect of financial development on economic growth.

The reason for this is the increase and expansion of financial development indicators and their sometimes contradictory effects along with the formation of economic crises at the global level. In other words, on the one hand, specific indicators are defined for financial development. On the other hand, these countries are involved in crises arising from the financial sector, which reduces economic growth.

That is why the empirical results of research in different countries and periods were conflicting; this shows that there has been no strong emphasis on the effect of financial development on economic growth and that other growth models were more confident. In [12] investigated how the financial development channel influences exchange rate fluctuations. The results show that at high levels of financial market development, the effect of exchange rate fluctuations on economic growth can be ineffective or positive. In contrast, the impact of exchange rate fluctuations on economic growth is negative at low levels of financial development and in effect, the economic risk is increased.

3 Experimental studies

3.1 Foreign studies

[32] was one of the principal founders of the view of the influence of financial markets on economic growth. [?] models discussed the effect of financial liberalization policies on capital accumulation and economic growth. The main discussion in Mc Kinnon's model is the effects of the real interest rate on investment and economic growth and that financial institutions play the role of financial intermediaries between depositors and investors. In his model, Mc Kinnon describes the relationship between financial (monetary) and physical capital as two complementary investment factors. Shaw's model emphasizes the role of financial institutions in efficiently allocating resources between savers and investors. The motivation of savers to improve their savings increases through financial liberalization and increasing the real interest rate by expanding the activities of financial intermediaries and creating conditions for financial development. The increase will lead to the promotion of investments, efficiency in investments, and increasing economic growth. Despite the differences between Mc Kinnon's and Shaw's models, these two models are presented as two complementary models [?].

Endogenous growth models have also established a broad horizon for studies on the effects of financial markets on economic growth. In this regard, the following models propose different paths: Kapur in 1976, Mathieson in 1979, Fry in 1987, and neo-schumpeterian models of endogenous growth comments by Romer in 1990 and Grossman and Helpman in 1991. In Kapur's model, in which the banking system provides financial resources for a developing country, the working capital plays an essential role in determining the production level, and the sources of banks offer a part of the working capital of economic enterprises. In this model, the economic growth rate also increases with the real increase in the supply of bank credits. Matheson's model, in 1979, for the financial sector and the movement of the interest rate towards the equilibrium interest rate of the market causes an increase in investment and economic growth. Fry's model, in 1986, in the framework of a life cycle model, proposes an open and small economy where savings finance investment. The interest rate influences short-term growth through financing, and the amount of credits becomes essential as an influential variable in financial markets. In this model, with financial liberalization and the movement of interest rates towards the equilibrium interest rate of the market, financial resources, investment, and economic development are increased. In neo-schumpeterian models of endogenous growth comments by Romer in 1990 and Grossman and Helpman in 1991, efficient financial services lead to the expansion of innovation and creativity and, as a result, efficiency and economic growth. In this way, even though the initial studies on the development of the financial market and economic growth by Mc Kinnon and Shaw through financial liberalization and its effect on the amount of savings and investment indicate a positive and significant relationship between these variables and economic growth, however, contrary to the views of the McKinnon-Shaw upon the positive effect of financial liberalization on

economic development, neostructuralists in the late 1980s addressed the adverse impact of financial liberalization on economic growth, proposing issues such as the informal financial market, market failure, and asymmetric information. The neostructuralists did this by theorizing the economists such as Taylor in 1983 and Stiglitz in 1994.

The empirical evidence of the relationship between financial market development and economic growth is not definite because it is difficult to explain a simple and one-way cause-and-effect relationship between financial market development and economic growth [4]. Experimental studies carried out since the 80s investigating the effects of financial markets and economic growth mainly deal with the cause-and-effect relationships between financial development and economic growth. In addition, some of these studies emphasized the different aspects of the development of financial markets on economic growth at the macro level. Some studies emphasize the positive relationship between the development of the financial sector and economic growth based on the role of financial services. In contrast, some others believe that economic growth leads to financial development. Some also define a two-way relationship between financial development and economic growth because they think that the efficiency of financial intermediaries and the financial market has led to a more appropriate allocation of resources and improved efficiency, resulting in economic growth increases. Economic growth can also lead to financial development and deepening in the long run [4].

In another study in 1996, Demetriades and Hussien investigated the causal relationship between economic growth and financial development in 16 countries using unit roots and co-integration tests. Johansen test shows the relationship between at least one of the indicators of financial development and economic growth among 13 out of 16 countries. In addition, the Granger causality test has shown a two-way causal relationship for some of the studied countries. In contrast, for some countries, no causal relationship is observed with one of the financial development indicators. In 1998, in a study entitled "Which of the bank-oriented or market-oriented financial systems is better?", Levine and Zervos examined the effect of bank-oriented and market-oriented financial structures, financial services, and laws and financing points of view on economic growth. Information from 48 countries was used between 1980 and 1995. The countries were classified on five structural indicators: activity structure, structure size, structure efficiency, overall structure, and structure regulation [5].

The results show that the point of view concerning the opposition between bank-oriented and market-oriented financial systems still needs to be confirmed. The evaluation of countries using financial structures in country-cross-sectional studies cannot explain the difference in the long-term growth performance of countries. However, evaluating countries using financial development can contribute to explaining the country-cross-sectional differences in economic growth so that the countries with higher degrees of financial development have higher economic growth rates and stability. [30], in their study entitled "financial systems, industrial structure, and growth," analyzed how the development of the financial sector affects industrial growth. Their main questions were as follows: What is the effect of financial development on the industrial composition and distribution size of companies? What is the relative importance of financial institutions, and what is their relationship with the state of economic growth? The results show that the less developed financial markets and the institutions belonging are an obstacle in quick response to the needs of the industrial sector, which will slow down the growth as a result [8, 18].

[31], in a study entitled "Financing and sources of growth in different economic development situations," examined the relationship between financial development and economic growth between 74 developing and developed countries from 1961 to 1995. According to income, the countries are classified into three groups high, middle and low income. The results show that the effect of financial sector development on economic growth is different in developed and developing countries so; that in developing countries, financial development has brought about economic growth by influencing capital accumulation, while in developed countries, financial development has led to economic growth through improving productivity, innovation, and inventions.

Liu and Has especially emphasized the role of financial development and financial structure, including banking and stock markets, monetary and financial policies, and the degree of international capital mobility in the economic growth process. The model is a one-part total production function in the form of the neoclassical standard from 1981 to 2001, where financial development is included as an input in the function. Using the econometrics method, the results show that more investments have accelerated economic growth in Japan. In contrast, a higher investment ratio to GDP has not necessarily led to better financial growth performance. In addition, increasing the real export growth rate has contributed to Korea and Taiwan have higher economic growth. The development of the stock market has had a positive effect on the economic growth of Taiwan. Also, Taiwan's economy has been less affected by the Asian financial crisis than others [19].

Deidda investigated a financial model with the assumption that the financial sector does the consumption of real resources of the economy. This model is defined based on explaining the behavior of households and economic enterprises, and financial institutions are intermediaries between them. The results show that financial development

occurs endogenously when economic development reaches its critical level.

Financial independence, allocation of savings through financial intermediaries, and a net reduction of operating costs of financial institutions lead to greater efficiency of investments. As technology becomes more capitalized due to independent financial activities through financial intermediaries, the growth effect of financial development becomes ambiguous. In addition, when financial development is sustainable, credit markets will become more competitive, and at the same time, efficiency will increase, leading to economic growth [7].

Using the information at the company level, investigated the effect of financial variables on the fundamental decisions of companies in Spain. The information refers to large companies during the years 1985 to 2001.

This study analyzes fixed investment behavior and employment as the most critical aspects that companies can adjust to changing financial conditions. Fixed investment and employment models have been estimated with GMM econometric methods. The results indicate that financial status is a solid and essential explanation of companies' fixed investment and employment decisions. In addition, it reveals evidence about the non-linear relationship between financial conditions and real activities [13].

In his study James examined the mechanism of the relationship between financial development and economic growth in Malaysia using six equations and the ARDL Bound Test from 1960 to 2005. The results of this research unraveled that financial development through increasing savings and private investment has caused high economic growth in Malaysia. The results of his studies have also confirmed the hypothesis of the endogeneity of financial development and growth based on the fact that financial development has caused economic growth by increasing investment efficiency [16].

Ang investigated the fiscal effects on income inequality in India, using annual time series data for over half a century. The research showed that financial development helps reduce income inequality, but financial liberalization aggravates it. The results are reliable for use in different scales of financial development and financial liberalization [2].

Louri and Miggiakis examined 11 countries of the euro area using the vector autoregression method in the form of panel data and concluded that there is a positive relationship between market concentration and prudent banking with bank interest rates. Stijn et al. using the dynamic panel method from 2003 to 2013 in 27 countries, concluded that a one percent decrease in interest rate leads to an 8 percent decrease in bank profit margins. Yuksel and Zengin, in 2017, used the multivariate regression method of border adaptation in the period from 2003 to 2014 in Turkey and found a negative relationship between the bank interest rate and currency and non-performing loans [21].

3.2 Domestic studies

[29] investigated the role of public and financial institutions in financial development and economic growth. In this research, the financial repression index is defined according to the value of the real interest rate using the information from 92 developed, less developed, and emerging countries from 1985 to 2005 [29]. The real interest rate has negatively and significantly affected economic growth. Then the effect of financial liberalization on financial development was investigated according to the state of public and financial institutions. The results demonstrate that financial liberalization in less developed countries has caused a decrease in financial development in these countries. In contrast, the effect of these policies in emerging countries has been positive. On the other hand, the study confirmed a positive relationship between financial institutions and financial development indicators.

[10] investigated the role of financial deepening on macroeconomic turbulence. In this article, the effect of financial deepening on the macroeconomic turbulence in Iran from 1991-2010 has been investigated using the generalized method of moments (GMM). The research results confirm the existence of a U-shaped relationship between financial deepening and macroeconomic turbulence [10]. Financial deepening reduces macroeconomic turbulence limitedly and up to a certain threshold. However, surpassing the point, the greater financial depth increases macroeconomic turbulence and reduces economic growth [10]. The three variables of inflation, exchange rate turbulence, and trade liberalization index as influencing variables on macroeconomic turbulence show that macroeconomic turbulence will decrease in inflation conditions. Furthermore, exchange rate turbulence increases macroeconomic volatility. Using statistical tests and quantitative models, investigating the relationship between financial deepening and macroeconomic turbulence in the target time period does not show a significant relationship [10]. [3] investigated the impact of the resource curse phenomenon on financial development and economic growth in the form of a dynamic panel model. In this article, the role of financial development in economic growth and the effect of economic growth on financial development in 36 developing and developed oil and non-oil countries were empirically evaluated during the years 1982-2011.

The experimental method based on panel data consisted of five-year averages, carried out using the dynamic

panel estimation through the Generalized Method of Moments (GMM) system. The estimates show that financial development plays a decisive role in influencing investment efficiency and, thus, economic performance; however, the ability of financial institutions is different in oil and non-oil countries. Another critical result is that the high levels of investment in oil countries have been of lower quality. Therefore, in these countries, a large investment is not enough unless it is accompanied by a developed financial system that prevents investment in projects with low returns. In addition, it was observed that the positive effect of per capita income on financial development is minor in oil-rich countries. In these countries, the real exchange rate also affects financial development. Abbasinejad et al., in 2017, investigated the effects of financial development on income distribution in Iran using the autoregressive distributed lag (ARDL) from 1973 to 2006. The Gini coefficient has been used as an index of income inequality, and the ratio of domestic credit to the private sector (% of GDP) has been used as an index of financial development. The research results showed that financial development reduces income inequality in Iran [1].

Motafaker Azad et al. investigated the effect of financial market development on income inequality in Iran. Using several different indicators and a structural vector autoregression approach, this study investigated the effect of financial development on income inequality by examining the direct and indirect influence channels of financial development on income inequality in Iran [24]. The results confirm the inequality discounting hypothesis, which is about reducing income inequality under the influence of financial development in Iran. However, it needs to give a decisive result about the indirect effects of financial development [24].

[14] presented a solution for profit management in the framework of the theory of financial repression. In this study, according to Iran's economic conditions, the bank deposit interest rate is determined by combining the two theories of financial liberalization and development and financial restriction. As a result, limited financial liberalization is recommended. In this method, contrary to the mandatory determination of the bank interest rate, the central bank has notified two rates as the ceiling and floor of the bank interest rate to the banks, which are the upper and lower bounds.

Then, according to their performance, banks can act freely and competitively between the ceiling and the interest rate floor and determine the appropriate interest rate. As a result, they adjust more quickly in economic cycles and maintain their financial resources. To do so, using a regression model with panel smooth transition regression models (PSTR), the upper and lower bounds of bank deposit interest rates were estimated with the data of the country's central bank and commercial banks from 2006 to 2016 [14].

4 Model and method of data analysis

Using Liu and Hsu's model and according to the special characteristics of Iran's economy, theoretical foundations, economic theories, and previous studies, the current research investigated the effect of financial repression and financial depth on macroeconomic variables (unemployment rate, exchange rate, and economic growth rate) in Iran, which is explained as below [19]:

$$\begin{aligned}UR &= F(GE.DEPTH.REP.GROWTH.INFL.EXCHANGE) \\EXCHANGE &= F(NX.DEPTH.REP.GROWTH) \\GROWTH &= F(DK.M.DEPTH.REP.UR.EXCHANGE)\end{aligned}$$

In the above model, the variables are defined as follows.

UR: Unemployment rate obtained from the Iranian Statistics Center.

NX: Net export or trade balance, which is used from the national accounts of the Iranian Statistics Center.

DK: Gross fixed capital formation (GFCF), which is used from the national accounts of the Iranian Statistics Center.

M: The amount of money, which is used from the central bank statistics.

GE: Total government expenditure, which is used from the time series statistics of the Central Bank.

DEPTH: Financial depth index obtained from dividing liquidity (M2) by gross domestic product (GDP).

REP: Financial repression index that uses nominal interest rate and inflation or real interest rate.

GROWTH: Economic growth rate (percentage)

EXCHANGE: Common exchange rate in the market INFL inflation rate

It is worth noting that simultaneous equations are formed in cases like the above equations, where the dependent variable is an equation, and the explanatory or independent variable is another equation. That is why this research uses the simultaneous equations system approach. Different methods are used to estimate the coefficients in the system of simultaneous equations. Since system equations are structurally different from multivariate regressions, they may not provide the classical assumptions governing multivariate regressions. One of the characteristics of system equations is that the dependent variable as an explanatory variable in an equation might be correlated with the residual term of the equation in which it is entered as an explanatory variable. The correlation of the explanatory variable with the residual term in an equation violates the classical assumption $cov(x_i, u_i) = 0$.

In such a situation, the ordinary least squares estimators are not only biased but also inconsistent. In other words, regardless of the sample size (no matter how large it is), the above estimates will never tend to the true values [11].

5 Analysis of results

5.1 Determining the degree of stationarity of variables

In econometrics, there are many methods to check the estimation of a model. In order to know which method (i.e., ordinary least squares method, Johansen method, self-explanatory vector method with extended intervals, etc.) to use, the unit root test must be performed. Before estimating the model, it is necessary to determine the stationarity tests of the variables to ensure the model’s estimated coefficients. The present research performs the stationarity test of the model variables by the generalized Dickey-Fuller (ADF) test. To this aim, for each variable, the Generalised Dickey-Fuller (ADF) unit root test is first performed on the level of the variable from the normal state with the exogenous variables of intercept and without time trend. Eviews software allows choosing the optimal number of breaks to automatically eliminate the consecutive correlation in the residuals.

Applying a maximum length of break by the user, Eviews software determines the number of breaks with the help of Akaike, Schwartz’s Bayesian, and Hannan-Quinn criteria. In the current study, the maximum length of the break applied to determine the optimal length of the break is 4, and the criterion to determine the length of the break is Schwartz’s Bayesian criterion. A stationarity test will be done for the first difference values of the time series variables of the model. The results of this test for all variables of the model are presented in tables 1 and 2, respectively, for the data level and their first-order difference.

Table 1: ADF test results on the level of variable

Variable	Model with intercept and no trend		Model with intercept and trend	
	ADF	critical value	ADF	critical value
UR	-3.06	-2.92	-4.29	-3.51
DEPTH	-0.007	-2.92	-0.31	-3.51
REP	-3.78	-2.92	-4.29	-3.51
GROWTH	-4.49	-2.92	-4.49	-3.51
INFL	-4.68	-2.92	-4.56	-3.51
EXCH	-2.43	-2.92	-0.73	-3.51
DK	-1.23	-2.92	-1.93	-3.51
GE	-2.61	-2.92	-2.77	-3.51
M	-0.36	-2.92	-0.88	-3.51
NX	-5.18	-2.92	-1.90	-3.51

According to the table (1-4), it can be concluded that the five variables of financial depth, exchange rate, investment, government expenses, and money volume are not stationary at the level because the absolute value of the calculated generalized Dickey-Fuller statistic is smaller than the critical values. Therefore, the null hypothesis of non-stationarity is not rejected. Therefore, the data are not stationary. In other words, they are not $I(0)$, and we must check whether they are $I(1)$. To do this, we need to take the first-order difference from the data.

Source: Research findings

Repeating the Dickey-Fuller test for the first difference, it was found that these variables are stationary after one differentiation. The null hypothesis of having a unit root of the data difference and non-stationarity is rejected. The opposite hypothesis of stationarity at a confidence level of 95% is accepted. Therefore, these variables are stationary of degree one $I(1)$.

Table 2: ADF test results on the first-order difference of the variables

Variable	Model with intercept and no trend		Model with intercept and trend	
	ADF	critical value	ADF	critical value
DEPTH	-6.28	-2.92	-6.36	-3.51
EXCH	-3.43	-2.92	-6.66	-3.51
DK	-6.71	-2.92	-6.63	-3.51
GE	-5.09	-2.92	-5.05	-3.51
M	-8.09	-2.92	-7.50	-3.51

6 Checking the diagnosis of system equations

A structural equation can be identified or known only when obtaining structural form coefficients from the summarized form coefficients; Otherwise, the structural equation will not be identifiable. Two general states are possible: a system of indefinite equations and a system of definite equations. The second state includes two states: exactly definite and over-definite equations. To determine whether the system of equations is definite or indefinite, each must be checked in terms of degree and ranking conditions.

Since the model of simultaneous equations has been used to estimate the model, the detection test of each system equation is done as follows for the system of equations to be identifiable. To better understand the concept of ranking conditions, the necessary symbols are defined as follows:

M = The number of endogenous variables in the model

H = The number of endogenous variables in the target equation

K = The number of predetermined variables of the model

J = The number of predetermined variables in the target equation

Table 3: Ranking condition based on the ability to distinguish the simultaneous equations system

Equation (in terms of dependent variable)	$m + 1$	$K + 1$	identifiability
The first equation	7	8	Over-definite ($K + 1 > m - 1$)
The second equation	5	8	Over-definite ($K + 1 > m - 1$)
The second equation	7	8	Over-definite ($K + 1 > m - 1$)

Source: Research findings

Establishing the ranking condition is also based on the fact that in a model with M equations and M endogenous variables, if and only if at least one non-zero determinant of degree $(M - 1) * (M - 1)$ related to the coefficients of the endogenous and predetermined variables outside the equation under investigation but included in other equations obtained, the desired equation will be definite [11]. Therefore, according to the explanations given, based on the two degree and ranking conditions, both equations in the system are over-definite. Consequently, it is possible to use the two-stage three-stage least squares (3SLS) estimator or GMM to estimate the model.

7 The results of the diagonal test

According to the results of the diagonal test, there is a significant correlation at a significance level of 5% among residual terms in the equations. Therefore, the null hypothesis is rejected, and the correlation between residual terms is confirmed. As a result, the diagonal test, like the simultaneity skewness test, does not consider the ordinary least squares method to be a suitable method for estimating equations, and the methods of simultaneous equations should be used.

Table 4: The results of diagonal test

Covariance	Disturbance term 1	Disturbance term 2	Disturbance term 3
Disturbance term 1	0.003		
Disturbance term 2	0.005	0.22	
Disturbance term 3	-0.019	0.14	0.15

8 Simultaneity test

Since some variables are endogenous and there is a possibility of correlation with the residual term, a simultaneity test is necessary to check the correlation between endogenous variables and residual terms. If simultaneity is confirmed, other methods should be used instead of this method. Hausman Test is used to perform this test. If the coefficient of the new residual explanatory variable from the first ordinary least squares is significant statistically, simultaneity bias is obtained. The critical feature of the simultaneous equations system is that the explanatory variable in an equation is used as the dependent variable of another equation. Since the simultaneous equations system is structurally different from multivariate regressions, it may not satisfy the classical assumptions of multivariate regressions. One of the decisive classical assumptions is the non-stochasticity of explanatory variables; if it is stochastic or random, it should have a distribution independent of the stochastic disturbance component. The critical feature of the simultaneous equations system is that the dependent variable in an equation is used as the explanatory variable of another equation.

Such an explanatory variable may be correlated with the residual term of the equation in which it is entered as an explanatory variable. In addition, the correlation of the explanatory variable with the residual term in an equation violates the classical assumption [11]. In 1976, Hausman proposed the following steps to test the hypothesis:

We estimate the equations of the solved form of the simultaneous model; that is, we consider each endogenous variable of the model as a function of Z_i . After estimating it, we store the estimated values (fitted value) of the endogenous variable \hat{y} and the resulting residual terms U_t . Then, we replace both of these obtained variables with the explanatory variable of the equation and then estimate it using the OLS method. In the third step, using the F test, the coefficient of U_{it} variables was examined for each of the coefficients of statistical significance. If the desired coefficients are not statistically significant, the hypothesis of non-simultaneity cannot be rejected. The simultaneity test was performed according to the procedures suggested by Hausman in 1976. The final results of this test for each of the equations are presented in the table below. The assumptions of this test are as follows:

- H0: There is no simultaneity (There is no correlation).
- H1: There is simultaneity (There is a correlation). Source: Research findings

Table 5: Simultaneity test

	Sig.	Sig.
The residuals of equation 1 in equation (2) and (3)	(0.000)	(0.000)
The residuals of equation 2 in equation (1) and (3)	(0.000)	(0.000)
The residuals of equation 3 in equation (2) and (1)	(0.000)	(0.000)

Because the residual coefficient is significant in the three equations in the system, all three equations have simultaneity bias. The existence of simultaneity bias violates the classical assumption. In other words, the obtained results show a simultaneity problem, and the estimates of the OLS method will be inconsistent. As a result, it is necessary to use simultaneous equations to achieve effective estimates.

9 Examining the quantitative results of model estimation

The estimation results of different models of simultaneous equations are presented below. However, firstly it is necessary to mention an important point. The concept of coefficient of determination (R-squared) is ambiguous in two-stage least squares (2SLS) and three-stage least squares (3SLS) methods and has no statistical significance. Therefore, it is not reported. On the other hand, in estimating the over-definite structural equations, a negative R2 may also be obtained. If we consider the R^2 formula, the error component used in it is obtained from the estimation of the structural regression equation, assuming the independence of the error component from the dependent variable. However, this assumption is not valid in the simultaneous equations, and maybe the negative R^2 is obtained. As a result, in simultaneous equations, the calculation of R^2 is not justified. The results of estimating the system of equations are presented below:

Source: Research findings (values in parentheses represent T-statistic)

* Significance at the level of 1% error (99% confidence); ** Significance at the level of 5% error (95% confidence); ***: significance at the level of 10% error (90% confidence)

Table 6: The results of estimating the equations with the 3SLS method

Equation	Coefficients	2SLS	3SLS
Equation one	C	*(18.74)11.36	*(18.83)11.04
	GE	*(-2.68)-0.335	**(-2.33)-0.279
	DEPTH	*** (1.87)0.146	(1.95)0.096
	REP	(1.70)0.085	(1.64)0.852
	GROWTH	*(-2.94)0.085	*(-2.59)-0.268
	INFL	(-0.80)-0.044	(-0.73)-0.039
	EXCHANGE	*(2.82)0.193	*(2.65)0.168
Equation Two	C	*(3.09)0.154	(0.97)0.45
	NX	*(3.54)0.653	*(3.91)0.708
	DEPTH	** (1.95)0.361	(6.1)0.104
	REP	*** (1.62)0.144	(2.3)0.203
	GROWTH	*(-3.31)-0.111	*(-14.29)-0.454
Equation Three	C	*(4.34)0.385	(-1.37)-0.28
	DK	(0.80)0.198	** (1.64)0.040
	M	*(-2.46)-0.218	*(-2.93)-0.117
	DEPTH	*(3.07)0.114	*(3.32)0.116
	REP	(0.59)0.050	(3.7)0.031
	UR	*(-3.79)-0.091	*(-5.03)-0.112
	EXCHANGE	(0.16)0.01	(0.05)0.003

10 Interpretation of the results with the 3SLS method

As seen in the first estimated model, the variable GE or government expenditure with a coefficient of -0.279, a statistical value of -2.33, and a confidence level of 5% has a negative relationship with the unemployment rate. Assuming that other factors are constant, with an increase of one unit in government expenditure, the unemployment rate decreases by 0.279 units. Therefore, the increase in government expenditure that affects the unemployment rate variable in Iran's economy brings about a reduction in the unemployment rate, following the Keynesian theory.

Furthermore, in the first estimated model, the DEPTH or financial depth variable with a coefficient of 0.146, a statistical value of 1.95, and a confidence level of 5% has a positive relationship with the unemployment rate. Assuming that other factors are constant, with an increase of one unit in the financial depth index, the unemployment rate increases by 0.01 units. Therefore, the increase in financial depth, which affects the unemployment rate variable in Iran's economy, brings about an increase in the unemployment rate.

In the first equation, the financial repression (REP) variable has no significant effect on the unemployment rate.

In the first equation, the exchange rate variable (EXCHANGE) with a coefficient of 0.168, a statistical value of 2.65, and a confidence level of 95% statistically has a positive relationship with the unemployment rate. Assuming that other factors are constant, with an increase of one unit in the exchange rate index, the unemployment rate increases by 0.168 units. Therefore, changes in the exchange rate in Iran's economy increase the unemployment rate.

In the second equation, the financial depth variable (DEPTH) with a coefficient of 0.104, a statistical value of 6.1, and a confidence level of 5% has a statistically positive relationship with the exchange rate. Assuming that other factors are constant, with an increase of one unit in the financial depth index, the exchange rate will increase by 0.24 units. Therefore, changes in the volume of money and mainly its increase, which affects the variable of financial depth in Iran's economy, increase the exchange rate.

In the second equation, the financial repression variable (REP) with a coefficient of 0.203, a statistical value of 2.30, and a confidence level of 5% statistically has a positive relationship with the exchange rate. Assuming that other factors are constant, with an increase of one unit in the financial repression index, the exchange rate will increase by 0.03 units. Therefore, interest rate changes, mainly its increase, which affects the variable of financial repression in Iran's economy, increase the exchange rate.

In the third equation, the financial repression variable (REP) with a coefficient of 0.031, a statistical value of 3.7, and a confidence level of 5 percent has a statistically significant relationship with the economic growth rate. Assuming that other factors are constant, with an increase in the financial repression index, economic growth increases, and interest rate changes can affect economic growth.

11 Conclusion and suggestions for further study

The purpose of this study was to analyze the impact of financial repression policies and financial depth on macroeconomic variables in Iran using the simultaneous equations approach from 2010-2016. The results showed that the policies of financial repression and financial depth significantly affect macroeconomic variables (economic growth, unemployment rate, and exchange rate). The research results show that the financial repression policy does not have a negative effect on economic growth and a positive effect on the unemployment rate; however, it has a positive effect on the exchange rate. In addition, the financial depth policy does not have a negative and significant effect on economic growth but has a positive effect on the exchange rate and unemployment rate. According to the results and the fact that the financial repression policy does not significantly affect economic growth, it is suggested that the government and the central bank implement the policies of financial repression and interfere with the interest rate market.

That is why the policies of financial repression and reduction of bank interest rates can regulate the banking system. As the financial repression policy does not have a positive and significant effect on the unemployment rate, it is suggested that the government and the central bank take other solutions, such as increasing expenses to reduce the unemployment rate. This is because lowering the interest rate does not significantly affect unemployment. Since the policy of financial repression has a positive and significant effect on the exchange rate, it is suggested that the government and the central bank reduce the bank interest rate to increase the value of the national currency and decrease the exchange rate so that the desire to save in banks is reduced and money enters the production process. Also, since the financial depth policy has not significantly impacted economic growth, it is suggested that the government take necessary measures to reduce the volume of money. Decreasing the volume of money does not directly increase the economic growth rate; however, the policy of increasing the volume of money and targeting money toward productive enterprises should be taken on. Generally, monetary and macro policymakers of the country should attach importance to the credit sector as an essential channel in transferring the effects of monetary policy to the real sector of the economy. If the target variable is economic growth, bank lending is a crucial tool and channel in influencing the mentioned variable by applying monetary shocks.

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