Original Research Article

Effects of Capital Raising on Liquidity Creation and Credit in the Banking System of Iran

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With the onset of the financing crisis in the real sector of the economy and the intensification of shortcomings in the banking system of Iran in recent years, the issue of capital raising has been seriously considered by economic and banking experts to improve the health and stability of banks and their credit provision. What has been critical in this regard is the effects of capital raisings on the liquidity creation and credit provision of the banks. Therefore, using data of 29 banks during the period 2008 to 2017, and the econometric method of dynamic panel data, the relationship between the capital raising and the liquidity creation and credit providing has been studied. For this purpose, in two steps, first, the effect of capital raising in general on the liquidity creation and credit of banks, and in the next step, the impact of different methods of capital raising on these factors has been studied. The results of the estimations show that an increase in total capital will lead to a rise in liquidity creation in banks. In examining the effect of various methods of capital raising on liquidity creation, however, only the method of cash contribution and retained earnings can have a positive effect on liquidity creation, and other techniques show adverse effects. Also, based on the results of the proposed models, banks' capital raising has harmed their credit provision. It means that banks have allocated the resources from capital raisings to things other than providing loans to customers.

Keywords: Capital Raising, Banking System of Iran, Liquidity Creation, Credit Provision.
JEL Classification: C23, G21

1 Introduction

The high dependency of economic enterprises in the real sector of the economy on financing from the money market has effectively placed the Iranian economy among the bank-oriented financial system, and depositing

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and granting loans by banks have been determined as the main role of banks in the economy (Kashyap et al., 2002). In this context, it is evident that the higher efficiency of financial intermediaries (including licensed non-bank credit institutions and banks) can provide more financing with more speed and ease. Thus it improves the macroeconomic indicators, including the higher, inclusive, sustainable, and job-creating economic growth.

The issue of efficiency, stability, and health in the banking system is closely related to the field of capital and capital assets of banks so that the importance of this factor has become more apparent in the case of the crisis of unauthorized financial institutions in recent years. In the current economic situation of the country and the face of the existing financial and economic bottlenecks, the emphasis on improving the components and capital indicators of banks, as a single bank or banking network, has been significant and given the combination of assets and liabilities and the capital structure of banks, has been one of the most important ways to ensure the health and stability in the banking and economic system of Iran.

Besides the importance of capital for banking health and stability, the capital raising has been considered as one of the methods of financing and increasing the level of banks' liquidity. To create liquidity, banks often rely on people's deposits, but if these deposits leave the bank, the banks will be at risk and crisis, thus creating liquidity can take some risks for the banks (Diamond & Dybvig, 1983). Therefore, providing the required resources of the bank by capital raising as an indirect tool reduces the liquidity risks and, to some extent, the credit risk of the bank. Thus, it can be acknowledged that the raised capital as a factor in changing the capital structure of banks affects the lending structure and liquid assets of the bank. So that, in recent years, with the intensification of credit and liquidity problems in banks, including the issue of frozen assets and the increasing share of non-productive holdings of banks, many economic and banking experts have considered the need to raise the capital of banks and emphasize its implementation.

On the other hand, using different methods of capital raising, especially in the banking sector, has different effects on the capital structure and structure of banks' assets and, consequently, their performance and non-performance indicators. Therefore, the selection of each method of capital raising should be under the conditions of the banking system and the expected desired changes in the indicators. In this study, to identify the effects and consequences of capital raising on the liquidity creation and credit-providing of the Iranian banks, first, we will examine various methods of capital raising, especially in the field of banking based on the related domestic and foreign

studies. Then the changes in the liquidity creation and credit providing banks through capital raising will be modeled and measured.

This study is organized into six sections. After the introduction, the theoretical principles and review of the related literature have been presented. Then, in the fourth section, the methodology of the study will be presented in terms of introducing the experimental models to analyze the effects of capital raising on liquidity creation and credibility, as well as determining the estimation methods. In the fifth and sixth sections, the results of the estimations and conclusions and further suggestions have been presented.

2 Theoretical Principles

People's perceptions of money and the way it is created are different from what happens. People usually consider the central bank, in other words, the government, as the supplier of money, but contrary to what is commonly thought, changes in the money supply result from the activities of the central bank, depositors (mainly commercial banks), or people. It is the commercial banks that create most of the money and liquidity of the economy.

Financial intermediation is the process of facilitating the transfer and orientation of funds from economic units having a surplus of money to economic units with a deficit of money. In this process, banks, as a financial intermediary, determine the payment mechanism and change the maturity of assets and liabilities and the amount of their risk, provide the required liquidity and reduce the transaction costs. One of the functions of the banks and the banking system, in general, is to create liquidity through banking operations and financial intermediation. In financial literature, banks create liquidity in two ways:

1) By converting illiquid assets into liquid debts (Diamond and Dybvig, 1983);
2) through off-balance sheet activities such as loan commitments or credit lines (Kashyap et al., 2002).

The two hypotheses "the effect of financial fragility crowding out" (Diamond and Rajan, 2000 and 2001; Gorton and Winton, 2000) and "risk absorption" (Berger and Bouwman, 2009) explain the relationship between bank capital ratio and liquidity creation. The hypothesis of the effect of banks' financial fragility crowding out argues that under a fragile structure (i.e. low capital), banks make more significant efforts to absorb resources, and thus higher liquidity is created. High capital ratios also reduce the liquidity creation by transferring investors' resources from liquid deposits to illiquid capital of the banks.

Also, the hypothesis of the effect of financial fragility crowding out indicates that when the capital structure of the bank is fragile, this will lead to higher supervision of borrowers by the bank, and, as a result, the bank can expand its loans and create more liquidity. The bank's raised capital will make its capital structure less fragile, thus preventing liquidity creation (Diamond & Rajan, 2000, 2001). On the other hand, as capital and deposits are replacing each other, higher capital reduces deposits and reduces the creation of money (Gorton and Winton, 2000). Some experimental studies have also shown that leverage requirements lead to a reduction in bank loans, indicating that there is a negative relationship between the capital and liquidity creation (Berger & Udell, 1994; Hancock et al., 1995; Peek and Rosengren, 1995).

Small banks need to monitor their borrowers, as borrowers usually have higher risks (Berger and Bouwman, 2009). Local individuals and companies mainly provide the resources of small banks, so the effect of the crowding out between the capital and deposits will be significant (Diamond and Rajan, 2000 and 2001).

The risk absorption hypothesis argues that higher capital ratios enhance the banks' ability to tolerate risk, and therefore make them capable of generating more liquidity (Coval and Thakor, 2005; Repullo, 2004; Von Thadden, 2004). The liquidity creation by banks puts them at risk and increases the likelihood of aggravation of losses (Allen and Gale, 2004; Allen and Santomero, 1997; Diamond and Dybvig, 1983). According to liquidity creation theory, when banks convert illiquid assets into liquid debts or finance illiquid assets with liquid obligations, their action is considered as liquidity creation. When banks turn long-term corporate loans (non-cash items) into savings deposits (liquid) for non-bank state institutions, they have created liquidity. But when banks use savings deposits to buy securities, they turn liquid assets into liquid debts, and liquidity remains unchanged (Berger and Bouwman, 2009).

The risk absorption hypothesis also suggests that using the raised capital; banks can attract higher risk, so creating more liquidity happens when they have a higher risk tolerance (Allen and Gale, 2004; Allen and Sontamero, 1997). Several experimental studies have shown that a decrease in the bank's capital ratios results in a loss of loans that reduces borrowing power (Peek and Rosengren, 1995). Thus, this hypothesis points to the positive relationship between capital and liquidity creation.

3 Literature Review

3.1 Foreign Studies

The majority of empirical studies on the effect of capital raising on liquidity creation have been based on the econometric methodology with panel data.

Using the financial information from U.S. banks in the annual period of 1993-2003, Berger and Bouwman (2009) measured the relationship between liquidity and capital creation. To this end, with a broad definition of liquidity creation based on the maturity of assets and liabilities in the balance sheet, they categorized the balance sheet items into three levels of liquid, semiliquid, and illiquid. Finally, they found that in this relationship, capital has a positive impact on liquidity creation just in large banks, and for small banks, this relationship is negative. Studying 17176 insurance companies in the United States during 1998-2007, Choi et al. (2009) found a negative relationship between the capital and their liquidity. They justified this by citing the higher share of liquid assets to illiquid assets under the existing rules of the insurance industry and the nature of their business. Also, the impact of specific characteristics of the companies on their liquidity creation was examined in this article. It was found that the size of the company and the variety of its products and services hurt the liquidity creation, and the leverage ratios and complexity of the company had a positive impact on liquidity creation. In their comprehensive empirical study of the factors influencing liquidity creation on 189 US commercial banks from 1997 to 2004, Pana et al. (2010) concluded that capital has a positive impact on explaining the changes of liquidity creation for all banks in the sample (small and large).

The results of Lei and Song's (2013) study showed the negative impact of bank capital on the liquidity creation and the validation of the hypothesis of the effect of financial fragility crowding out. According to Horvath, Seidler, and Weill's study (2014), the liquidity creation has been the cause of the negative granger in the reduction of capital, and capital has been the cause of the negative granger of liquidity creation. These findings support Basel III's view of reducing liquidity creation, and the result of severe liquidity can reduce banks' underperformance. Bruno and Shin (2014) examined the experimental findings to show how global liquidity affects the financial leverage of banks around the world through borrowing and lending activities. Bouwman (2013) used vector auto-regressive (VAR) modeling, investigated the effects of monetary policy shock (federal interest rate change), economic growth, price, and capital ratio on the bank's liquidity percentage variable. In

which there was a significant relationship between the capital ratio and liquidity.

3.2 Domestic Studies

According to Taghizadeh Khanqah and Ahmadnia's (2013a & 2013b) study, examining the impact of capital structure on liquidity and investment growth opportunities in companies listed on the Tehran Stock Exchange, there is a significant negative relationship between the liquidity and debt ratio, and there is a significant positive relationship between the financial leverage and the cash flow ratio. The study of the impacts of capital structure on the investment growth opportunities also shows the considerable impact of financial leverage on the investment growth opportunity proxies. Nili et al. (2015) concluded that the structure of resources required in the banking network is mainly centered on the capital, deposits, debt from the central bank, and the interbank market. In fact, in the Iranian banking network, the supplementary deposit market is mainly borrowing from the central bank and the banks in the banking network, and a small percentage of shareholders' shares. Shahchera and Taheri (2015) examined the effect of banks' capital structure on the liquidity creation and concluded that the raised capital leads to less liquidity in the Iranian banks; therefore, in the Iranian banking network, there is a negative relationship between the capital and liquidity creation. According to the results of another study by Shahchera and Taheri (2016), the ratio of capital raising has a positive and significant relationship with liquidity creation. Still, there has been a negative and significant relationship between the capital raising from cash contribution and liquidity creation. Also, the relationship between the capital raising from cash contribution and the loan ratio has been significant and negative. Also, Shahchera and Taheri (2017) showed that the ratio of capital change in sustainable financing, as well as the inverse ratio of sustainable financing, have positive and significant effects on the liquidity creation in the banking network.

4 Experimental Methodology

4.1 Model Specification

Given the dynamic nature of econometric models used in most of the relevant studies introduced in the previous studies section, concerning the effect of capital raising on the liquidity creation and credit of banks, in this study, the dynamic models will be estimated. Therefore, the relationship between the liquidity creation and credit-providing with the capital raising of the Iranian

banks can be used in the form of econometric models with the following table data by adapting two studies of Berger and Bouwman (2009) and Horvath et al. (2014):

$$LC_{i,t} = f(LC_{i,t-1}, CR_{i,t-1}, X_{i,t}, \mathbf{M}_t) + \upsilon_i + \eta_t + \varepsilon_{i,t} \tag{1}$$

$$LTG_{i,t} = f(LTG_{i,t-1}, CR_{i,t-1}, X_{i,t}, \mathbf{M}_t) + \upsilon_i + \eta_t + \varepsilon_{i,t} \tag{2}$$

$$LR_{i,t} = f(LR_{i,t-1}, CR_{i,t-1}, X_{i,t}, \mathbf{M}_t) + \upsilon_i + \eta_t + \varepsilon_{i,t} \tag{3}$$

In the above relation, the indices t and i, indicate time and sections (banks), respectively, η_t and ν_i, indicate the invisible effects between time and sections. It is also assumed that the disruption component (ε_{it}) has a normal standard distribution and no Serial Correlation. For the liquidity creation index, two computational variables are used in this study, namely the liquidity creation ratio (LC) and the liquidity transformation gap index (LTG). In the above relations, CR represents the capital raising variable[1], and X is the matrix of control variables. According to the relevant studies, control variables can include the size of the banks (Size), the ratio of return on equity (ROE), the ratio of return on assets (ROA), the loan ratio (LR), the earning volatility[2] (EV), the ratio of Non-performing loans (NPL), financial stability index[3] Z, market share in deposits (MS), ownership of banks in terms of public or private[4] (OWN) and liquidity to asset ratio (LIQ). Matrix M also includes the second category of macroeconomic environment variables affecting liquidity creation. Cases such as inflation (INF), unemployment rate (Unem), economic growth rate (GDP), exchange rate volatility (ERV), and overall freedom (Free) can be included in this matrix.

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[1] This variable will be obtained as the residual capital difference at the end of the year compared to the beginning of the year.

[2] This variable will be obtained by fitting a Panel GARCH model to the ROA variable and extracting the values of the conditional variance of that model.

[3] It is calculated based on the following equation:

$$Z_{i,t} = \frac{ROA_{i,t} + \dfrac{Equity_{i,t}}{Assets_{i,t}}}{Std.ROA_{i,t}}$$

It is he combined index of the bank stability that the larger the z, the lower the bank's possibility of bankruptcy. In fact, this index is inversely related to the possibility of bank bankruptcy. Bankruptcy of a bank is defined as the value of the bank's assets being less than the value of its debts.

[4] This variable is virtual and for state-owned banks equals 1 and otherwise zero.

Given the principle of parsimony in modeling and the need not to lose too many degrees of freedom, it is necessary to choose the most critical and effective explanatory variables in fitting the final model. To do so, with trial and error and performing various estimates, the selection of the most important and, at the same time, the most effective control variables affecting the liquidity creation and credit will be made.

In the second step, to test the methods of capital raising (from retained earnings, from the revaluation of fixed assets, from cash and current receivables and other reserves) which has a more significant impact on the liquidity creation and credit-providing, the following models are considered:

$$LC_{i,t} = f(LC_{i,t-1}, RE_{i,t-1}, ROF_{i,t-1}, R_{i,t-1}, OR_{i,t-1}, X_{i,t}, \mathrm{M}_t) + \upsilon_i + \eta_t + \varepsilon_{i,t} \quad (4)$$

$$LTG_{i,t} = f(LTG_{i,t-1}, RE_{i,t-1}, ROF_{i,t-1}, R_{i,t-1}, OR_{i,t-1}, X_{i,t}, \mathrm{M}_t) + \upsilon_i + \eta_t + \varepsilon_{i,t} \quad (5)$$

$$LR_{i,t} = f(LR_{i,t-1}, RE_{i,t-1}, ROF_{i,t-1}, R_{i,t-1}, OR_{i,t-1}, X_{i,t}, \mathrm{M}_t) + \upsilon_i + \eta_t + \varepsilon_{i,t} \quad (6)$$

In the above-assumed models, the capital raising of banks (CR) is divided into the following four variables:
1) Capital raising from retained earnings (RE),
2) Capital raising from the revaluation of fixed assets (ROF),
3) Capital raising from the right offering (R) and
4) Capital raising from other reserves (OR). It should be noted that since the effect of this method of capital raising cannot be expressed in terms of a specific policy proposal, this variable is excluded from the econometric analysis.

4.2 Data Resources
The period analyzed in this study was the period of 2008-2017, and the data resource is the annual statistics published by the Higher Institute of Banking Education of Iran. The statistical population of this study includes 29 privatized, non-state and state banks active in the official Iranian money market. It should be noted that the period and basis for the selection of the analyzed banks is based on the availability of sufficient information. [List of the selected banks has been presented in the attached Appendix A.] Data on macro variables have been extracted from the Central Bank's economic indicators.

4.3 Calculation and Analysis of Essential Research Indicators

In this section, an analytical review on the state of liquidity creation, crediting, and capital raising in the Iranian banks will be done as the most critical research variables in this study.

4.3.1 Liquidity Transformation Gap Index

The liquidity transformation gap index is a simple instrument for identifying and measuring the lack of financing resources for granting loans from deposits, which is calculated from the deduction of cash assets from cash debts as a percentage of the total assets. (Deep and Schaefer, 2004).

$$Liquidity\ Transformation\ Gap = \frac{D-L}{A}$$

In this regard, D represents the liquid debt (including Qarz al-Hasanah's current deposits and savings and short-term deposits), L represents the cash assets, and A represents total bank assets. Values greater than zero in this indicator indicate that a large volume of bank deposits (cash debts) has become illiquid assets; thus, financing the required resources to grant loans and consumption for illiquid assets has been made from liquid liabilities. In other words, the positiveness of this index shows that the bank has been succeeded in playing the role of its financial intermediary and has been able to provide the required liquidity for the Iran's economic system.

The values of the average liquidity transformation gap index of the banking industry during the years 2008 to 2017 are presented in Figure (1). The positive index shows that the banking system has been succeeded in financial intermediation to provide the required liquidity for the economic system. The trend of this index has continued almost steadily until 2015. Still, since 2015, due to the intensification of the balance sheet disorders, the value of this index has decreased.
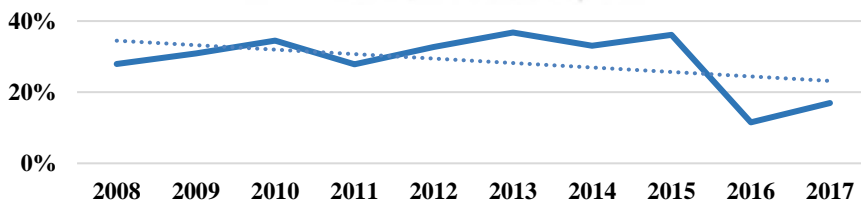

Figure 1. The Average Liquidity Transformation Gap Index in the Banking System of Iran.

4.3.2 Liquidity Creation Index

The overall difference between the liquidity creation index and the liquidity transformation gap index is in the definition of the resources available to the bank for financing for exploitation in long-term assets. This index not only considers the liquidity creation through banking deposits but also considers all conventional sources of bank financing, including the guarantee items and bank capital. The following equation is used to calculate the liquidity creation index (Berger & Bouwman, 2009):

$$\textit{Liquidity Creation} = \big[\tfrac{1}{2} * \textit{Illiquid assets} + 0 * \textit{semiliquid assets} - \tfrac{1}{2} * \textit{liquid assets} + \tfrac{1}{2} * \textit{liquid liabilities} + 0 * \textit{semiliquid liabilities} - \tfrac{1}{2} * \textit{illiquid liabilities} - \tfrac{1}{2} * \textit{equity} + \tfrac{1}{2} * \textit{illiquid guarantees} + 0 * \textit{semiliquid guarantees} - \tfrac{1}{2} * \textit{liquid guarantees} - \tfrac{1}{2} * \textit{liquid derivatives}\big]/TA$$

The components of this equation include:
- Illiquid assets
- Semiliquid assets
- Liquid assets
- Illiquid liabilities
- Semiliquid liabilities
- Liquid liabilities
- Illiquid guarantees
- Liquid guarantees
- Semiliquid guarantees
- T.A.
- Equity

The positive and high value of liquidity creation ratio index shows the positive effect of illiquid assets and liquid liabilities on liquidity creation. And the main part of the loan granted by banks have returned to banks in the form of liquid deposits (savings and current); thus, the bank has played a significant role in financial intermediation activities (as the primary role of banks). As can be seen in Figure (2), the above results have been obtained in the liquidity creation process index, and this indicator has an almost similar trend to the liquidity transformation gap index.
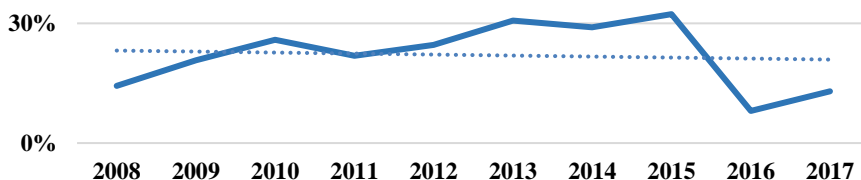
Figure 2. The Average Liquidity Creation Index in the Banking System of Iran.

4.3.3 Credit Index

Based on the studies conducted by Shahchera and Taheri (2016 and 2017), the loan ratio will be used for this index. The high loan ratio limits the liquidity of banks because the loans granted have less liquidity power than other assets. On the other hand, loans are usually classified as the most profitable assets of a bank, and therefore the higher the ratio of a bank's loans, the higher the profitability of that bank. On the other hand, the low index can also indicate the deviation of banks from the main activity of the bank, the mediation of funds. Figure (3) shows the loan ratio, and the overall trend of the index is declining, which indicates that most of the banks' liquidity is spent on things other than lending.
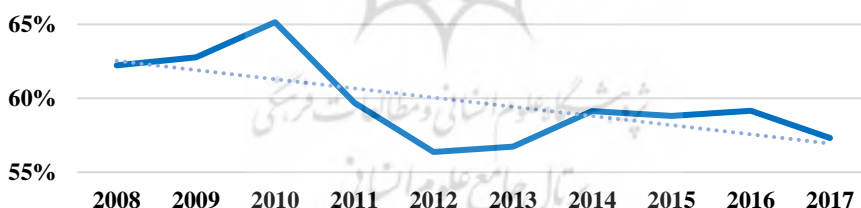

Figure 3. The Average of the Loan Ratio in the Banking System of Iran.

4.3.4 Capital Raising Index

Due to the need to study the trend of capital raising in the banking system of Iran to examine its effect on the liquidity creation and credit of banks, in Figure (4) the composition of banks' capital raising has been presented.
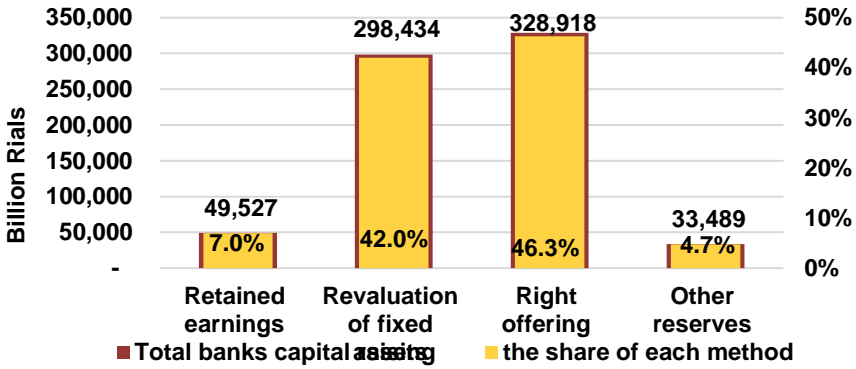
Figure 4. The Composition of Various Methods of Capital Raising in the Banking System of Iran (Cumulative in period of 10 years).

During the years under review, the largest share of banks' capital raising has been in the form of liquid inflows. The revaluation of fixed assets; and the composition of banks' capital raising has been presented in figures (5) and (6), according to the year and total capital raising of the banking system.
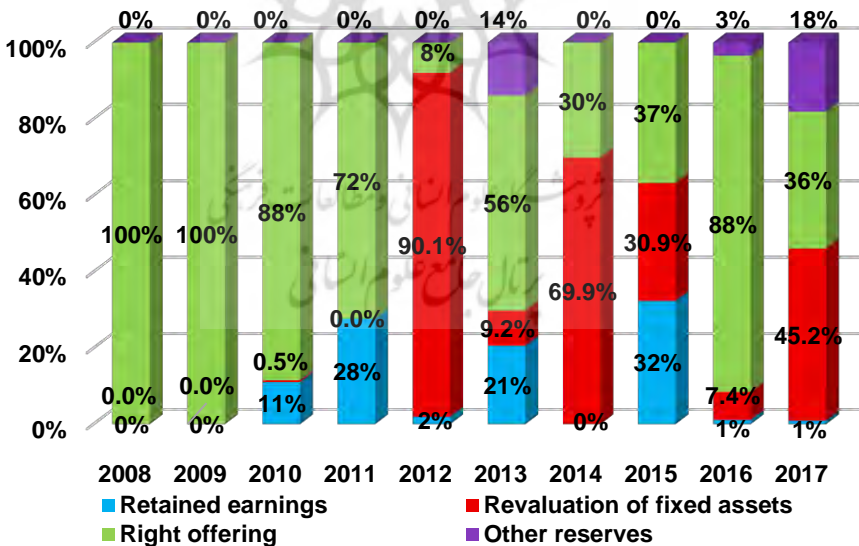

Figure 5. The Composition of Various Methods of Capital Raising in the Banking System of Iran (The Average of the Banking Industry)
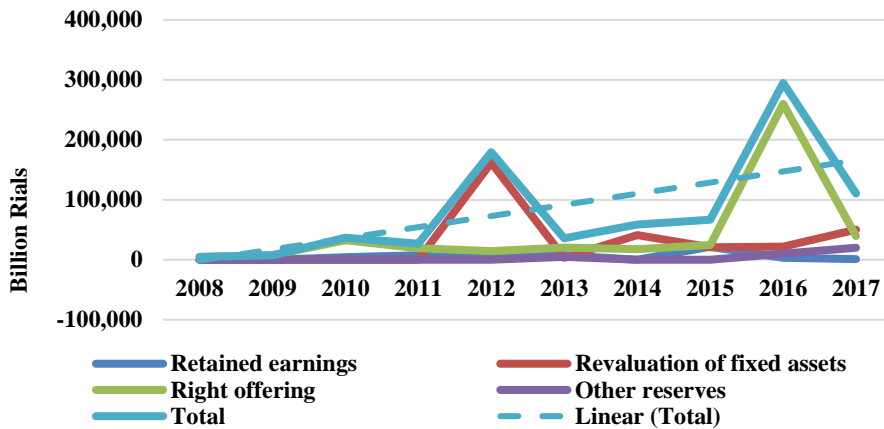
Figure 6. The Total Capital Raising of Banks.

The general trend of total capital raised in the banking system of Iran in the years under review is positive and incremental. It is important to note that although the raising in total capital per year is influenced by a particular method of capital raising, with fluctuations and considerable changes in different years, there is no similarity between the trend of continuous capital raising and each of the methods of capital raising (separately). It indicates the lack of relationship between the totality of capital raising and the different forms of capital raising.

5 Estimation Results

According to the study period of 2008-2017, which includes 10 years (less than fifteen years), there is no need to study the stability of variables before the estimation, because the stability issue is for a long time. In Table (1), the estimation results of the models related to the relationship between liquidity creation and credit-providing with capital raising in the banking system of Iran have been presented. These estimation models have been modeled, tested, and examined during several stages, and finally, the three models listed in the Table have been selected according to the best results.

Table 1
The estimation results of the models

Explanatory Variables	Dependent Variable		
	Model (1)	Model (2)	Model (3)
	LC	LTG	LR
LC_{t-1}	0.345 ***		
LTG_{t-1}		0.137 ***	
LR_{t-1}			-0.375 ***
CR_{t-1}	0.084 *	0.077 **	-0.218 ***
$Size_t$	-9.764 ***	-7.227 ***	-11.153 ***
LTD_t	0.035 ***	-.0007	
$FATA_t$	-1.174 ***	-0.908 ***	-0.316 ***
$INVTA_t$		-0.688 ***	
NPL_t	-0.544 ***	-0.237 ***	
LR_t	0.390 ***	0.383 ***	
Z_t	-0.220		
EV_t			-3.361 ***
$UNEM_t$	-1.578 ***	-0.374	-0.353 **
INF_t			-0.0724 ***
Constant	79.048 ***	60.52 ***	153.311 ***
Observations	137	128	147
Instruments	32	30	30
Sargan Statistics	20.10	17.91	20.52
Prob (Sargan)	0.576	0.592	0.550
Wald chi^2	2747.06 ***	7184.73 ***	49801.79 ***

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

All estimations have been presented using the two-step method of Arellano and Bover (1995) and using the estimator of the generalized method of moments (GMM). As can be seen in Table (1), in all estimation models, the probability value of Sargan statistics is statistically insignificant, indicating the accuracy of the instrumental variables used in all GMM-estimated models. So, there is no evidence indicating the existence of preliminary clarification in terms of instrumental variables selection. Wald chi^2 statistics have been presented to examine the relationship between the dependent variable and all the explanatory variables of each model, whose significance means that the mentioned relationship exists in all three models.

Theoretically, based on Berger and Bouwman's risk-taking hypothesis (2009), it is predicted that the raised capital will strengthen the bank's ability to create liquidity. In the estimation models listed in Table (1), theoretical expectations are met because the relationship between the liquidity creation in

both models listed in the first two columns and capital raising is positive and significant. Thus, the estimations of the models show that with capital raising in the banking system, the liquidity creation has occurred, and it has been possible for the banks to allocate the funds to various instances of liquidity creation, including the loan granting, investing or distributing other assets. According to the estimation results of the model, it is expected that the variable with the lagged liquidity has a positive and significant effect on the liquidity creation, which means that with the increase of liquidity creation in the previous period, the liquidity creation in the current period will increase, too. It can also be interpreted that increasing the liquidity creation of the current period will increase the liquidity creation and the role of banks in the economy of the next period.

However, concerning the estimation of the third model, which discusses the effect of capital raising on credit-providing, the results show that capital raising in the banking system has hurt the bank credit-providing. It means that the Iranian banks have not used this capacity (raised capital) to provide credit and validate their role in the economy and have diverted the increased resources to other fixed and illiquid assets.

Regarding the negative and significant impact of a variable with lagged liquidity creation on credit-providing, it should be acknowledged that increasing the credit in one period has reduced the credit-providing power of the banks in the next periods due to the stagnant atmosphere of society. So, turning loans into non-performing loans (NPLs) cause a shortage of resources in banks.

The size of the banks has hurt liquidity creation and credit-providing. As expected, higher-sized banks (higher asset volume) have a higher power in liquidity creation and credit-providing. But the recent banking crisis, which has increased the number of unproductive assets for banks, has further weakened the ability to create liquidity and credit for larger banks compared to smaller banks, so the size of the banks has harmed the liquidity creation. This result is consistent with the results of the study by Horvath et al. (2014).

In this model, the ratio of non-performing loans has been used to control the impacts of capital raising on liquidity. In recent years, the majority of the Iranian banks have faced significant amounts of such non-productive assets in their portfolios, so that this variable will be a symbol of the Iranian banking crisis as well as the risk of the banking network. A decrease in banks' abilities to create liquidity is expected due to the increase of the mentioned loans, so a reverse relationship between the liquidity creation and non-performing loans can be expected.

The credit-providing ratio (loan ratio, LR) has a positive and significant impact on both liquidity creation ratios, and these results are consistent with the results of Shahchera and Taheri s study (2016). In fact, according to theoretical expectations, the more loans the banks pay, the more liquidity will flow into society. As banks increase the provision of loans, due to the high turnover of these assets, they typically become deposits in the banking sector, and thus positively affect the liquidity creation and the liquidity transformation gap ratios.

Among explanatory variables, the ratio of loan to deposit has a similar function to the credit-providing ratio, which, according to the results, has had a positive effect. The higher this ratio for the bank, the greater the power of resource utilization and, thus, liquidity creation.

Earnings volatility (EV) has hurt banks' credibility as expected because the higher a bank's earnings fluctuate, the more likely it is to spread uncertainty. Therefore banks will be more cautious in granting loans.

The two variables reflecting the impact of the macroeconomic environment (inflation and unemployment) on the banking system harm the liquidity creation and credit providing. Since raising unemployment as a symbol of a recessionary situation will reduce the demand for loans and increase non-performing loans, it will affect the ability of the banks to create liquidity and credit. On the other hand, the inflation increasing by expanding the inflationary expectations will increase the bank interest rates, reduce the purchasing power in society and thus reduce the demand for loans from banks; these two results are consistent with the result obtained in Horvath et al. (2014).

Following the study of Berger and Bouwman (2009), the financial stability index Z was used only among the explanatory variables affecting the LC liquidity creation index, which has been ineffective. By increasing the stability of a bank's operating structure, it is expected that the bank takes the risk of loan paying, investing, and creating higher liquidity in general. The bank may also take less risky activities and reduce liquidity creation to maintain existing stability. In Berger and Bouwman's study (2009), this effect has been positive in large and medium-sized banks and negative in small banks. Therefore, based on the size of a bank, this effect can vary. Hence both positive and negative relationships between the stability and liquidity creation are expected. In the results of Table (2), this index is ineffective. Since the Iranian banks are very heterogeneous in size, and the banking system has been volatile in recent crisis years, the stability has been ineffective in creating liquidity for the Iranian banking system.

The ratio of fixed assets to total assets as a share of non-productive assets is one of the factors that, like NPL, is expected to limit the bank resources in liquidity creation and credibility. So its negative relationship with both kinds of the dependent variable (liquidity creation and credit) is expected. The same was right in the results.

Finally, like the ratio of fixed assets of the banks, the proportion of investments to total assets can have a low turnover, and thus the banks face the resource constraints. Therefore, its negative relationship with liquidity creation is expected.

To analyze the various methods of capital raising, the bank capital raising variable (CR) has been divided into the variables of capital raising methods, and the models mentioned in Table (1) have been repeated. As can be seen in Table (2), the results for the control variables are similar to the previous modeling.

The method of capital raising from retained earnings (RE) has had a positive impact on liquidity creation because this resource is part of the profit already used in liquidity creation. So, this result is consistent with theoretical expectations and have a positive effect. But capital raising from the revaluation of fixed assets has hurt the liquidity gap index, and the obtained result is consistent with theoretical expectations. Because using this method of capital raising has not led to the entry of new financial resources into the banks, and only during the accounting operation, the capital account will increase, or some financial accounts will be affected. In particular, in recent years, currency shocks in the economy of Iran, which have ultimately led to the revaluation of banks, have led to a decline in the lending capacity and liquidity creation of the banks due to the stagflation, NPLs increase, and loan demand decline.

The method of capital raising from cash contribution (R) has a positive impact on the liquidity creation index, which is in line with given expectations. The method of capital raising from cash contribution and the matured claim is a way which leads to the creation of new financial resources for the banks and increases their ability in loan paying and creating liquidity

Also, among the methods of capital raising, the method of capital raising from retained earnings has a positive impact on credit, similar to the estimations related to liquidity creation. Still, the method of revaluation of fixed assets (ROF) has had no impacts on credit. Meanwhile, the method of capital raising from the cash contribution has harmed credit, which is consistent with the results obtained in Table (1). The negative effect of this method of capital raising has led to the negativeness of the overall effect of

capital raising on credit; On the other hand, it has overcome the positive effect of the method from the retained earnings.

Table 2

The estimation results of the models (derivative models based on capital raising)

Explanatory Variables	Dependent Variable		
	Model (4)	Model (5)	Model (6)
	LC	LTG	LR
LC_{t-1}	0.189 ***		
LTG_{t-1}		0.108 ***	
LR_{t-1}			-0.273 ***
RE_{t-1}	0.157 ***	0.199 **	0.059 ***
ROF_{t-1}	0.005	-0.011 ***	0.00195
R_{t-1}	0.018 *	-0.004	-0.0112 **
LTD_t	0.032 **		
$Size_t$	-10.922 ***	-7.723 ***	-13.028 **
Z_t	-0.567 ***		
EV_t			-3.866 ***
NPL_t	-0.368 ***	-0.197 *	
$FATA_t$	-0.235	-0.705 ***	-0.567 ***
$INVTA_t$	-1.017 ***	-0.650 ***	
$UNEM_t$	-0.919 **		-0.791 ***
INF_t			-0.114 ***
Constant	104.847 ***	79.341 ***	165.617 ***
Observations	128	128	147
Instruments	32	29	32
Sargan Statistics	16.025	17.911	22.533
Prob (Sargan)	0.715	0.593	0.428
Wald chi^2	615.23 ***	4284.98 ***	1580.20 ***

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

6 Conclusions and Suggestions

The purpose of the present study was to investigate the effect of capital raising and its methods on creating liquidity and credit in the banking system of Iran by using econometric methods. The results of the modeling showed that capital raising generally leads to an increase in liquidity creation of banks, and this is consistent with theoretical expectations and the results of other studies. In studying the impact of different kinds of capital raising methods on liquidity creation; however, cash contribution method and retained earnings can have a positive effect on liquidity creation, and other methods have adverse effects. Theoretically, based on Berger and Bouwman's risk absorption hypothesis (2009), it is predicted that capital raising will increase the bank's ability to

create liquidity. Thus, with the raised capital, the bank allocates the cash proceeds from the capital raising to the examples of liquidity creation (such as granting loans and investing in securities, etc.) and play their intermediary financial roles in the economy, which has been recently achieved in the economy of Iran. On the other hand, based on the results of the proposed models, capital raising has hurt credit providing banks. It means that the Iranian banks allocate the resources obtained from capital raising to cases other than providing loans to customers. Due to the problems in providing loans (during and after granting loans to customers) and the possibility of default, they prefer to devote their resources to assets that do not have the risk of default and are likely to have higher returns. It seems that different types of banks' investment and fixed assets such as buildings, etc. have been good options for the consumption of bank resources (obtained from capital raising).

It should be noted that in the intermediary operations of banks, what strengthens their performance and affects the economy is the absorption of real surplus liquidity in society and the accumulation of micro-capital in the form of depositing or increasing capital with the concept of investor cash. By absorbing resources, incredibly sustainable, and long-term resources such as investors' cash contributions, banks will be able to allocate resources optimally. They will be able to provide loans to various economy sectors (household or manufacturing).

Capital raising from revaluation has not led to the entry of new resources in the banks and only includes a shift in the balance sheet. Especially in recent years, currency shocks in the economy of Iran that have led to the price increase of various assets have had a significant impact on the increased value of banks' assets. On the other hand, these conditions have faced the banks with problems such as being affected by the country's stagflation situation in the form of NPL increase and power decrease in lending and liquidity creation. In the method of capital raising from surplus assets revaluation, banks have only presented a better form of their capital structure, possibly intending to reduce the leverage ratios and the resulting risk in recent years.

According to the results, focusing on capital raising in the banking system of Iran to improve the money turnover and liquidity raising in the real sector of the economy can be useful in capital raising methods of cash contribution and retained earnings. Also, given the importance of increasing the banks' credit providing power, the government and central bank are recommended to give incentives such as granting exemptions or making various tax breaks and lowering the legal reserve rates that raise capital from retained earning method.

References

Allen, F., & Gale, D. (2004). Financial Intermediaries and Markets. *Econometrica*, 72(4), 1023–1061.

Allen, F., & Santomero, A. M. (1997). The Theory of Financial Intermediation. *Journal of Banking & Finance*, 21(11), 1461–1485.

Arellano, M., & Bover, O. (1995). Another Look at the Instrumental Variable Estimation of Error-Components Models. *Journal of Econometrics*, 68(1), 29-51.

Berger, A. N., & Bouwman, C. H. (2009). Bank Liquidity Creation. *The Review of Financial Studies*, 22(9), 3779-3837.

Berger, A. N., & Bouwman, C. H. (2017). Bank Liquidity Creation, Monetary Policy, and Financial Crises. *Journal of Financial Stability*, 30, 139-155.

Berger, A. N., & Udell, G. F. (1994). Did Risk-Based Capital Allocate Bank Credit and Cause A "Credit Crunch" in the United States? *Journal of Money, Credit, and Banking*, 26(3), 585-628.

Bouwman, C. H. (2013). Liquidity: How Banks Create It and How It Should Be Regulated.

Bruno, V., & Shin, H. S. (2014), Capital Flows, Cross-Border Banking, and Global Liquidity, *NBER Working Paper*, No.19038.

Choi, P. P., Park, J., & Ho, C. (2009). Insurer Liquidity Creation: The Evidence from the U.S. Property and Liability Insurance Industry. American Risk and Insurance Association, *Working Paper*.

Coval, J. D., & Thakor, A. V. (2005). Financial Intermediation as a Beliefs-Bridge between Optimists and Pessimists. *Journal of Financial Economics*, 75(3), 535-569.

Deep, A., & Schaefer, G. (2004). Are Banks Liquidity Transformers? *KSG Working Paper*, No. RWP04-022.

Diamond, D. W., & Dybvig, P. H. (1983). Bank Runs, Deposit Insurance, and Liquidity. *The Journal of Political Economy*, 91, 401–419.

Diamond, D. W., & Rajan, R. G. (2000). A Theory of Bank Capital. *The Journal of Finance*, 55(6), 2431–2465.

Diamond, D. W., & Rajan, R. G. (2001). Liquidity Risk, Liquidity Creation, and Financial Fragility: A Theory of Banking. *Journal of Political Economy*, 109, 287–327.

Gorton, G., & Winton, A. (2000). Liquidity Provision, Bank Capital, and the Macroeconomy. *Working Paper* (October 9, 2000).

Hancock, D., Laing, A. J., & Wilcox, J. A. (1995). Bank Capital Shocks: Dynamic Effects on Securities, Loans, and Capital. *Journal of Banking and Finance*, 19(3), 661–677.

Horváth, R., Seidler, J., & Weill, L. (2014). Bank Capital and Liquidity Creation: Granger-Causality Evidence. *Journal of Financial Services Research*, 45(3), 341-361.

Kashyap, A. K., Rajan, R., & Stein, J. C. (2002). Banks as Liquidity Providers: An Explanation for the Coexistence of Lending and Deposit-Taking. *The Journal of Finance*, 57(1), 33–73.

Khoshtinat, M., Taghavifard, M. T., & Nobari, N. (2016). Financial Performance Analysis of Iranian Private Banks. *Quarterly Journal of Islamic Finance and Banking Studies*, 2(3), 113-138.

Nili, F., Shahchera, M., & Taheri, M. (2015). The Liquidity Creation and Determining the Role of Financial Intermediation of Banks in Iran. *Quarterly Journal of Ravand*, 22(70), 13-49.

Lei, A. C., & Song, Z. (2013). Liquidity Creation and Bank Capital Structure in China. *Global Finance Journal*, 24(3), 188-202.

Pana, E., Park, J., & Query, T. (2010). The Impact of Bank Mergers on Liquidity Creation. *J Risk Manag Financ Inst*, 4(1), 74–96.

Peek, J., & Rosengren, E. (1995). The Capital Crunch: Neither a Borrower nor a Lender Be. *Journal of Money, Credit, and Banking*, 27(3), 625–638.

Repullo, R. (2004). Capital Requirements, Market Power, and Risk-Taking in Banking. *Journal of Financial Intermediation*, 13(2), 156–182.

Shahchera, M., & Taheri, M. (2016). The Necessity of the Banks' Capital Raising and Its Impact on the Lending Power in the Country's Banking System. *26ᵗʰAnnual Conference of Monetary and Foreign Exchange Policies*.

Taghizadeh Khanqah, V. & Ahmadnia, L. (2013). The Impact of Capital Structure on Liquidity and Investment Growth Opportunity in the Tehran Stock Exchange. *Journal of Basic and Applied Scientific Research*, 3(4), 463-470.

Taghizadeh Khanqah, V. & Ahmadnia, L. (2013). The Financing Structure of Large Oil Firms in the Iranian Capital Market. *Master thesis*, Ferdowsi University of Mashhad.

Von Thadden, E. L. (2004). Bank Capital Adequacy Regulation under the New Basel Accord. *Journal of Financial Intermediation*, 13(2), 90–95.

Appendix A: Banks under the Study

The sample used in the estimations of 29 private and state banks of Iran for 10 years from 2008 to 2017 includes: Mellat, Kar Afarin, Refah, Iran zamin, Sina, Tosee saderat, Gardeshgari, Tosee Taavon, Saman, Maskan, Tejarat, Ansar, San'at O Ma'dan, Saderat, Pasargad, Keshavarzi, Eghtesad Novin, Ghavamin, Khavarmianeh, Mehr Eqtesad, Hekmat Iranian, Post Bank, Sepah, Parsian, Qarz Al-Hasaneh Mehr, Day, Shahr, Ayandeh, and Melli.