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The Role of Banking Crisis in the Effect of Income Diversity on Risk of Banking Industry in Iran

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ABSTRACT

Today, with the globalization of the economy and the increased competition between the banks, the profits of traditional banking activities have diminished, and their risk has been on rise. Thus, banks should adopt more efficient risk management methods. In the last three decades, Iranian economy has faced many fluctuations in macroeconomic areas, e.g. the banking industry. The main goal of the current study is to examine the role of banking crisis in the effect of income diversity on risk of banking industry using panel econometric method (EGLS). For this purpose, 8 accepted banks in the Tehran Stock Exchange² were evaluated as a research statistical population during (2005-2018). The results show that an increase in the share of Non-interest income (income diversity) in the time of banking crisis does not have a significant effect on the banking stability. Another finding of the study suggests that there is a negative significant relationship between the index of concentration during the crisis and the stability of the banking industry. Also, there is a positive significant relationship between the size of the bank, the loan ratio, and the capital adequacy index during the crisis with banking risk.

1. Introduction

The banking industry in the Iranian economy plays a key role in securing deposits towards investiture expenditures due to capital market imperfections. In fact, the banking sector in the Iranian economy acts as the main bridge between supply and demand of monetary resources, so that any deficiency in the structure of this sector and ineffective operation can lead to disturbance in

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other sectors. The role of monetary and financial system in the economy is undeniable, so that ignoring problems in this sector causes irreparable damages to the economy. On the contrary, systematic organization of this field improves the productivity and efficiency of this system, contributing to the overall growth of the economy.

The banks and credit institutions, as economic entities in the monetary and financial system, play a pivotal role in economic activities through attracting depositors' funds (supply liquidity), and allocating them to active economic sectors, e.g. commerce, services, and manufacturing. Accordingly, banks receive deposits at a low interest rate and lending facilities at higher interest rates, which leads to disparity between rates, earnings, and margins (Ahmadian and Kiwanvand, 2014). Therefore, it can be posited that source of incomes in service institutions, e.g. banks, include funds obtained from services offered to customers, which increase their assets and equity. The bank's revenue mechanisms (revenue structure or revenue diversity) can be categorized into two broad classes: interest revenue and non-interest revenue.

Interest incomes constitute a part of the bank's income, which comes from individual contributions, e.g. the reception of long-run deposits from customers, investment of deposits in various businesses, and the provision of long-run facilities to customers. Non-interest income, as another channel of bank revenues, is generated through service fees and financial investments. These incomes include loan services, bank guarantee services, electronic banking services, currency services, issuance of various checks, etc.

Economic cycle consists of four elements: growth, expansion, recession, and economic crisis. In economic recession, the total production and the goods price reduce, which in turn diminishes income and profit margin. The outcome of lowering earnings and margins is the decrease of the return on investment (ROA) for shareholders and owners of companies (Baqai et al., 2010). It also deteriorates the company's ability in repaying debts to creditors. In this case, the economic recession, as the root cause of economic crisis, reaches its climax. Given that banks are the pillar of the economic system, not repaying by customers raises the amount of their deferred claims, which ultimately reduces the lending power of the banks.

Industries, factories, and traders need financial resources to supply raw materials and keep their production wheel moving. With lower lending power of banks, the economy falls into a recession, giving rise to an economic crisis. Banking crisis disturbs the banking system of a country, spreading from one bank to another. This is due to the existence of an interbank market. Banking crisis is underscored by the lack of risk management. It should be noted that the essence of banking is risk-taking and instability, which are associated with banking operation. Since any risk implies potential danger or hazard, banking denotes taking risks by making informed decisions.

Risk refers to the probability of a loss resulting from a decision or a potential event. The risk of asset is a probable change in the future ROA. Theoretically, it is not feasible to eliminate all kinds of risk, but identification and management of risk seems to be the only possible solution. In fact, risk management is a process associated with uncertainties caused by the bank's financial market, and refers to the adoption of a suitable strategy. It is a set of actions which can preserve assets of an institution, a bank, or an enterprise. Therefore, identifying and controlling each of these risks is vital for the banking sector (Mehraara and Mehranfar, 2013).

Crises and recessions, according to the business cycle theory, sometimes spread to all or part of the countries, and overcoming the crisis has always been one of the major concerns of economists and policymakers. On the other hand, in the Iranian economy, due to the privatization of banks and the expansion of the field of banking activities now and in the future, the possibility of a banking crisis is increasing.

The present study examines what the income structure of banks should be like in the event of a banking crisis in order to have better (more stable) risk management. In fact, investigating this issue can make banks more efficient in the event of a banking crisis. Therefore the main objective of the current study is to examine the role of banking crisis in the effect of Income diversity on risk of banking industry using panel econometric method (EGLS). For this purpose, 8 accepted banks in the Tehran Stock Exchange were evaluated as a research statistical population during (2005-2018). It should be noted that this study is novel because it has not been researched on the role of the banking

crisis in the impact of income structure on the risk of the banking industry in the Iranian economy.

The remainder of this study is organized as follows. Section 2 provides a theoretical foundation of the key concepts, i.e. crisis, banking crisis, income structure, and financial stability. In section 3, previous works related to the subject matter are reviewed. Section 4, the model is presented. The results are analyzed. Finally, presented concludes and policy recommendations.

2. Theoretical Foundation

In recent decades, the Iranian banking system has faced issues such as nationalization of banks. A survey of conditions governing Iranian banks suggest that the Iranian economy has involved in a banking crisis, but since most banks are owned by the government, and receive financial supports from the central bank, these conditions have not been translated into a full-fledged economic crisis (Moshiri and Nadali, 2010).

2-1. Crisis

The economic crisis refers to overproduction—the saturation of the market with goods which customers cannot afford to buy. When there is no customer in the market, and goods are not traded, the production reduces naturally over the time, leading to the shutdown of factories and unemployment of millions of workers, which in turn makes the sales more difficult, and deteriorates the crisis. Consequently, the credit system fails, and the debtors lose their ability to repay their debit in due time. The value of the firms' shares falls in the market, and invest institutions go bankrupt one after another.

In this way, what first appeared as surplus goods in the market transformed into a full-fledged crisis which disrupted the entire economy, and caused disasters far more devastating than natural ones (Sultan Abadi, 2011). When internal or external factors interfere with the normal function of active systems, and the system components undergo fundamental changes, an abnormal situation emerges, which is characterized with instability, producing a shock or crisis in the system by deterioration of the situation. This transformation can affect the function of other systems, too, and lead to a wide range of system and non-system responses (Ahadi Dolatsara, 2008).

2-2. Banking crisis

Financial markets can facilitate the supply of credit on demand, but when in trouble, they contribute to the rapid spread of economic crisis to all sectors of the economy. In an economy without a massive financial market, economic growth is slow, and therefore economic crises may appear more infrequently than that of the economies with profound financial markets. Crisis in financial markets, not only through credits, but also by influencing the expectations of economic agents, can facilitate the spillover of the crisis to all the economic sectors. The banking crisis emerges in two ways: First, a rapid change in the quality of bank assets which is underscored by a shock imposed on the credit of the bank's borrowers. Secondly, depositors lose their trust in the banking system with regard to the fulfillment of their obligations, which is followed by abrupt withdrawal of deposits from the system. This banking crisis, however, leaves macro-economy in a state of shock.

In the aftermath of a crisis, interest rate changes overnight, currency market drives volatility, prices of various assets, including real estate, fluctuate, and the stability of the debt market is undermined, giving rise to unemployment. Indeed, weaknesses in the private and public sectors are shifted to the banking system. There is also the opposite of this situation, and with a weakness in banks, the real sector of the economy comes to suffer losses. When a large number of banks in a country are unable to pay their debts, people lose their trust in other banks and, therefore, withdraw their invests from banks. These events are referred to as 'banking crisis.

The outcomes of the banking crisis include reduction in GDP, the capital outflow, and the devaluation of domestic currency (Azimi, 2011). There are four criteria for a banking crisis: 1) The ratio of bank lending to total loans is more than 10%; 2) there are many national banks; 3) several banks are continuously on the verge of bankruptcy and, 4) the cost of a bailout package exceeds 2% of GDP. One of the most striking developments is that banking crisis occurs concurrent with the currency crisis. On many occasions, these two crises are simultaneous, that is most of banking crisis are accompanied with a currency crisis. This is because with diminished trust in the banking system, market actors look for a safe place for their capital, and the foreign

exchange market offers one of the best asset markets with high liquidity. This is the reason for simultaneous occurrence of banking crisis and the currency crisis. In the short-run, financial development will be a major risk factor for financial institutions, leading to loan failure, credit expansion, and even banking crisis. In addition, financial development can increase the financial system risk. Banking and finance have stricken both developed and developing countries, and the crisis experience may reduce banking risk to some extent, and subsequently raise the banking risk in the future (Vidensonet and Tangier, 2016).

The banking crisis usually interferes with banking regulations and policies. Yet, financial reforms may reduce the banking risk. On the other hand, legal reforms undertaken following a banking crisis to reduce bank executions, through weakening the market order mechanism, may have an adverse effect on the banking risk. Banking risk seems to be significantly dependent on business cycles, especially during the economic boom. But it is relatively weak during recession. In addition, during the economic boom, banks are more likely to grant commercial loans, and confine new loans during disasters times.

The banking credit risk is closely associated with the base of business cycles during the recession, with banks being forced to grant and increase the number of unconditional loans (Vithessonthi and Tangura, 2016). Historically, in many parts of the world, economic recession ensuing banking crisis is considered as the most difficult type of recession in terms of its duration and management. The great recession of the 1930s, Japan's prolonged recession in the 1990s, and the recent global crisis in 2008 all hinge upon the financial crisis of banks. Japan's experience can offer valuable lessons for administrating our banking system. The Japan's government failure to make incisive decisions in the early 1990s, with regard to the management of financial and banking crisis, led to two decades of near-zero growth for this country. So that its economic effects have not been completely vanished. The question is that what the solution is to the current banking crisis in Iran. First, policy makers need to have a clear picture of the status of all banks. The central bank must be exactly aware of the situation of banks and

their problems in terms of capital and liquidity shortages. In addition, banks should be categorized into three broad classes: banks in desirable situation (sufficient capital and liquidity), banks with insufficient capital which need capital injection to avoid bankruptcy, and banks which have liquidity problem, whose situation can be improved by the access to the new sources. The appropriate solution for each bank may be different, and erroneous implementation of the same strategy may incur more costs.

The easiest way is to integrate troubled banks into a unified entity, but this method will not be effective. Because the balance sheet of these banks will be all faulty. The merger of banks can be beneficial only if it helps reduce the current costs of the merged bank. In the absence of financial support from the government and the central bank to decrease the costs of the merged bank (the layoff of human resources, branches, etc.), in the long-run, the problems of the new bank will not be resolved.

The second solution is to create a state-owned financial institution to buy toxic and non-cash assets and deferred loans from banks. This solution is especially suitable for banks with liquidity problem. It should be noted that this would be effective provided that the new financial institution buy non-cash assets of banks at a rate lower than their book value. Buying these assets at their book value is actually equivalent to offering subsidies to these banks. The new financial institution can turn into a profitable institution in the long-run by managing these assets and increasing their profitability.

The third solution is the injection of new capital into banks, which face the problem of inadequate capital by the government. This can be effective as a temporary solution to the bankruptcy of these banks. Meanwhile, the government should concern that once the problems of these banks are resolved, they have to be reassigned to the private sector. This solution will be effective in the mid-run if the government can reduce the current costs of these merged banks.

The last solution, and perhaps the best, is the use of foreign investor resources. It should be noted that the government alone is not capable of owning all troubled banks without borrowing from the central bank. This method will ruin all the government's achievement in curbing inflation. There

are now many barriers to the acquisition of Iranian banks by foreign banks, e.g. the limit on the share of an Iranian bank owned by a foreign bank. Foreign investors would be encouraged to invest in Iranian banks if they were allowed to assume the steering wheel, and by changing the internal processes of banks and services provided to customers, turned them into profitable financial institutes.

As mentioned above, a wrong solution to the problems will only worsen the situation. Injecting funds into a bank with liquidity shortage will not solve its problem. Forcing a bank into buying another bank, regardless of its problems, will not be useful. Another important point is that the way the central bank oversees the banking system needs to be reviewed and reformed significantly. Instead of focusing on the provision of banking services (such as the obliging banks to grant marriage facilities, etc.), and imposing restrictions on interest rates and interest rate of bank, the central bank should concentrate on the risk taking of banks and their balance sheet. Without refining this process, another banking system crisis will be inevitable.

2-3. Income structure (income diversity)

The revenue generation mechanism of banks (income structure, or income diversity) can be categorized into two broad classes: interest income and non-interest income. Interest income is a part of banks' income which comes from the individual contributions, e.g. the reception of long-run deposits from customers, investment of deposits in various businesses, and the provision of long-run facilities to customers. That is, the income comes from the difference between the interest paid to and received from customers, which constitute a major source of banks' income. The growing competition between banks and changes in the disclosure rules (presentation of financial reports) have forced banks to lower their lending rates, which explains the reason for the sudden interest of banks in non-interest services.

In addition, strong regulatory approval of capital adequacy requirements in terms of asset size has urged banks to plan for expanding their revenue flow without engaging in risky assets. Accordingly, banks can focus on obtaining non-interest income (Monetary and Banking Institute, 2007). Non-interest income is another form of bank revenues generated from service fees,

financial consultation, and investment. It includes loan services, bank guarantee services, electronic banking services, currency services, issuance of various types of checks, etc.

The diversity of incomes is achieved with a change in the revenue generation of banks through non-interest income, and the portfolios include a variety of instruments and investments, which allow banks to gain higher non-interest income at a lower risk. Non-interest income increases the ability of banks to resist economic shocks and eliminate the centralized strategy of earnings in a certain way. The revenue-generating strategy is generally more risk-oriented, and poses a higher risk to banks (Shahchara and Jozadani, 2017).

De Young and Roland (2001) argue that the expansion of the bank revenues can increase risk. First, income derived from lending services over time tend to be sufficiently stable due to high information of borrowers and lenders and the replacement costs for them. It is because the income obtained from the provision of independent interest rate service is usually subject to fluctuations. Banks can easily replace them with the activities which are independent of interest rates, while replacing these activities with lending activities would be problematic. Secondly, with the expansion of non-interest activities, the bank's leverage increases, leading to higher fixed costs due to the new investments in technology and human resources. Due to the previously established loan relationship, the final cost is not restricted in additional loans and, in the end, the moderators have to deal with lower capital equipment for non-interest income activities, which may increase the fluctuating revenues linked to the financial power.

Celine and Tarazi (2014) argued that shifting to non-interest activities raised bank profits and their risk-adjusted revenues, especially when banks were more dealing with government securities transactions. In addition, they found that greater involvement in non-interest incomes is beneficial only to banks, whose interaction with small- and medium-sized enterprises is limited. Furthermore, the share of non-interest income in large banks is higher than that of small banks, and the size of a bank has a positive effect on return on assets. Yet, with high non-interest income, this effect is diminished.

Structural changes in the banking system and the diversity of financing other firms have urged banks to constantly look for ways of revenue generation other than the provision of facilities. From a theoretical point of view, banks can benefit from the economic scale, when they expand their revenue channels. In addition to providing loan services to the customers, banks can be more efficient and more profitable by providing other financial services and taking advantage of the customers' information. Because banks can multiply their revenues or transfer them from facilities services (interest) to non-facilitated services (such as other financial services, which generate revenues for banks irrespective of the interest rates effect) and, hence, reduce overall banking system risk (Haiday et al., 2012).

2-4. Risk

Due to continuous changes in environmental factors and economic systems, the financial structure of different institutions is subject to a different risk each day. Various institutions, e.g. financial institutions and even governments, face specific risks in their area of activities.

In general, there are two types of risk: financial risk and non-financial risk. Financial risks include: 1) risk of liquidity (risk of cash loss for repayment of obligations); 2. credit risk (the borrower's inability or unwillingness to fulfil the obligations on the due time); 3) risk of general changes in prices, so that with an increase in the general level of prices (inflation), the cost of a firm rises, and ultimately affects the firm's performance; 4) rate of interest risk (interest rate fluctuations in the current economy), and 5) market risk. Non-financial risks include management, industry, political, laws, human resources, and operational risks.

2-5. Financial stability

In the Iranian economy, like any other economy, the banking sector plays a crucial role. Considering that a major part of the banking system is run by the government, scant attention has been paid to the financial stability of the banking system, and there are no defined indicators or indices for assessing the stability of the banking sector. Public sector, despite its interferences in the banking system, does not consider its sustainability. The banking system in Iran operates in an isolated environment with restricted communications

with the outside world, and is fundamentally different from the global banking system. Many studies have shown that the financial health of a banking system depends on its operational independence.

Simply defined, financial stability refers to the states, where the system is not exposed to critical situations. Several factors affect financial stability, the most important of which are macroeconomic variables (i.e. inflation, GDP, and currency rate), and the special conditions of banks (i.e. the profitability of banks, the ratio of loans to assets, and the ratio of costs to income). Financial stability has a positive effect on the performance of financial entities and banks, and can improve the efficiency of their activities. Results show that financial stability in private and public banks is different (Mirbageri Hir et al., 2017). Financial strength, or financial stability, refers to a state, where the financial system can resist the economic shocks, minimize financial imbalances, and prevent the interferences in its performance (Central Bank of Europe).

Banks should be allowed to involve in the economic activities to maintain their health, and there should be no pressure on banks in this regard. Also, private banks of Iran can play an important role in success of this program. The role of these banks could be crucial by supporting the production and the private sector activists, and advocating projects which are really critical for the national economy. The main reasons underlying the instability of banks are: 1) the financial mediators' debts are much more than their capital, and this exorbitant debt is heavily influenced by the economic fluctuations; 2) the financial mediators play the role of borrowers or creditors, and the main source of their profits is the difference in various time periods and risks threatening the parties to contracts, as well as the imbalance between assets and liabilities of the bank, which can undermine the stability of the banks, and 3) banks rely on the trust of people and if this is betrayed, they will not be able to continue their activities.

3. Background of Research

A review of the studies in Iran shows that none of these studies has directly investigated the mediator role of the banking crisis in the effect of the income

structure on risk in the banking industry. Therefore, in this section, we will review the researches which are more relevant to the subject of this paper.

Lepetit et al. (2008) considering the effect of size on diversification of bank's earnings proposed that diversification had augmented risk in small banks and, therefore, these banks will less likely to engage in business activities, and prefer traditional banking activities. Festic et al. (2011) indicated that non-interest activities increased the credit risk. Since these activities provide the opportunity without legal requirements, has a significant effect on increasing the leverage. Brunnermeier et al. (2012) came to the conclusion that banks with higher non-interest income had a larger share in the systemic risk than the traditional banks. After breaking total non-interest income into commercial revenues and funding and investment sectors, they found that both sectors were almost equally exposed to the systemic risk. They also noted that banks which had higher commercial revenues in the year before the recession had lower returns during the recession.

Pennathur et al. (2012) studied the effect of ownership structure on the relation of income diversification and risk in Indian banks during the 2001–2009 period. In their paper, they investigated the determinants of non-interest income and the impact of diversification on the diverse profit-making methods and bankruptcy risk scale in public, private, and foreign banks. They emphasized that public and private banks had diverse strategies with various effects on the banks' performance. Foreign banks are deeply involved in interest-based activities, while public sector banks have lower interest income than the private sector banks. They found that diversification of interest and intermediary activities reduced the volatility of revenues in public sector banks. Greater engagement in activities leads to higher banking risk in both domestic and foreign private banks; however, higher interest incomes are associated with a lower default risk in both public and private sectors.

Hidayat et al. (2012) indicated that the effect of income diversification on banking risk was strongly dependent on the size of the banks' assets. In addition, there is a negative relationship between the degree of product diversification and banking risk in small-sized banks, while this relationship is positive for large-sized banks. Nikomran et al. (2013) investigated the

relationship between credit risk and liquidity risk, and the effect of three independent variables of government ownership, banks' size, and financial crisis on these risks in the Iranian banks during the period of 2005–2012. Results indicated a positive significant relationship between credit risk and liquidity risk. Furthermore, government ownership and the banks' size have a positive significant effect on the liquidity risk, while the effect of financial crisis is not significant. Moreover, none of the above variables had a significant effect on credit risk.

Salehi (2013) investigated the level of income diversification in public and private banks and its impact on the credit risk. Results of the estimates adapted from various models to assess the effect of income diversification on private and public banks in Iran using multivariate regression analysis suggested that several variables influenced diversification in private and public banks. While the effect of intermediary income on public banks is significant, the effect of operating income on private and public banks is not confirmed. Yet, the relationship between the intermediary income and the credit risk of private and public banks is not significant. The operating income variable also had a direct effect on the credit risk in public banks (contrary to expectations), without any significant effect on the credit risk of private banks. These results suggested that in our country in the period under study, banks did not use income diversification effectively to diminish risk. Demirkguc-Kunt et al. (2013) studied the relationship between capital structure and stock returns, showing that during a financial crisis, capital was more important, especially to large banks. This capital advantage is an important asset during the crisis; because it prevents most banks from further risk taking (great capital protects individuals against major shocks).

Noroozi (2014) studied the effect of macro variables on credit risk of banks in Iran, and investigated the indices of credit risk in the Iranian banks during the period of 2006–2011, by using the method of system generalized method of moments (GMM). Results suggested that the credit risk of banks was influenced by macro variables. In particular, the interest rate of facilities, inflation rate, government debt, and unemployment rate are positively correlated with, and GDP growth is negatively correlated with the credit risk

of banks. In addition, bank characteristics, e.g. size and profitability, have a negative effect, and the credit risk of previous period had a positive effect on credit risk of banks. Engineer et al. (2014) found a strong negative relationship between the intensity of bank competition and the banking system risk. They found that severe competition encouraged banks to diversify risk, and the banking system would experience less shocks.

Engel et al. (2014) studied the relationship between the banking system risk and non-interest income by considering the banking system in different countries. They found that banks in a low-concentration banking system (e.g., in Japan and the United States) had higher levels of non-interest income, but did not reduce the profit fluctuations and, thus, they struggled with high banking system risk.

Laeven et al. (2015) studied the determinants of the system risk of large banks during a certain financial crisis. They observed that systemic risk increased with the growth of bank size, and was inversely related to the banks' capital. In general, larger banks have lower capital ratios, unstable funds, and diverse revenues with a higher potential risk. Deregulation, technological advancement, and financial innovation in the two decades before the global financial crisis increased the banks' size. It was assumed that increasing the size and scope would be translated into greater profits, and considering the benefits of portfolio diversification, they would reduce the banking system risk (Jonghe et al., 2015).

Farhang et al. (2016) studied the effect of non-interest income on risk and profitability in the banking industry over the period 2004–2014, by using GMM. Results indicated that increasing non-interest income would raise profitability, and reduce risk in the Iranian banking system. Based on the results and also due to the current problems of the Iranian banking system, much attention should be paid to the banks' non-interest income as a key solution. Faramarzi and Amini (2016) investigated the effect of income structure and bank size on profitability and risk of the banks listed in Tehran Stock Exchange Market during the period of 2009–2014, by using fixed and random panel effects method for estimating the multivariate regression model. They concluded that there was no significant relationship between the income

structure of banks and their profitability. They also reported a significant relationship between income structure of banks and the banking system risk.

Shahchara and Jozdani (2016) studied the income diversification and profitability in Iran, and proposed that non-interest income had a positive effect on the banks' profitability, and a negative effect on banking system risk. Through diversification of their revenues, banks can move into modern banking system by changing traditional banking activities. They can increase their ability to counter risks, and reinforce banking system by maximizing their profits. Ahmadi et al. (2016) discussed that the banking system risk was as old as banks' activity, and despite the diversification of banking services, risks had been on rise. It is because the expansion of banks' activities, inability of borrowers to repay debt, access to international banking systems, and the outbreak of financial crises have mounted new risks.

Hosseini and Mostafavi (2016) investigated the relationship between size and income diversification, and their interaction with system risk of private bank, assessing system risk with the Expected Extreme Deficit Index. This is the average return on the stock of banks at times when banking sector efficiency index falls below the risk-adjusted value. The data of eight banks listed in the Tehran Stock Exchange for the period 2009–2014 were used. Their findings indicated that the diversification of bank revenues, which was measured by the NII (non-interest income) index, had a reverse effect on its systemic risk. In other words, banks with a high interest to portfolios income have a higher systemic risk. Also, the effect of income diversification on systemic risk reduction in larger banks with increased non-interest income would significantly diminish the system risk. Results rejected the strong influence of the banks' size on the system risk of banks under study.

Talebi and Selgi (2016) studied the relationship between risk and ratio of capital adequacy, the adequacy of capital requirements for risk control, and the behavior of banks with different capitals by using data from the Iranian banks over the period 2010–2015, and using SEM method. Results indicated a two-way relationship between risk and capital ratios. In addition to the legal pressures, capital market imperatives also affect capital changes, and banks with lower capital tend to moderate their capital at a low rate.

Ebrahimi-Zadeh, (2017) showed that the relationship between capital and banking system risk was negative, since more capital reduced the risk in the banking network. It is worth noting that risk and bank capital have been linked to national economic conditions in some other studies such as Van Roy (2008).

4. Model and Data

This section describes a multiple regression analysis carried out to analyse the role of banking crisis in the effect of Income diversity on risk of banking industry using panel econometric method (EGLS).

$$\begin{aligned}
 Risk_{it} &= \beta_0 + \beta_1 c - str + \beta_2 LogA_{it} + \beta_3 \left(\frac{E}{A}\right)_{it} + \beta_4 \left(\frac{Loans}{Assets}\right)_{it} + \beta_5 Eff_{it} + \beta_6 Lerner_{it} \\
 &+ \beta_7 Crisis_{it} + \beta_8 c - str_{it} * Crisis + \beta_9 LogA_{it} * Crisis + \beta_{10} \left(\frac{E}{A}\right)_{it} * Crisis \\
 &+ \beta_{11} \left(\frac{Loans}{Assets}\right)_{it} * Crisis + \beta_{12} Eff_{it} * Crisis + \beta_{13} Lerner_{it} * Crisis + \lambda_i + \phi_t \\
 &+ \epsilon_{it}
 \end{aligned} \tag{1}$$

Where $Risk_{it}$ indicates the risk of bank i in year t that is measured with the logarithmic ZSCORE index, and the remainder of the variables are determinants of risk. In the case of the equation explaining the risk, the explanatory variables are introduced with a time lag of one period (i.e., rather than belonging to period t , they belong to period $t-1$), as it is reasonable to assume that the influence is not immediate, but operates with a certain time lag. ϵ_{it} is disruption component, ϕ_t is time effects and λ_i is fixed effects. There are also independent variables used in this study: $c-str$ indicates income diversity (income structure), which is derived from the ratio of non-interest income to total net income; $\left(\frac{Loans}{Assets}\right)_{it}$ is the ratio of total facilities granted by banks to total assets, $\left(\frac{E}{A}\right)_{it}$ is the ratio of equity to total assets, Eff_{it} is efficiency derived from the ratio of Bank revenues to operating costs $Lerner_{it}$. The Lerner index is used to calculate the degree of concentration, $Crisis$ is the variable of the banking crisis which is obtained through the method of the market tension indicator. Also, by multiplying each

variable in the banking crisis, the effect of the banking crisis on that variable can be calculated.

The panel data was used to assess the models. The main advantages of panel data are as follows: It allows designing complex patterns. It provides more possibilities for identifying and measuring effects. It can also control the individual effects of cross-sections that are not visible. It enables the researcher to consider the relationship between variables and even individual units, or cross-sections over time. Therefore, the wider diversity and lower linearity between variables would be more efficient.

The main purpose of this paper is to examine the role of banking crisis in the effect of income structure on the banking industry risk. The sample consisted of the annual data of Iranian banks including Eghtesad Novin, Parsian, Pasargad, Tejarat, Sina, Saderat, Karafarin, Mellat during the years 2005-2018. These audited data were derived from reports given to banks by the central bank.

In this paper, the logarithm of capital adequacy ratio has been used to assess bank risk. The Lerner index has been used to assess the extent of bank concentration. The Lerner index, which is derived from non-structural models, was proposed by Alba Lerner in 1934. In his theory, he asserted that the Lerner index could be used to determine a firm's power of setting price at a level beyond the marginal cost and to examine the market power. The technical relation of the Lerner Competitiveness Index is as follows (Lerner, 1934).

$$L = \frac{P - MC}{P} = -\frac{1}{ed}, \quad ed < 0 \quad (2)$$

$$Ed = -\frac{dq}{dp} \cdot \frac{p}{q} \quad (3)$$

where L is the Lerner index, P is product price, MC is marginal cost, Ed is product demand stretch and q is the amount of product demand. The value of Lerner index is between 0 and 1 with values close to 1 indicating greater monopoly status (less competition) and more market power. On the other hand, Lerner values close to zero reveals that firms are not able to create a gap between price and marginal cost and determine a product price at a level

higher than the marginal cost, so that the firm operates in a market with low competition. (Khodadad kasha, 2000).

5. Analysis of results

5-1. stationary analysis of variables

Using conventional econometric methods in estimating the coefficients is based on the assumption that the variables of the model are stable. If there are unstable variables, T and F statistics may not be reliable. To ensure the stability of variables, the unit root test of the panel data was used. According to the null hypothesis of this study, that variable in the question is unstable.

If the variable is unstable, the model will have false regression (Baltaji, 2006). However, it is necessary to use one of the following five methods to test the unit root test of the panel: 1- Levin-Lin-Chu's test; 2- Im, Pesaran and Shin's test; 3 - Brtvng test; 4-Fisher's test and 5- Hadri Test.

The results of the tests indicated that all variables were stable, except for the variable of the logarithm of total assets and efficiency, which became stable after one differencing. To study the stability of variables, we used the Levin-Lin-Chu's test (the key test), Im, Pesaran and Shin's tests, and Fisher's test. Table 1 shows the unit root test results for the research variables at the level and first order difference.

Table (1): Results of stability test of the variables

PP	ADF	IPS	LLC	Variables:
15.33	14.73	-	-1.85	LOG Zscore
(0.50)	(0.54)	-	(0.03)	
I0}{	I0}{		I0}	
41.51	30.64	-1.24	-4.20	STR
(0.0005)	(0.01)	(0.1066)	(0.00)	
I0}{	I0}{	I1}{	I0}{	
66.69	38.05	-1.95	-4.08	LOG Assets
(0.00)	(0.0015)	(0.0256)	(0.00)	
I1}{	I1}{	I1}{	I1}{	
35.56	34.98	-1.88	-3.62	Loans/Assets
(0.0033)	(0.0040)	(0.0298)	(0.0001)	
I0}{	I0}{	I0}{	I0}{	
66.39	32.02	-2.33	-1.84	Equity/Asset
(0.00)	(0.0097)	(0.0097)	(0.0326)	
I0}{	I0}{	I0}{	I0}{	
90.03	28.87	-0.5219	-9.15	Efficiency
(0.00)	(0.0248)	(0.3008)	(0.00)	
I1}{	I1}{	I1}{	I1}{	
27.41	15.78	-0.11	-2.24	Lerner
(0.0371)	(0.4678)	(0.4553)	(0.01)	
I0}{	I0}{	I0}{	I0}{	
101.239	44.25	-3.64	-7.11	Crisis
(0.00)	(0.0002)	(0.001)	(0.001)	
}I0{	}I0{	}I0{	}I0{	

Source: Researcher findings

5-2. Cointegration tests

In the next step, using a panel co-integration test, the long-term economic relationships are examined. The main idea behind the co-integration test is that although most economic time series are unstable (contain random trend, the linear combination of these variables in the long run may be stable. Co-integration test helps testing and assessing these long-term relationships (Bahrami et al., 2013). Kao (1998) suggested the ADF unit root test as the test of null hypothesis for non-convergence. The null hypothesis regarding the non-co-integration of variables is rejected by the Kao test, and variables will become co-integrated based on this test in the long term. The results are placed at the bottom of Table 2.

Table 2 shows the results of estimating the mediating role of banking crisis on the effect of income structure on risk in the banking industry during the period of 2005-2018 using logarithmic ZSCORE index .It is worth noting that to assess test model, F-Lemmer was conducted and after ensuring that the model was panelized, the Hausman test was used to determine fixed and random effects. The results are presented in the following table.

Table (2): The determinants of bank risk in Iran during the period 2005-2018.

Variables	RISK(1)	RISK(2)	RISK(3)	RISK(4)	RISK(5)	RISK(6)	RISK(7)
STR	-0.018 (-1.50)	-0.007 (-0.69)	-0.018 (-1.48)	-0.018 (-1.50)	-0.014 (1.041)	-0.020*** (-2.68)	-0.017 (-1.44)
Log Assets	- 0.328** (-2.10)	-0.33** (-1.99)	-0.316** (-2.034)	-0.33** (-2.12)	-0.3197* (1.90)	-0.2179* (-1.72)	-0.33** (2.04)
Loans/Assets	-0.027 (0.045)	-0.14 (-0.283)	-0.004 (-0.007)	-0.075 (-0.128)	-0.0808 (-0.151)	0.147 (0.2489)	-0.080 -0.130
Equity/Assets	7.74*** (3.88)	8.34*** (3.94)	7.800*** (3.94)	7.68*** (3.73)	7.642*** (3.66)	7.247*** (4.61)	7.65*** (3.72)
Efficiency	0.02* (1.81)	0.02 (1.32)	0.025* (1.79)	0.024* (1.80)	0.0198 (1.23)	**0.0347 (4.403)	0.02* (1.73)
Lerner	0.68 (1.50)	0.8240* (1.70)	0.69 (1.51)	0.7107 (1.54)	0.7290 (1.55)	0.5724 (1.32)	0.74 (1.62)
Crisis	-0.0526 *** (-5.30)						
Str* Crisis		0.012 (1.55)					
LogAssets* Crisis			0.009 *** (-5.75)				
Loans/Assets* Crisis				-0.075 *** (-3.86)			
Equity/Assets* Crisis					-0.4914 *** (-3.59)		
Efficiency* Crisis						-0.01*** (-7.905)	
Lerner* Crisis							0.06*** (-3.65)
R2	0.52	0.75	0.69	0.80	0.88	0.74	0.65
R2 adj	0.48	0.62	0.57	0.86	0.86	0.82	0.57
F	38.68	32.96	44.45	31.86	34.74	63.75	44.95
Hasman-Test	FE	FE	FE	FE	FE	FE	FE
Kao	-2.86	-3.09	-3.07	-2.82	-2.88	-3.64	-2.87
D-W	1.70	1.69	1.69	1.70	1.68	1.72	1.70

Source: Researcher findings

*Significant at 10% ** significant at 5% and *** significant at 1%

The income diversification index shows that banks, in addition to revenues generated from facilities, are active in other fields and earn as much money. If the difference between income from facilities and other earnings is lower, it means that the bank can earn good income from other activities. If the value of the income diversification index is larger, the income diversity of the bank is higher, and it can be said that if banks can operate in areas other than their main activities, they can decrease their financial vulnerability index by increasing their incomes and increase their stability and thus reduce their risk (Mirbageri Hir et al., 1395).

According to the literature and studies such as De Young and Roland (2001), Stiroh and Rumble (2006) and Lee et al. (2014), non-interest incomes are expected to have a positive effect on risk. In this study, both under normal conditions (no crisis) and during banking crisis, the income diversity index has no significant effect on risk. However, the income diversification policy is used to reduce bank risk.

The relationship between capital and risk taking is one of the major issues in the banking industry. The standards recommended by the Basel Committee suggest that greater capital increases bank security against risks. On the other hand, it may urge banks to take higher risk, if this effect is greater than that of the capital protection so that banks with greater capital may be more likely to fail (Ghosh, 2014). Some studies such as Koehn and Santomero (1980); Blum (1999); Hovakimian and Kan; (2000); Lin, Penm, Gong & Chang (2005) and Ghosh (2014) have confirmed the positive relationship between capital and bank risk.

However, researchers such as Ahmad et al. (2009); Behr et al. (2010); Mirzaei, Moore & Liu (2013) and Ebrahimi Zadeh, (2017) showed that the relationship between capital and bank risk was negative with more capital leading to lower risk in the banking network. It is worth noting that risk and bank capital have been linked to national economic conditions in some other studies such as Van Roy (2008). Demirkguc-Kunt et al. (2013) investigated the relationship between capital structure and stock returns, showing that during a financial crisis, capital was more important, especially to large banks. This capital advantage is an important asset during the crisis, as the capital

prevents most banks from further risk taking (greater capital protects you against major shocks).

In this research, there was a positive and significant relationship between capital adequacy index and bank risk under normal (crisis) conditions. However, during the crisis, there was a negative and statistically significant relationship between capital adequacy ratio and bank risk. Theoretically, by increasing the ratio of capital adequacy, the bank's coverage will be higher against existing risks. In the context of the banking crisis, banks should increase their capital adequacy ratio to reduce risk. Of course, banks may be encouraged to take more risk in their portfolios by increasing credit and facilities and reducing their ratio in the hope of maximizing expected returns and increasing bank revenues. Although a bank with higher capital adequacy ratios is more vulnerable to economic crises and risks, it also reduces the bank's ability to utilize capital and pay more facilities to increase profitability.

The results of model estimation show that bank size factor has a negative and significant effect on bank stability in normal conditions. Also, in crisis situations, the size of the bank is estimated to be negative and significant on the stability of the bank. In times of crisis, smaller banks are more profitable. It indicated that larger banks are more complex and thus it would be difficult to monitor their risk, which in turn increases risk.

The variable coefficient of the ratio of facilities to assets in crisis conditions has had a negative and significant effect on bank stability. This means that, in a critical condition, the bank should have more liquidity in its reserves to respond to customers and maintain its position in dealing with the banking crisis.

The connection between banking concentration and banking stability in the ordinary sense is meaningless. But in times of crisis, the index of concentration on banking stability has had a negative and significant effect. Because in times of crisis, competition to keep its position and bankruptcy in crisis is more important for the banking system than maintaining market share and monopoly power.

One of the evidence of the crisis in the banking system is the high volume of deferred bank claims. Although part of these claims is due to government

debt to banks, most of these claims are due to the lack of proper crediting and also direct investment by banks with popular deposits in risky projects such as the construction of massive construction projects in a recession. Unfortunately, due to the strong reliance of banks on property surety, with the deepening recession in the estate market, banks are not able to fully recover their claims through the sale of real estate.

In this research, the variable of the banking crisis has had a negative and significant effect on banking stability and this effect is economically justified. Because with the increase in the volume of doubtful claims, a large part of the bank's assets is inaccessible and undermines the operation of the banking industry. The effect of the variables of banking efficiency in the normal situation is estimated to be positive and significant on bank stability and has a negative and significant effect on banking stability in the context of the banking crisis. This means that in case of crisis, operating costs are not properly managed.

6. Conclusions and Policy Recommendations

Since the 1980s, developed and developing countries have experienced severe banking crises, and policymakers have used various types of interventions in response to the banking crisis. The study of the conditions governing the banking industry in Iran, and its comparison with the situation of the countries which have had the same experience, indicates that the Iranian economy is experiencing a banking crisis. But since there are government-owned banks, there has not observed a clear crisis in the economy. On the other hand, based on the theoretical foundations, income diversification is a risk reduction strategy, which has recently been adopted by some banks. This strategy has succeeded in some cases, but sometimes it has increased the banking risk.

Accordingly, the present paper studied the role of the banking crisis and the effect of the income structure on the banking industry risk in Iran. The study was conducted by using financial statements of 8 banks active in Tehran Stock Exchange over the period 2005–2018.

Results indicated that there was not a significant relationship between the index of income imbalances during the crisis and the banking system stability

in Iran. The banking system degree of concentration during the crisis has a negative significant effect on its stability. Moreover, efficiency has a negative significant effect on the banking industry stability during the crisis. In addition, results indicated that there was a negative significant relationship between the ratio of concessional facilities to the total banking system assets and the banking system stability during the crisis. Moreover, there is a negative significant relationship between equity ratio to the total assets (capital adequacy index) and the banking system stability during the above mentioned period. There is also a negative significant relationship between the bank size and banking system stability during the crisis.

Based on the results, the following suggestions could be made to improve the performance of the banking industry in Iran during the banking crisis:

1) Given the impact of the amount of deferred claims on liquidity problems, financial crises and bank failures, banks are recommended to grant investment funds to banks only after validating their customers and imposing more stringent obligations on bail.

2) Due to the positive relationship between the bank size and the banking system risk during the crisis (negative correlation with banking system stability), the Iranian banking system cannot benefit from the scale-based savings and, thus, it is required to conduct asset management policies and reduce the risk by expanding the banks' assets.

5) Given the impact of the deferred claims amount on liquidity problems, financial crisis and banking system failures, it is recommended that banks, after validating customers and imposing more stringent obligations on bail, give them access to facilities.

3) The positive relationship between the ratio of capital adequacy and risk (negative correlation with the banking system stability) suggests that the above mentioned ratio is not at the appropriate level to cover the banking system risks and maintain its stability. Therefore, the central bank should pay close attention to the risk capital adequacy ratio of the banks in view of the risks in the country's economic system.

4) The positive effect of the Lerner index on the banking system risk during the crisis indicates that with increasing concentration and reducing banking

competition, the risk in the whole banking industry will increase. Thus, creating a competitive environment between banks can increase the financial sustainability.

5) Considering the positive significant relationship between the banks' granting and the risk facilities during the crisis, the government should adopt the banking system policies, and do not increase the risk of lending, regardless of the borrowers' financial ability.

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