

# Dynamics of banking soundness based on CAMELS rating system

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## ABSTRACT

The banking system is one of the most important economic sectors in Iran that has the most relation with the country's macroeconomics; therefore, any kind of volatility and instability in it can influence the country's macroeconomics. Therefore, assessing the performance of the country's banking industry and analyzing the bank soundness is essential. One of the most conventional methods to analyze and evaluate the bank soundness is using the CAMELS rating system which consists of six dimensions to measure the performance of the bank. Each of these dimensions has many components, and together with the variables that influence them and the interactions between them constitute a complex economic and monetary system. In this study, using the qualitative system dynamics approach, a systemic analysis of the structure of this issue is provided. The results show that the factors, Capital Adequacy, Quality Management and Asset Quality are the most important issues of Iranian banks in banking soundness management, and developing these three factors is the way out of the problems.

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## I. INTRODUCTION

The banking system is one of the most important economic sectors in Iran that has the most relation with the country's macroeconomics; therefore, any kind of volatility and instability in it can influence the country's macroeconomics. Therefore, assessing the performance of the country's banking industry and analyzing the banking soundness is essential. Bank for International Settlements believes that the indicator of banking soundness can identify major vulnerabilities of the bank's system and explain the reasons involved. In addition, as a general criterion in identifying the troubled banks, these indicators can alert the banking regulatory authorities. On the other hand, these criteria can be applied individually or in the form of homogeneous banking groups, and it is of special significance in bank ranking (Hilbers, Leone, Gill, & Evens, 2000). In both developing and developed countries, banks contribute to economic growth by their important part in financial intermediation. There is a strong relation between the financial sector and economic growth (Ulas & Keskin, 2015). The growth and financial stability of the country depends on the financial soundness of its banking sector (Altan, Yusufazari, & Bedük, 2014). In many developing countries, the important reasons for financial reforms, have been the need to establish a modern and sound financial sector to act as the "backbone of the economy" and allocating the economy savings in the most productive manner among different potential investments, (Keovongvichith, 2012). In order to ensure the banking soundness and sustainability, banks should be analyzed and assessed, the needed

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reforms be carried out, and the potential banking damages be eliminated. Monitoring can be performed in two forms; On-Site Monitoring and Off-Site Monitoring. In On-Site Monitoring, the aim is to evaluate the management quality and the banks' internal control system and their compliance with laws and regulations. Off-Site Monitoring concentrates on the general published information such as annual and interim reports, and its objective is identifying the soundness of the banking system. On-Site Monitoring has higher accuracy and reliability whereas Off-Site Monitoring has a high repeatability (Vilén, 2010). If there is a correct assessment within the bank, according to the published financial statements, Off-Site Monitoring can also be of high accuracy (Cole & Gunther, 1995). CAMELS rating system is one of the common criteria in measuring the banking soundness and in this study, using a systemic approach, the causal relations between the components of this rating system is identified, and the important feedback loops of this dynamic system is represented, also ways for improvement will be presented according to the acquired knowledge of how the system's variables interact.

## **II. LITERATURE AND BACKGROUND**

In this way, one of the most popular methods for the analysis and evaluation of the banking soundness is represented by the CAMELS framework. This framework, firstly known as CAMEL, was created in 1979 in USA by the bank regulatory agencies, and its use has been extended since then, being considered a useful tool for the regulatory authorities from different countries in order to assess the soundness of financial institutions (Roman & Şargu, 2013). CAMELS consists of five components; Capital adequacy, Asset quality, Management quality, Earnings and Liquidity (Wirnkar & Tanko, 2008). In fact, U.S. regulators recognized that the current global competitive markets had not been adequately factored into CAMEL and, in 1997, added a sixth factor designed to capture systemic risk. This systemic component, S, attempts to capture banks' sensitivity to market factors that include interest rate, foreign exchange and price risk (Gasbarro, Sadguna, & Zumwalt, 2002). The most common way to measure the financial performance and quality management of the banks is examination of financial ratios and their comparison with the benchmarks (Mihailović, Bulajić, & Savić, 2009). Each component of this rating is calculated on a 1 to 5 scale, being accumulated into a composite evaluation, also defined by the 1 to 5 scale (Rozzani & Rahman, 2013).

Capital adequacy (C) is one of the most important indicators for the financial soundness of the banking sector because it guarantees the capacity of this sector to absorb the eventual losses generated by the manifestation of certain risks or certain significant macroeconomic imbalances (Roman & Şargu, 2013). Asset quality (A) is an important parameter to examine the degree of financial strength. The maintenance of asset quality is a fundamental feature of banking. The prime motto behind measuring the asset quality is to ascertain the component of nonperforming assets as a percentage of the total assets (Altan et al., 2014). Management Quality (M) is not just dependent on the current financial performance. This component consists of a large range of issues such as the education level and expertise of the management. Thus, it is the hardest

one to measure when compared to others (Dincer, Gencer, Orhan, & Sahinbas, 2011). Strong Earnings (E) and profitability profile of a bank reflect its ability to support present and future operations. More specifically, this determines the capacity to absorb losses by building an adequate capital base, finance its expansion and pay adequate dividends to its shareholders (Nimalathan, 2008). Liquidity (L) management in banks has assumed prime importance due to competitive pressure and the easy flow of foreign capital in the domestic markets. The impact of liquidity crisis in the banks can adversely impact the financial performance of the banks (Kumar, Harsha, Anand, & Dhruva, 2012). Commercial banks are increasingly involved in diversified operations such as lending and borrowing, transaction in foreign exchange, selling off assets pledged for securities and so on. All these are subject to market risk like interest rate risk, foreign exchange rate risk, and financial asset and commodity price risk (Baral, 2005). The system's methodology of the present issue is using the system's approach and tools available in system dynamics approach. System dynamics is a powerful solution that simulates a system using computational approaches and allows to study the issues and explain the behavior of complex systems (Sterman, 2000). System dynamics is a simulation-based approach to gain helpful insight into the dynamic complexity of the system (Ahmadvand, Varandi, Bastan, & Yahyaei, 2014). After specifying the system and the included elements, we consider their change over time and determine feedbacks between the elements present in the system (Abbasi, Bastan & Ahmadvand, 2016). When an element of the system is indirectly influenced by itself, it forms a causal or feedback loop (Kirkwood, 1998) . In fact, the efficiency of dynamic modeling of the system is understanding and presenting the feedbacks procedure (Sterman, 2000). Causal-Loop Diagram is one of the important tools to show the feedback structure in the systems (Bastan, Abdollahi, & Shokoufi, 2013).

The first studies undertaken on the subject of banks performance appeared in the late 1980s and the early 1990s, employing one of the two model types: the Market Power (M) model or the Efficiency Structure (E) model (Zouari, 2010). A popular framework used by regulators is the CAMELS framework, which uses some financial ratios to help evaluate a bank's performance (Barker & Holdsworth, 1993). In Bangladesh, they examined the CAMEL model for regulation and supervision of Islamic banks by the central bank. This study enabled the regulators and supervisors to get a Shariah benchmark to supervise and inspect Islamic banks and Islamic financial institutions from an Islamic perspective (Sarker, 2005). They examined the performance of Private Commercial of Bangladesh banks using the CAMEL Model. The author concluded that the central banks of all around the world have improved their supervision quality and techniques (Kabir & Dey, 2012). They analyzed the performance of State Bank Group through the help of the CAMEL model in Bangladesh. They found that though ranking of ratios is different for different banks in the State Bank group (Mishra, 2012). In recent years, one of the most used models for the estimation of a bank performance and soundness has been represented by the CAMELS framework (Baral, 2005). This system is used also as a bank supervision instrument by the regulatory authorities (Hays, De Lurgio, & Gilbert Jr, 2009). Evaluating the CAMELS ratios from 1950 to 1990, they addressed banking soundness and the

result shows that these ratios have the ability to predict the banking soundness (Barr, Seiford, & Siems, 1994). An important problem encountered in product or process design is setting the process variables to meet a required specification of quality characteristics (Salmasnia, Bastan, & Moeini, 2012). Many researches have been done on issues of service organizations such as banks (Tabandeh & Bastan, 2014),(Akbarpour, Bastan, Mohammad Hosseini, & Akbarpour, 2014),(Mokhtari, Salmasnia, & Bastan, 2012) and (Salmasnia, Bastan, & Moeini, 2012). Also using system dynamics approach for same problem modeling is common (Ahmadvand, Varandi, Bastan, & Yahyaei, 2014), (Ahmadvand, Bastan,Nasiri, 2013), ( Ghanei, Ahmadvand, Bastan, 2013), (Bastan, Abdollahi, & Shokoufi, 2013), (Bastan & Ghoreishi, 2016), ( Khoshneshin and Bastan, 2013), (Abbasi, Bastan, & Ahmadvand, 2016), (Bastan, Mosaed and Kashef, 2013). In this study, it is attempted to examine all of the factors influencing the system's banking soundness using a systemic, integrated and holistic approach, whereas other conventional methods in analyzing this issue mostly have an island and static approach to the issue of banking soundness; hence benefiting from a holistic and dynamic approach in the analysis of this issue is its most important innovative aspect.

### **III.MODELING**

Given the key role of the banks as one of the most important financial and economic pillars of Iran, assessing the performance in this financial institution of decision-makers of economic field of the country and the country's central bank is of special importance. The soundness of the banks in terms of evaluating the performance can provide a clear perspective for all the stakeholders and decision-makers of the bank's status compared to organizations with similar activities. Although Iranian banks have used the CAMELS indicator to assess the soundness of their banks and this use is even emphasized as imperative from the country's Central Bank as the regulating and supervising of the country's banking network, none of the country's banks has had the necessary soundness and stability and lack the necessary standards at the international level in the field of banking soundness. Therefore, considering the ambiguity in the issue, the aim of this study is to discover and represent the interrelations of the issue's variables in order to increase the system of banking soundness. In the following figure, you can see a rich illustration of the system of the banking soundness based on the CAMELS rating system.

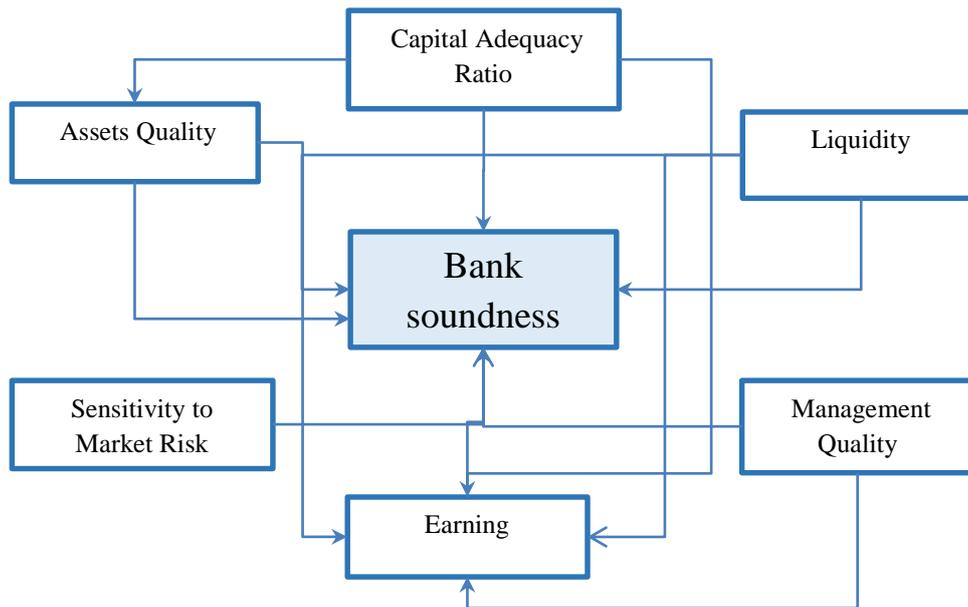


Figure 1- Subsystems of the problem structure

As mentioned above, the system of banking soundness is measured on the basis of the CAMELS indicator, hence the liquidity and profitability are inversely correlated, and the higher the sensitivity to market risk the lower the banking soundness. As the profitability and asset quality and capital adequacy increase, the banking soundness increases, also as the liquidity and quality management decreases, the profitability decreases and it has an adverse effect on the banking soundness.

Based on the CAMELS dimensions and components and the theories of banking specialists in this area, dynamics that have occurred in the soundness of the banks can be explained in the form of the following dynamic hypothesis term.

The first indicator to examine is capital adequacy. Evaluating the components of capital adequacy in different banks indicate that in most banks faced with capital increase leads to the reduction of the Return on Capital and asset quality, and as a result, the earning decreases. Increased capital adequacy has a positive effect on banking soundness but reduced earning has a negative impact on banking soundness. Although decreased risk weight asset can improve the indicator of capital adequacy as one of the indicators of banking soundness, decreased earnings will be the result, which will have a negative effect on banking soundness; therefore, the eventual effect of changes in capital adequacy on the banking soundness depends on the changes of factors influencing capital adequacy. The second indicator is asset quality. Increase in non-current receivables and outstanding facility leads to decreased asset quality, and also an increase in non-current receivables leads to reduced profit margins and earning and the banking soundness will face difficulty. Banks that increase their facility are faced with increased asset quality and earning assets ratio. In case of increased investment in banks, it is associated with an increase in the earning asset ratio and asset quality, also investments result in reduced profit margins and the banking soundness. If a bank increases its asset, it will face a decrease in the earning asset ratio and asset quality. The third indicator is the management quality. This is usually performed through qualitative evaluation and assessing the management systems, corporate culture, control mechanisms and others. The higher the total deposit the higher the efficiency of the bank, which leads to increased management quality. The number of a bank's branches is inversely correlated with efficiency, and as it increases, the efficiency decreases,

but as the number of the branches increases, the efficiency increases which causes enhanced quality management. The banks that experience earning have an increased management quality. One of the expenses that banks pay is the staff costs and as it decreases, the productivity increases which results in improved management quality. Facilities influence the bank's efficiency and the efficiency influences the banking soundness. The fourth indicator is earning. The banks that have experienced decreased returns on assets and return on capital have an increased risk in the face of difficulties, which will have a negative effect on the banking soundness. Increase in non-current receivables reduces the profit margins. In other words, low asset quality in banks has decreased their earning. Since asset quality and earning indicators are among the indicators of banking soundness, a reduction in both indicators can have a negative effect on banking soundness. As the total income increases and the bank's share from the interest income, operating margin and profit margin increases, which lead to improved earnings. Furthermore, increased interest income will lead to banking soundness and earning. In other words, banks that have been able to have better performance according to the indicators of banking soundness have been more successful in profit making. The fifth indicator is the liquidity. Banks that have been faced with reduced corporate bonds, non-current receivables, cash in hand and stable deposits have a reduced liquidity, which will eventually have a negative effect on the banking soundness. The shift of the banks from investment deposit to deposit run-offs leads to reduced liquidity, which has a negative impact on the banking soundness. As the liabilities of a bank increases, the liquidity decreases, which leads to the banking soundness. In addition, the liquidity is inversely correlated with earning; therefore, financial institutions should establish an appropriate balance between liquidity and earning. The sixth indicator is Sensitivity to Risk Market. Predominantly, as the bank's currency incomes increases, the sensitivity to market risk decreases, which will have positively effect on the banking soundness. As the assets, investments and interest income increase, and the receivables, loans, currency capital and total assets decrease, sensitivity to market increases and the banking soundness decreases. A schematic expression of the formulated dynamic hypotheses in the form of causal diagram is shown in the following figure.

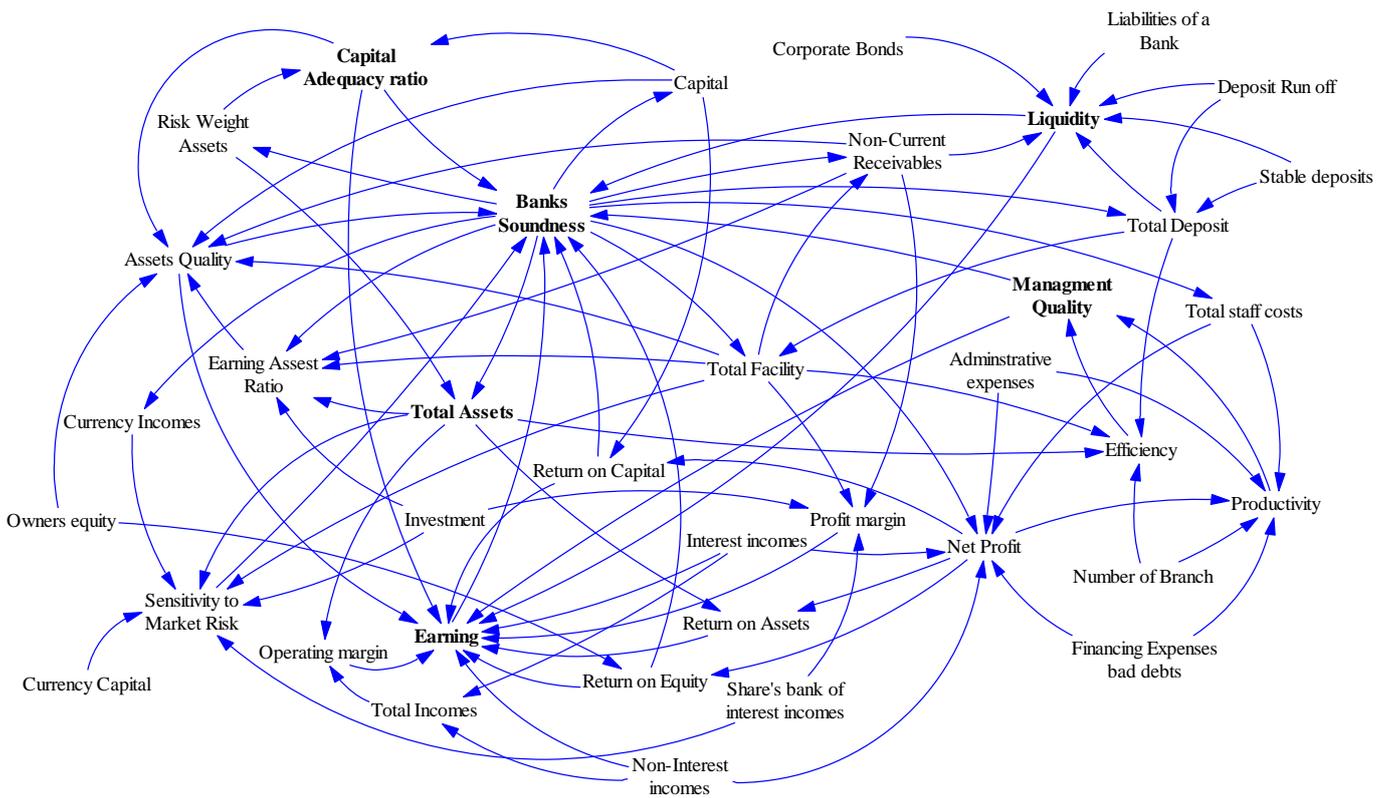


Figure 2. Causal Loop Diagram

As you can see in the causal diagram of the system, the causal structure of the issue is a very complex and intertwined structure, and in order to better understand the structure of the system, it is essential to separately analyze a number of the main feedback loops of the issue. The first loop is related to the loop of the liquidity component. As you can see in Figure 3, in loop B1, an increase in total deposits will cause an increase in the bank facilities and bank facilities causes an increase in receivables, which results in reduced liquidity; lack of the necessary liquidity in banks endangers the banking soundness and in order to improve the banking, it is necessary to attract deposits soundness in loop R2; attracting deposits increases liquidity and banking soundness. In loop R1, increased non-current receivables lead to decreased liquidity and banking soundness.

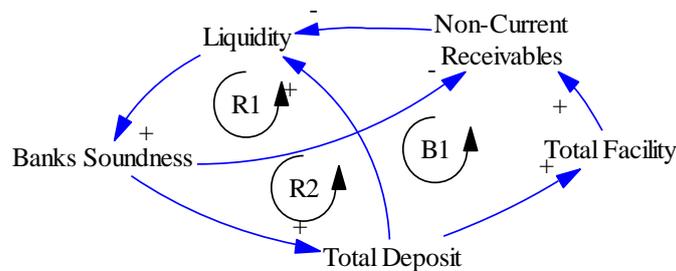


Figure 2- Liquidity effect loops on banking soundness

In loop B2, as the currency income increases, the market sensitivity increases, which leads to decreased the banking soundness. In loop R3, as the total assets increase, market sensitivity decreases, which leads to improved banking soundness. In loop R4, increased bank facilities result in decreased sensitivity to market risk and increased banking soundness.

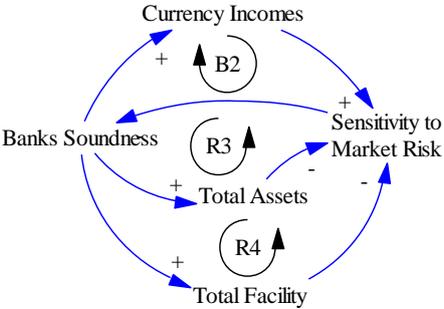


Figure 4- Sensitivity to Market Risk effect loops on banking soundness

In loop R5, as the net profit increases, ROE will increase, which result in increased earning and banking soundness. In loop R6, increased net profit leads to increased return on capital ratio and banking soundness. In loop R7, as the receivables increase, profit margin decreases. This leads to decreased earning and soundness of the bank. In loop R8, as the ROA increases, the earning and banking soundness increases. In loop B3, as total assets increase, ROA decreases, which result in reduced earnings.

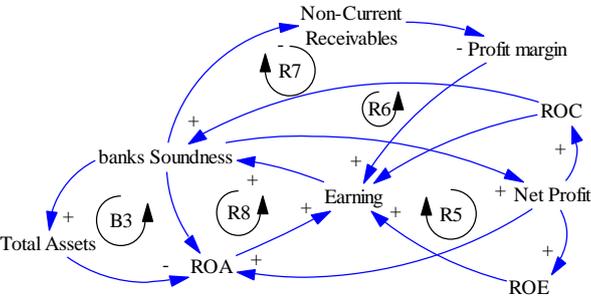


Figure 5- Earning effect loops on banking soundness

In loop R9, as the capital increases, the capital adequacy ratio increases, which result in improved banking soundness, but in loop B4, as the risk weight assets increase, the capital adequacy ratio decreases and the banking soundness decreases.

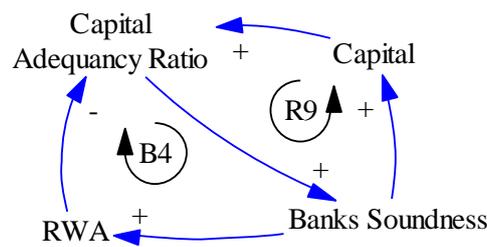


Figure 6- Capital Adequacy Ratio effect loops on banking soundness

In loops R10 and R11, as the total deposits and net profit increases, the efficiency and productivity increase, which results in improved quality management and banking soundness but in loops B5 and B6, an increase in the total facility and staff costs leads to decreased efficiency and productivity of the bank, which results in decreased quality management and banking soundness.

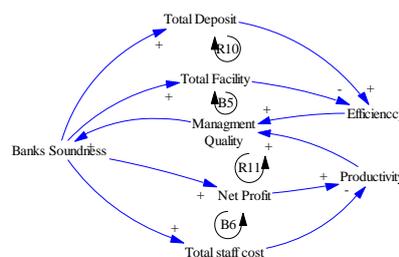


Figure 7- Management Quality effect loops on banking soundness

In loop B7, increased facilities lead to decreased asset quality and increased banking soundness. In loop B8, increased non-current receivables lead to decreased asset quality. Increased asset quality results in increased banking soundness and total facility, and as a result, non-current receivables increase. One of the most important factors in decreasing asset quality is the increased receivables, which leads to decreased profit margins, earning and banking soundness, which endangers the banking soundness. As the facilities increase, the asset quality decreases and as the earning asset ratio decreases, the asset quality and banking soundness decrease. In the loop R12, increased receivables lead to decreased assets, and increased banking soundness leads to decreased Non-Current Receivables. In loop R13, increased earning asset ratio leads to increased asset quality and in banking soundness. This leads to increased total facility and as a result, increased earning asset ratio.

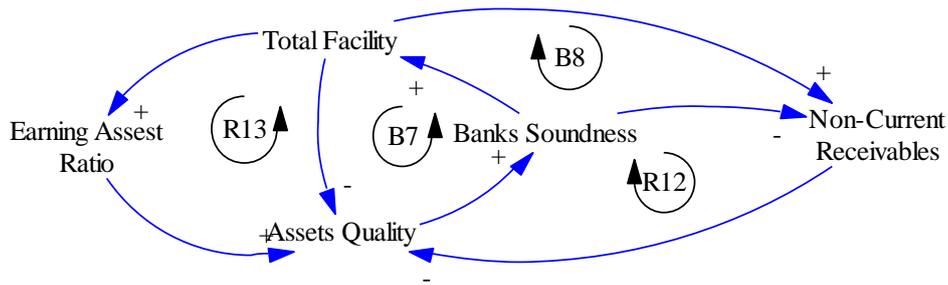


Figure 8- Asset quality effect loops on banking soundness

#### IV. CONCLUSION AND RESULTS

The soundness of the banks in terms of performance is a desirable and appropriate action, which can promote qualitative and quantitative of the banks in the prevailing competitive atmosphere and eventually leads to the country's economic growth and prosperity. Studies show that performing this has a long-standing history in the world's banking, and important and well-known specialized agencies have been established for this, but so far, at Iranian banking system, the issue of the banks' soundness has not been looked at in an integrated and systemic way as a necessity. In this regard, given the issue's importance, developing a desirable mechanism and appropriate model for country's banking indicators could be the beginning of a new movement in this area and it results in improved efficiency of the banking system. In order to achieve the objectives of the project, evaluating the performance of banks should not be considered solely from the financial aspects, but it is necessary to precisely and holistically evaluate the banks' performance from all the aspects (financial or non-financial) and through determining precise quality and quantity indicators. Due to the fact that most of CAMELS indicators' weight is respectively 25% management quality, 20% asset quality, 20% capital adequacy, 15% incomes, 10% liquidity, 10% sensitivity to risk market, the strengths as well as vulnerabilities of the bank are management quality, capital adequacy and finally asset quality; and through planning to improve these, the banking soundness increases.

In this paper, a systemic model illustrating the dynamics of the banking soundness for Iranian banks is presented. This systemic model has 86 feedback loops and considering its most important loops, we can say that studying the efficiency and effectiveness of the resources, income growth to its maximum level, costs reduction and facilitation in the use of the banks' efficiency should be further emphasized. Observing the management quality is among the factors influencing the earning of the banks; therefore, the banks should pay attention to improving management quality and have a formulated program to control the bank's costs. In addition, due to the fact that the bank's capital is feasible through changes in the numerator and denominator, hence banks can choose different approaches due to different economic conditions. In the current conditions in Iran, a reduction in granted credit leads to decreased

production finance and thereby economic growth. Therefore, in this condition, reduced granted credit is not recommended; rather the best option for the banks is capital increase due to the fact that asset quality in the banks is low. Therefore, as the banks' capital increases, their capital adequacy ratio improves, and as this ratio increases, lending power and providing facilities for clients in the bank increase. The most effective agent in the management of capital adequacy is to have a management information system so that this system provides its management with all the information related to a client in all areas as soon as possible.

Due to the fact that receivables have the most important role in asset quality, it is better that the country's lawmakers support the absence of impunity for overdue receivables, no further installment of the debts of debtors of the banking network. In order to reduce the receivables to the country's banking network, it is recommended to precisely investigate the borrowers' financial power. In other words, identifying clients are among the most important factors influencing the reduction of receivables.

This study addressed modeling a systemic model for banking soundness with a qualitative system dynamics approach, and for future studies, we recommend the researchers to formulate the quantitative system dynamics models of the issue considering the large number of variables and their mathematical relations.

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