Factors of Non-Conformity Behavior and the Emergence of a Ponzi Game in the Riba-Free (Interest-Free) Banking System of Iran

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Abstract—In the interest-free banking system of Iran, the savings of society are in the form of bank deposits, and banks using the Islamic contracts, allocate the resources to applicants for obtaining facilities and credit. In the meantime, the central bank, with the aim of introducing monetary policy, determines the maximum interest rate on bank deposits in terms of macroeconomic requirements. But in recent years, the country's economic constraints with the stagflation and the consequence of the institutional weaknesses of the financial market of Iran have resulted in massive disturbances in the balance sheet of the banking system, resulting in a period of mismatch maturity in the banks' assets and liabilities and the implementation of a Ponzi game. This issue caused determination of the interest rate in long-term bank deposit contracts to be associated with non-observance of the maximum rate set by the central bank. The result of this condition was in the allocation of new sources of equipment to meet past commitments towards the old depositors and, as a result, a significant part of the supply of equipment was leaked out of the facilitating cycle and credit crunch emerged. The purpose of this study is to identify the most important factors affecting the occurrence of non-confirmatory financial banking behavior using data from 19 public and private banks of Iran. For this purpose, the causes of this non-confirmatory behavior of banks have been investigated using the panel vector autoregression method (PVAR) for the period of 2007-2015. Granger's causality test results suggest that the return of parallel markets for bank deposits, non-performing loans and the high share of the ratio of facilities to banks' deposits are all a cause of the formation of non-confirmatory behavior. Also, according to the results of impulse response functions and variance decomposition, NPL and the ratio of facilities to deposits have the highest long-term effect and also have a high contribution to explaining the changes in banks' non-confirmatory behavior in determining the interest rate on deposits.

Keywords—Non-conformity behavior, Ponzi game, panel vector autoregression, nonperforming loans.

I. INTRODUCTION

THE Iranian economy is considered to be a country with a bank-centered financial system, in which a dominant share of real sector financing is provided by the banks of the country [1]. The banking system of Iran, following the Islamic Revolution and the change of regime that took place in 1979,

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with the passage of the Riba-free (interest-free) Banking Act of 1984, unilaterally removed the mechanism of interest from the banking operation and became an interest-free banking system. In this regard, Islamic finance instruments were redefined according to permissible Islamic contracts for equipping and allocating banking resources, and an important step was taken in the direction of implementing the Islamic law of Islam by removing the "Riba" [2]. However, after about four decades of enforcing interest-free banking law, the banking system of Iran faced major challenges and difficulties due to the impact of the peripheral environment. It should be noted that conventional banking systems have also faced such difficulties at some points of time. Facing the challenge of a "credit crunch" is one of the most important issues [3]. The non-implementation of the approved rates by the money market supervisor is another factor that has led to an increase in the cost of financing. It is noteworthy that in the Iranian economy, one of the direct tools of monetary policy of the Central Bank of the Islamic Republic of Iran is controlling bank interest rates. With the implementation of the interest-free law and the introduction of contracts with fixed and participatory returns, the Central Bank entrusted the Money and Credit Council for setting out the criteria for determining the expected profit or rate of return arising from the grant facilities of banks and the minimum and maximum profits or expected returns in accordance with Article 2 of the regulations of the third chapter of Riba-free law. Also, in accordance with Article 3 of the regulations of the fourth chapter of this law, the Central Bank can determine the minimum rate of return (interest) for choosing investment projects or partnerships, and can also determine the minimum or probable maximum expected profit rate or potential return rate for the other types of bank loan facilities [2].

However, since the beginning of 2012, the Iranian economy has entered into a new stagflation cycle [4]. This stagflation basically was created by several factors including intensification of budget deficit, growing NPLs, The structural shortages especially in financial market, fiscal dominance and importantly unprecedented CBI and oil export sanctions since 2007. Due to these sanctions, the Iran economy has faced foreign exchange supply shocks so that all the markets have experienced extreme fluctuations and the business environment was destroyed [5]. In the meanwhile, inefficient conducting of the subsidies elimination caused some supply-side troubles.

This condition led to an increase of NPLs, a mismatch

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maturity of liabilities and assets and banks and non-banking financial institutes got stuck in Ponzi schemes. In fact, implementation of the Ponzi game on the part of the banks is because the installments of the facilities have not been restored on the due date and, on the other hand, banks have been obliged to pay profits to depositors, which has caused them to be trapped in the Ponzi game. Therefore, determining the interest rate in long-term bank deposit contracts was accompanied by non-observance of the rate set by the Central Bank. The challenge of non-confirmatory behavior, if continued, can set the stage for the outweigh of resource allocation justice and create a significant gap between potential and actual growth from the channel of increasing the vacant capacity of the economy.

The purpose of this study is to identify the most important roots and factors affecting the occurrence of non-confirmatory financial banking behavior. To this end, PVAR using the data from 19 public and private banks of Iran during the period of 2007-2015 has been employed.

In the present article, after explaining the nature of the Ponzi game and the credit crunch, some studies in this field are presented. In addition, the adverse effects of continuity of the banking system's credit crunch on the real sector of Iran's economy and deviation from Islamic values are discussed. Then, in the form of quantitative modeling, the causes of this non-confirmatory behavior of banks have been identified.

II. Theoretical Foundations and Empirical Studies

A Ponzi scheme refers to the fraudulent organized behavior of seducing resource holders by paying higher rates than conventional rates in parallel markets under the supervision of the supervisor. In the banking system, the existence of structural problems in the optimal allocation of resources, along with the lack of effective external oversight, has led to a violation of banks' compliance with the rates approved by the supervisory authority. Although relying on the attraction of high-cost resources can save the banking system from collapse and bankruptcy for a short period of time, external shocks or increase in the level of the Ponzi game play a critical role in the credit crunch. On the other hand, the concept of credit crunch has a long history that goes back to the debates during the analysis of the Great Depression of the 1930s. Bernanke and Lowns saw the decline in tangible supply of credit as the cause of a credit crunch in the 1990 US crisis. On the other hand, the scarcity of loan resources in the 1960s crisis has been rooted in the lack of capital base of the banks, which forced them to save on providing facilities [6].

Baek considered freezing of assets in the balance sheet as a factor in increasing the bank interest rate and the uncertainty in the activity of the bank from the place of the facility default as a cause of credit crunch [7].

Paul Mizen describes the concept of credit crunch as a serious constraint on the supply of bank credits resulting from two paths of (1) the lack of capital base of the bank or a depreciation of the bank capital, which is rooted in the weakness of bank resource management, and (2) the circumstances resulting from the supervisor's policy of maintaining more or requiring more resources in the process of legal deposits and the like. He introduces a credit crunch as a mild credit crisis, which can, in advanced phases of a credit crunch, lead to a credit crises with continued credit squeeze, and then financial crisis from the channel of a decline in market efficiency and the impact on the capital market, thereby imposing a serious constraint on resources available to economic units and households, on the one hand, and reducing the resources of the interbank market, on the other hand [8].

Kano et al. also saw the credit crunch in the growth of interest rates on bank facilities above its normal range, which is due to limited resource availability [9].

Pazarbasioglu et al. used the analysis of bank balance sheet imbalances and analyzed the imbalance of monetary policy in terms of credit crunch [10].

Cingano et al. examined the impact of credit crunch on the level of investment in the economy by examining the channel of supply of borrowed funds. In the present study, while analyzing the banking system's credit crunch by examining the banks' balance sheets, the two cross-cutting effects of the financial drought (due to the excessive surplus of the demand for facilities from the supply of credits and facilities) on the growth rate of investment and also, the effect of the decrease in investment on the level of resources of the banking system were examined. The results of this study showed that during the period under review, due to the freezing of bank assets, the supply of resources decreased and resulted in a 40% decrease in the growth of the investment process in four years. This is important because of the high sensitivity of capital accumulation in the economic corporates to the allocation of resources from the banking system in the Italian economy over the period of 2007-2010 [11].

Haltenhof et al. examined dimensions and roots of the credit crunch caused by the Great Depression and concluded that the fiscal stress in the banking system led to an impact on reducing the access of firms and households to resources resulting from the granting of bank credits, which sets the stage for labor force moderation and, as a result, an increase in unemployment. The study states that the increase in assets with low liquidity that are typically accumulated in balance sheet from property surety severely decrease credit available to consumers, which affects unemployment more than reduction of credit for manufacturing firms. The research concludes that long-term credit crunch can affect employment through several independent channels as a key variable in the real sector. The first channel is the direct effect of the reduction of resource allocation in the banking system on economic firms. The second channel is being affected by the reduction in home equity line of credit and thus, being affected by decline in housing investment and disruption of small businesses in the field of housing. The third channel is that reduced facility provision causes growth in the final cost of loans for households, which results in expensive financing and reduced formation of capital due to the allocation of community savings in the payment of installments [12].

In defining the credit crunch, Syron states that credit crunch is a mode of credit market in which severe constraints on the

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supply side of credit markets' resources have been formed. He believes that the hardest form of credit crunch would be non-payment of facilities to large scale applicants and in a way that leads to the formation of a liquidity dispute. The liquidity crisis is formed in a situation where liquidity is experiencing significant growth at the macroeconomic level, while economic enterprises are faced with serious financial distress at the micro level. He argued that perhaps the best measure for proving the existence of a "credit crunch" is the degree of adaptation of the model of facility provision in the period suspicious to credit crunch with the standards governing the normal business cycle. He considers asymmetry of maturities of debts and assets as one of the most important factors in creating a credit crunch and paying surplus interest to depositors in order to succeed in the ruling competition in the deposit process. He considers spending new deposits in order to meet the bank's obligations to pay off the principal and interest of past deposits an important factor in reducing resources in the facility cycle [13].

III. Evidence of Credit Crunch in Iran

One of the central assumptions of this paper is the confrontation of the Iranian banking system with a situation of credit crunch. The consequence of a credit crunch coupled with a sudden drop in loan repayments by banks and credit institutions is the formation of a surplus of significant credit demand by firms and households over a mid-term period of time, and on the other hand, failing to provide appropriate responses or in line with the demand made by the suppliers of facilities and credits, as well as the lack of expected change of this paradigm without intervention and policy making. The weakening of the banking system's lending capacity has been conditioned in the credit market, with the favorable economic growth being geared towards financing firms, because in the normal state, the enterprises need financial resources in order to turn the wheel of their activities to supply products and services that are in demand using these resources. In the Iranian economy, because of the insignificant share of the capital market in the financing process, major barriers to attracting foreign investment and the consequence of fluctuations in foreign exchange earnings from the sale of oil and the reduction of government leverage are the main source of financing for the economic units of banks and credit institutions. At present, banks and non-bank credit institutions active in the formal market suffer from a wide range of balance sheet disturbances due to the expansion of non-financial assets and typically with a low degree of liquidity, which is the reason for the withdrawal of more than 44% of the resources of equipping banks (in the form of Islamic contracts) from the process of creating credits (providing facilities in the form of interconnected, cooperative, and mortgage contracts).

A. Evidence of a Credit Crunch on Demand Side

The World Economic Forum annually publishes a report entitled "Global Competitiveness Report". In this report, countries are ranked according to the "Global Competitiveness Index". The Global Competitiveness Index examines this broad concept by providing a weighted average for many components, each of which focuses on the assessment of aspects of competitiveness. The Global Competitiveness Index, based on the theory of various stages of economic development, distinguishes three stages in the economic development of countries (Fig. 1). It should be noted that about two-thirds of the variables of this index are measured based on a survey of executive directors of economic firms (at a qualitative rating of 1 to 7) and one third remaining on the basis of official statistical data published by countries. In this index, the factors influencing competitiveness are classified into 12 groups. One of them is the pillar of the "Financial Market Development". From the point of view of the authors of this index, an efficient financial sector that supplies financial resources from surplus funds and savings of citizens of a country, as well as resources imported from abroad, is allocated to areas where the highest added value and the highest level of productivity in the national economy is achieved. The position of Iran in the pillar of the financial market development in recent years is evident in the following table, as it is clear that the index of ease of access to loans in Iran is not in a good status; according to the definitions provided by the reference providing this indicator, the ease of access to loans (credits) reflects the fact that to what extent loans are easily accessed and feasible without collateral and with just a good business plan. Accordingly, Iran's rating from this perspective was 138 in 2015, which has slightly improved over the past two years, but in aggregate and in comparison with other countries, it shows an inappropriate situation that can somehow confirm the existence of a credit crunch in the country. As it is seen in Fig. 1, private sector activists also find that the main problem of business is access to financing sources, which confirms the weakness in the productivity indicators of the banking system and the financial markets of the country [14].

Another fact indicating a credit crunch is the decline in the ratio of private sector grant facilities to GDP, especially since 2010 onwards, in Iran compared to other countries as evidence of inappropriateness of situation in Iran (Table I).

Another measure that could represent a credit crunch in Iran is to compare the income situation of parallel markets with the interest paid to depositors. As it turned out, in recent years, in parallel with the stabilization of the foreign exchange market and the recession in the real estate market, the yield on bank deposits has grown dramatically compared to other markets. The real interest rate of banks, which is obtained by adjusting inflation, has become very positive after years of experiencing negative figures. This is due to the fact that banks need new bank deposits to continue their business to meet their past commitments. This has made it possible to create a Ponzi game and a strong competition for deposits between banks. The result is a higher interest rate on bank deposits and, consequently, an increase in the interest rate of the facility and a credit crunch from the channel of certainty the injection of resources into the credit market.

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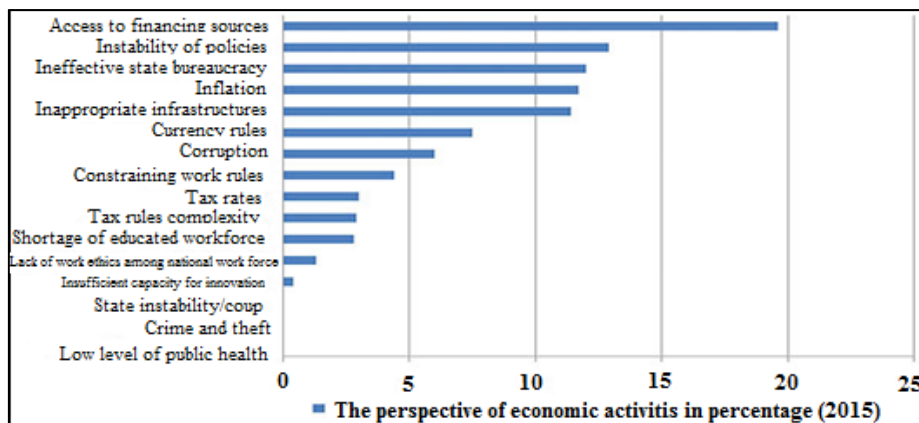International Journal of Economics and Management Engineering
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Fig. 1 Major business challenges from the viewpoint of private sector activists in 2015

TABLE I
THE AMOUNT OF FACILITIES GRANTED TO THE PRIVATE SECTOR AT THE NATIONAL LEVEL RELATIVE TO GROSS DOMESTIC PRODUCT (%) [15]

| Name of the country	1994	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Iran	21.1	19.5	23.1	24.3	26.3	29	30	33.6	37.3	32.2	33.5	13.7	12.5	12.5	12.3
Low-income	13.8	16.6	18.8	22	19.9	12.2	19.8	20.1	19.8	22	26.9	26.1	27.2	28.7	28.5
Medium-income	49.1	49.8	50.3	54.3	57.3	56.5	55.6	57.6	60.5	61.6	72.3	73.1	74.9	80.4	86.1
High-income except OECD	43.3	55.1	57.3	55.1	53.8	50.6	49.5	50.3	54.4	56	65.8	62.4	60.7	61.6	67.7
OECD	120.4	144.2	145.5	140.8	145.2	146.8	153.7	158.8	161.1	156.5	165.4	161.6	156.3	158.3	159.1
Middle east and North Africa	31.3	38.7	42.2	42.8	41.5	40.2	40.9	40.4	44.2	45	50.4	43.5	40	34.7	32.5
Europe and Central Asia	78.3	91.7	94.8	95.5	97.6	99.6	103.4	108.4	115.3	119.8	126	122.9	119.2	116.3	112.7
Highly indebted countries	11.5	13.7	14	13.7	13.8	13.6	14.6	14.9	15.3	15.9	16.6	16.6	17.2	18.4	19.2
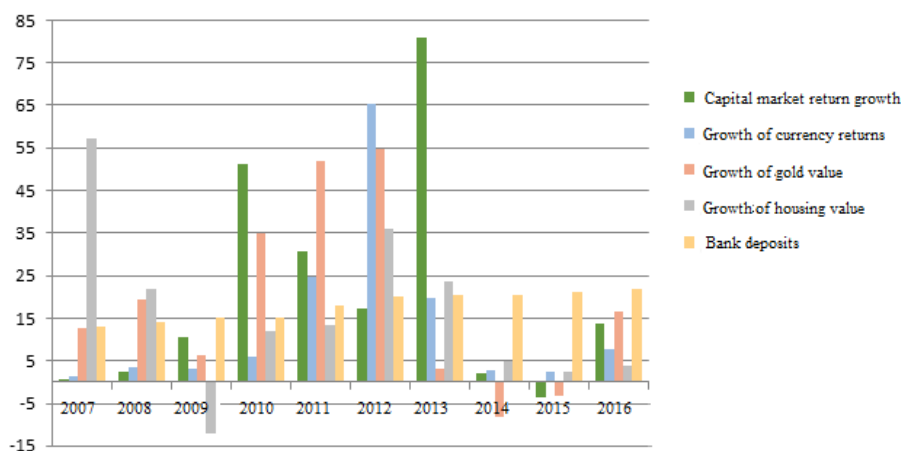
Fig. 2 Comparison of bank deposit revenues with investments in parallel markets (%)

On the other hand, according to the provisions of the budget laws of previous years, some of the non-performing bank resources have been included in the cycle of renewal of credit and facilities, and from the point of view of the new and conventional facilities, a smaller share of the banking system's facilities has been allocated to them. This means that new applicants will not be able to obtain facilities, because the banking system will provide services in the renewal cycle for bad debts that typically fail to meet their obligations to the bank due to the lack of profitability of their business.

IV. METHODOLOGY

We are using panel-data vector autoregression methodology. In this type of model by combining the traditional approach of VAR (endogenous variables) with panel data approach that shows unobservable individual heterogeneity of variance [16]. VAR model estimation methods change in accordance with the combined data. Therefore this data is classified in two categories of micro and macro:

A. Microeconomic data with high N and low T

B. Macroeconomic and financial data with big N and T.

T indicates the size of the time-series and N indicates the number of sections [17].

The data used in our model with T=9 and N =19 are of the first series. For the first time, Holtz-Eakin et al. studied VAR

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model in terms of small time-series. Although in these models, the size of the time-series is small, this does not mean that the data cannot be accumulated or unsteady [18]. Another thing that should be considered is the violation of compatibility assumptions of Quasi Maximum Likelihood (QML) in using the fixed effects model [19]. For this purpose, standard Generalized Method of Moments (GMM) [18], [20], developed Generalized Method of Moments [21]–[23] and Fixed effect - Quasi Maximum Likelihood (FE-QML) and Random effect - Quasi Maximum Likelihood (RE-QML) [24] are represented.

VAR model is displayed as follows:

$$Y_{i,t} = \sum_{j=1}^{p} \alpha_j Y_{i,t-j} + \beta'(L)X_{i,t} + \partial_i + \varepsilon_{i,t} \qquad (1)$$

$\varepsilon_{i,t}$, error term, is with the average of zero but there could be heterogeneity of variance between sections and time periods. ∂_i shows sectional effects (Regardless of time). $X_{i,t}$ is predefined variables as the dependent variable lag is predefined. Y_i is non-confirmatory behavior. The problem in estimating model (1) is the relationship between dependent Individual Effect with the explanatory variables. This causes the OLS estimators to be biased and inconsistent, therefore we use first-difference estimator [25]:

$$\Delta Y_{i,t} = \sum_{j=1}^{p-1} \alpha_j Y_{i,t-j} + \beta'(L) + \Delta X_{i,t} + \Delta\varepsilon_{i,t} \qquad (2)$$

Δ is the lag operator. Equation (2) solves the problem of the relationship between the dependent variable lags with error term, but also creates another problem: dependency between the variable with dependent lag and error term. Therefore OLS would be biased and inconsistent again. As a result, as it has been mentioned before by using variables with dependent lag ($Y_{i,t-s}$; $s \geq 2$) as a tool and GMM techniques the second problem will also be solved [20]. Therefore, Z_i matrix with predefined regressor $X_{i,t}$ dependent on individual effects is formed as:

$$Z_i = \begin{matrix} Y_{i,t} & X_{i,1} & X_{i,2} & 0 & 0 & 0 & 0 & 0 & \cdots & 0 & \cdots & 0 & 0 & \cdots & \cdots & 0 \\ 0 & 0 & 0 & Y_{i,1} & Y_{i,2} & X_{i,1} & X_{i,2} & X_{i,3} & \cdots & 0 & \cdots & 0 & 0 & \cdots & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \cdots & \vdots & \cdots & \vdots & \vdots & \cdots & \cdots & \vdots \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \cdots & Y_{i,1} & \cdots & Y_{i,T-2} & X_{i,1} & \cdots & \cdots & X_{i,T-1} \end{matrix} \qquad (3)$$

In (3), lines are related to first-order differential equation (2) for time periods of t= 3, 4… T for section i, which provides torque conditions:

$$E\left[Z'_i \,\Delta\varepsilon_i\right] = 0 \qquad (4)$$

Generally, estimating $\Delta\varepsilon_i = (\Delta\varepsilon_{i3}, \Delta\varepsilon_{i4}, \ldots, \Delta\varepsilon_{iT})$ while $Z_i =$, which is made based on the torque conditions of GMM, minimize our criterion:

$$J_N = (\frac{1}{N}\sum_{i=1}^{N}\Delta\varepsilon_i' Z_i)\, W_N\, (\frac{1}{N}\sum_{i=1}^{N} Z_i'\Delta\varepsilon_i) \qquad (5)$$

Using the weight matrix:

$$W_N = \left[\frac{1}{N}\sum_{i=1}^{N} Z_i' \widehat{\Delta\varepsilon_1}\widehat{\Delta\varepsilon_1}' Z_i\right]^{-1} \qquad (6)$$

$\Delta\varepsilon_i$ are consistent estimators of first difference wastes. This method is known as two-step GMM estimator; by the assumption of homogeneity of the variance ε_{it}.

First, the differenced model asymptotically shows the same result as the one step GMM estimator by using the alternative matrix below:

$$W_{1N} = \left[\frac{1}{N}\sum_{i=1}^{N} Z_i' H Z_i\right]^{-1} \qquad (7)$$

H is a Square matrix (T-2) with number 2 on the diagonal, -1 on the first non-diagonal element and 0 in the rest points. W_{1N} is not dependent on any of the estimated parameters [26].

On using a one step or two step model, [26] believes that the dependency of two step matrix on estimated parameters causes less reliability on estimates of the asymptotic distribution of normal two-step estimator. Therefore, we are also using one step estimator.

V. INTRODUCTION OF THE MODEL AND DATA

The credit crunch in Iran's banking system and implementation of Ponzi game have created non-confirmatory behavior, the most important of which can be summarized in three categories:
1. Toxic assets of the banking system, the most important of which are NPL of banks. These assets have contributed to the inability of banks to fulfill their obligations to depositors.
2. The high ratio of facilities to deposits, which provided the basis for the occurrence of NPL and the creation of high obligations for banks in relation to depositors.
3. Return of parallel markets, in order not to withdraw resources from banks, the nominal rate of bank profits is higher than the returns of other markets. Thus, the general

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pattern of PVAR is in the form of relation (8):

$$EXR_{i,t} = \alpha_0 + \sum_{k=1}^{K} \gamma_k EXR_{i,t-k} + \sum_{k=1}^{K} \beta_k NPL_{i,t-k} +$$

$$\sum_{k=1}^{K} \lambda_k LTD_{i,t-k} + \sum_{k=1}^{K} \theta_k RPM_{t-k} + \upsilon_i + e_{i,t} \quad (8)$$

$$i = 1, ..., N$$

$$t = 1, ..., T$$

In (8), the indexes t and i represent the time and sections (banks), the values of α, β, γ, and etc. are the model parameters and υ_i is the invisible effects between the sections. It is assumed that the error term ($e_{i,t}$) is of standard normal distribution and non-serial correlation. In this study, a four-variable VAR model is used.

In the above relations, $EXR_{i,t}$ is the average gap of interest rate of the deposit of bank i in the year t from the allowed rate of the interest rate determined by the central bank, $NPL_{i,t}$ denotes the ratio of non-performing loans, $LTD_{i,t}$ is the ratio of deposit to the banks' facilities; also the variable with time series observation of RPM_t represents the return of the nearest rival market for deposits in the Iranian economy, which has the highest correlation with the annual inflation rate of the country INF_t. RPM_t can include any variables of stock market return SEC_t, the currency market returns CUR_t (US Dollar in Tehran's free market), the housing market returns House$_t$, and the gold market return Gold$_t$ in the Iranian economy.

Data used in this paper will include data collected by the Iran Banking Institute [27] for financial statements of 19 public and private banks during the period of 2007-2015.

Data used are annual statistics published by the Iranian Banking Institute, which, according to available data, is scheduled for the period of 2007-2015. Among them, information from 19 private and public banks of the country has been used. The basis of their selection was the completeness of their information during the period under review. Also, data on variables related to returns of parallel markets for a bank deposit such as stock market return SEC_t, the currency market returns CUR_t, the housing market returns House$_t$, and the gold market return Gold$_t$ have been extracted from the data on the website of Financial Informing Network of Gold, Coin & Currency Live Price [28].

VI. ECONOMETRIC ANALYSIS AND RESULTS

The main purpose of this empirical analysis is to test the causal relationship between the average gap in the interest rate on bank deposits from the allowed maximum interest rate set by the central bank with the inflation rates, non-performing loan ratio and the ratio of unproductive assets. The tests used in this study consist of three parts of panel unit root test, panel cointegration test, and panel Granger causality test. The analysis of the results of this section is provided using Eviews 10 and STATA 14 software.

A. Panel Unit Root Test

In analyzing panel data, in order to examine the stationary status of the variables, it is necessary to carry out unit root tests of variables. There are several tests including Levin-Lin-Chu (LLC), Im-Pesaran (IPS), and Maddala-WU (MW). Following [29] and [30], LLC and IPS tests are used here. The LLC test is carried out with the assumption of a unit among all sections, but it is not so powerful for small samples due to serial correlation. The IPS test, with the assumption of the existence of a separate unit root for each section, is able to better test small samples by eliminating serial correlation. The MW test examines various lags through Augmented Dickey Fuller test. The null hypothesis of all three tests is the existence of unit root in the variables studied and their non-stationary.

In Table II, the root test results for each of the three variables with observations are shown in the panel form.

According to the results in Table II, it can be seen that in accordance with the LLC and MW tests, all variables are statistically significant and do not have unit root. But according to IPS tests, the majority of variables is at the unit root level and are not stationary; therefore, with first order differentiation, all variables become stationary according to the IPS test results.

TABLE II
PANEL UNIT ROOT TEST

Variable	LLC test Level	IPS test Level	IPS test First difference	MW test Level
EXR	-203.266 ***	-16.9021 ***	-14.1722 ***	71.4019 ***
NPL	-17.0539 ***	-0.0593	-2.99783 ***	72.4846 ***
LTD	-8.03515 ***	-0.09083	-2.3473 ***	72.1474 ***

All unit root test are carried out considering intercept and process; *, **, and *** represent significance at error levels of 10%, 5%, and 1%, respectively.

B. Panel Cointegration Tests

Regarding the cointegration of variables from the first order differentiation according to the IPS test, it is necessary to carry out the cointegration test in order to examine the existence or absence of a long-run relationship between the variables. There are several tests in this regard, such as [31]–[34]. Here, the two Pedroni and Kao tests are used because of their popularity. The results of these tests are shown in Table III.

TABLE III
PANEL COINTEGRATION TEST

Pedroni Panel (Within dimension)		Kao	
statistics	Value	Statistics	Value
v-Statistic	-0.187329		
rho-Statistic	0.777087	ADF	-2.03496 **
PP-Statistic	-3.019134 ***		
ADF-Statistic	-3.712572 ***		

*, **, and *** represent significance at error levels of 10%, 5%, and 1%, respectively.

The null hypothesis is the lack of cointegration between variables. According to the results of the Pedroni test, in the

intra-section panel, two statistics out of the four statistics confirm the hypothesis of cointegration. Considering the fact that rho-Statistic has less power than PP-Statistic and most statistics also confirm the cointegration, the existence of cointegration is confirmed. In the statistics obtained from the Kao test, the existence of cointegration between the variables is confirmed. Given the first-order cointegration among variables, it is possible to use them in a non-differentiating model.

C. Correlation Analysis between Parallel Markets for Depositing in Banks

Due to the nature of the observation of the dependent variable of (1), which is a panel, it is not possible to simultaneously use all the time series variables that include parallel markets for depositing in banks. The inflation rate itself cannot be used as representative of the returns of other financial markets because the inflation rate is very comprehensive and includes all markets (commodity, service, financial, etc.), but parallel markets with long-term deposits include four stock, housing, gold and currency in Iran, attracting large volumes of funds and allowing them to speculate. Correlation analysis method can be used to select a market with the greatest correlation to inflation as the best parallel market for bank deposits, since the policy to set the maximum interest rate on bank deposits by the central bank is made in relation to inflation rates.

In Table IV, the correlation matrix between the annual inflation rate of the country INF_t, stock market return SEC_t, the currency market returns CUR_t (US Dollar in Tehran's free market), the housing market returns $House_t$, and the gold market return $Gold_t$ in the Iranian economy is calculated using Stata software. As it is seen, the currency market has the highest correlation with the inflation rate. Therefore, instead of RPM variables in (8), currency market returns will be used for modeling.

TABLE IV
CORRELATION MATRIX OF THE RETURN VARIABLES OF PARALLEL MARKETS FOR DEPOSITING IN BANKS

Variables	INF	SEC	CUR	GOLD	House
INF	1				
SEC	0.2784	1			
CUR	0.6668	0.2339	1		
GOLD	0.5413	0.1971	0.7061	1	
House	0.5267	0.0503	0.3325	0.3079	1

D. Investigating Causal Relationships

In this section, the P-Var model is estimated using the Stata software using the module designed by Abrigo and Love [36] and its results are presented. In the first step, considering vector regression models, it is tried to determine the optimal lag length. Based on three criteria for choosing the model presented by Andrews and Lu [35], the MAIC, MBIC and MQIC criteria will be used to determine the optimal lag. Table V presents the results of optimal lag determination tests.

Regarding the results of Table VI, Panel Var first-order model is preferred because it has the lowest values of the

MAIC, MBIC, and MQIC criteria [36].

TABLE V
RESULTS OF OPTIMAL LAG LENGTH DETERMINATION TEST

lag	MBIC	MAIC	MQIC
1	-150.5313	-28.96648	-78.05086
2	-96.04555	-15.00236	-47.72528
3	-45.26977	-4.748181	-21.10964

With this in mind, the Panel Var model with one lag is chosen and the GMM estimator is used to estimate the model. In Table VI, the model results are presented with four variables of EXR, NPL, LTD and CUR. The results show that the response of the average gap between interest rate of bank i with the maximum interest rate set by the central bank is positive to a momentum in the exchange rate, the ratio of the facility to the deposit, the ratio of non-performing loans and the gap between interest rate of dividend with the maximum amount. At the same time, it is expected that with the increase in non-performing loans and limited resources available to the bank, the bank's ability to pay higher than the permissible limit of the central bank is reduced, but banks began Ponzi game to supple the interest rate of deposits considering the non-performing facilities and try to attract new deposits by paying higher interest rate. Therefore, the EXR response to NPL has been positive.

According to the results of Table VI, the high ratio of facilities to bank deposits has a positive and significant effect on a banks' non-confirmatory behavior, as banks have tried to provide new deposits through attractive interest rates. Also, among the explanatory variables of the PVAR model, the EXR coefficient has the highest value, which indicates that banks are being trapped into Ponzi game, and unconventional payments in each period have forced banks to continue this non-confirmatory behavior in subsequent periods. After EXR, the NPL has the highest impact, which is evidence of the involvement of most banks in the Ponzi game.

TABLE VI
ESTIMATING PVAR MODEL

Response of	Response to			
	$EXR_{i,t-1}$	$NPL_{i,t-1}$	$LTD_{i,t-1}$	$CUR_{i,t-1}$
$EXR_{i,t}$	0.3713 ***	0.2117 ***	0.0159 **	0.0108 ***
No. of obs	93			
No. of panels	19			

*, **, and *** represent significance at error levels of 10%, 5%, and 1%, respectively.

TABLE VII
GRANGER CAUSALITY TEST RESULTS (WALD TEST)

	$NPL_{i,t-1}$	$LTD_{i,t-1}$	$CUR_{i,t-1}$	ALL
$EXR_{i,t}$	35.845 ***	6.193 ***	9.141 ***	131.432 ***

the figures presented in this table are chi-square statistics (*, **, and *** represent significance at error levels of 10%, 5%, and 1%, respectively).

Although the causality is derived from the results of Table VII, the Granger causality in Table VII is investigated in order to more accurately estimate the model, which has the similar results as Table VII.

According to the results, all of the explanatory variables

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considered in (8) are the causes of non-confirmatory behavior of banks.

E. Impulse Response Functions

Impulse response functions are used as a tool for obtaining information about the interaction between variables in dynamic patterns. According to the PVAR pattern and Fig. 3, impulse response functions can be seen.

According to Fig. 3, a shock in the exchange rate up to two periods will have a significant effect on non-confirmatory behavior; the effect of this shock decreases after the first period. The shock in the facility/deposit ratio will also be reduced after the first period. In the meantime, the NPL shock has increasing influence on non-confirmatory behavior up to two periods and then decreases. The NPL shock maintains its significant effects for up to five periods and the severity of its effects is higher than the previous two variables.
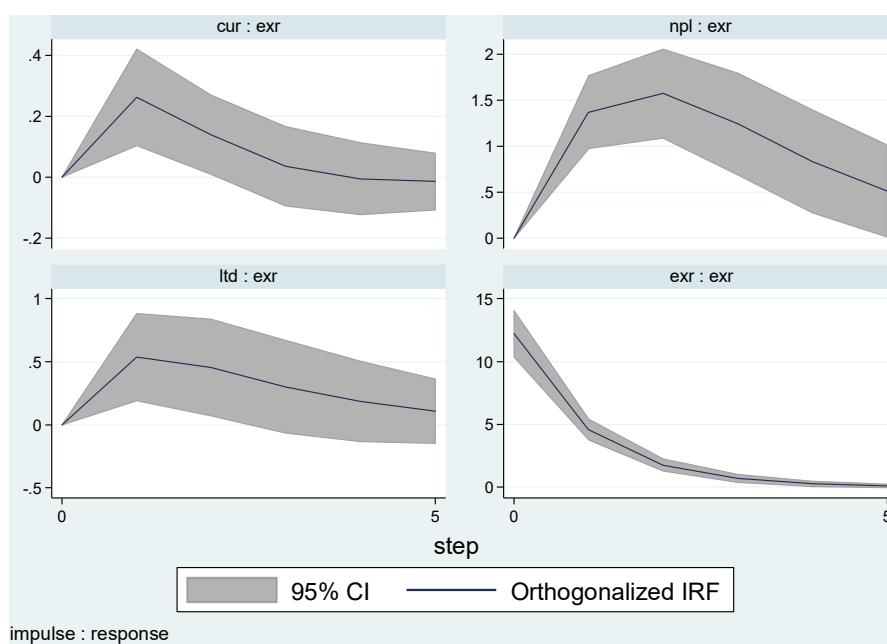

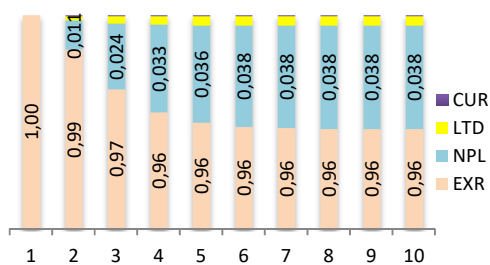Fig. 3 Impulse response function

Fig. 4 Variance Decompositions

F. Relative Contribution of Variables in Explaining Non-Confirmatory Behavior

Using the variance decomposition method, the relative effects of variables can be examined. As can be seen in Fig. 4, after the average gap between the interest rate of bank deposits with the permissible limit of the interest rate set by the central bank (non-confirmatory behavior), the NPL variable has the largest share in explaining the changes in the EXR after 10 periods. However, the NPL variable at the beginning of the shock in economic growth has a share of about 1.1%, and its share in the explanation of economic growth reaches 3.8% after 10 periods. In the meanwhile, the two variables of LTD and CUR have a very low contribution of less than 1% in explaining the bank's non-confirmatory behavior.

VII. CONCLUSION

The interest-free (Riba-free) banking system of the country faces great balance sheet disturbances, especially on the side of assets, due to the consequence of inappropriate monetary and fiscal policies over the past few years, as well as institutional weaknesses in the structure of the credit market. The reduction of the liquidity of banking system assets has led to the withdrawal of a significant part of banks' equipping resources from the process of creating credit and the emergence of risky behaviors combined with non-confirmatory behavior. This study aimed to identify the most important factors for the bank's non-confirmatory behavior using data from 19 public and private banks. For this purpose, using the econometric model of PVAR for the period of 2007-2015, the causes of this non-confirmatory behavior of banks have been investigated. The most important reasons for non-confirmatory behavior were categorized into three categories of toxic assets of the banking system (NPL), a high ratio of facilities to deposits (LTD) and parallel market returns (RPMs). According to the results of the model, all three factors have a positive and significant effect on non-confirmatory behavior. Granger's causality test results suggest that the return on parallel markets for bank deposits, non-performing loans, and the high ratio of facilities to bank

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deposits are all a cause of the formation of non-confirmatory behavior. According to the findings of impulse response functions, comparing to CUR (exchange rate return), LTD and NPL have more long-term effects on forming of banks' non-confirmatory behaviors. Also, the variance decomposition results show that LTD and NPL explain the non-confirmatory behaviors changes better. At present, this non-confirmatory behavior is such that there is a kind of downward stickiness in terms of interest rates, which has led to the ineffectiveness of policies to support production and employment in the country. It seems that the continuation of this process (the Central Bank's insistence on lowering the interest rates and resistance of the banks in this direction) will reduce the financial stability of the banking system and will lead to more severe crises in the future of the Iranian economy. Therefore, the necessity of proper and timely decisions of the Central Bank in order to discipline banks in depositary affairs and granting of facilities is considered vital. From this perspective, it seems that applying corrective policies in the direction of more liquidity of assets, such as the formation of asset management companies, can be great in this regard. But the important point of the above analyzes is the neglect of the deviation formed in implementing the Islamic banking system in the country. If the facilities granted to customers based on Islamic contracts are exclusively used as the main purpose of providing facilities, the issue of the possibility of forming non-performing loans will be reduced. In this regard, the investigation, monitoring, and evaluation of banks in providing their facilities is very important. The next point in the deviation from the implementation of the Islamic banking system in Iran is that in determining the interest rates on deposits and facilities, the main focus is on inflation, and the returns of other markets and the conditions of the real economic variables are ignored by banks.

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