



Surveying Effective factors for Outstanding Bank and Present Solutions for decreasing that by system dynamics (Case study: Mellat bank in west Azarbaijan)

Bafandeh Zende Alireza, Paseban Mohammad and Cheshmikhani Roya

¹Department of industrial Management, Tabriz branch, Islamic Azad University, Tabriz, IRAN

Available online at: www.isca.in

Received 4th April 2013, revised 17th May 2013, accepted 19th June 2013

Abstract

In recent years, the growing volume of deferred loans, and consequently, the blockage of a considerable amount of bank resources, has led to a decrease in the circulation of the resources and made impossible accurate and exact planning for optimal use of them. Resolving this problem (i.e., decreasing the deferred loans and increasing the speed of circulation of resources) is one of the most important challenges of the banking system. The main purpose of the present study is to identify the causes of deferred loans and to introduce ways of reducing them, using the system dynamics. The study is of basic-applied type. The managers of Mellat Banks across the West Azarbaijan province constitute the population of the study. In order to obtain the effective variables, all the managers were interviewed, and the variables which were of little effect were identified and excluded using t-test. After the effective variables had been identified, the cause-effect and flow-stack diagrams were drawn, and the behavior of the model was compared with real data which were available for the past 5 years. After successful examination of the model, a simulation was carried out for the following year and, by changing the amount of each variable, the best scenario was selected. The factors under the control of Mellat Bank as well as those available to the Central Bank were identified as the most effective factors.

Keywords: Loans, deferred loans, system dynamics, policy analysis.

Introduction

One of the most important challenges facing the banking system in the recent years has been the growing amount of deferred loans. Traditional methods of managing credit risks and using techniques like the development of credit policy, evaluation of economic-technical- financial dimensions of projects, taking precious collaterals, setting up data bases, and building customers' credit ranking system have, in practice, failed to change the trend of banks' deferred loans¹. According to, Selzming (1980), the Brazilian economist, "If I owe one million dollars, I am the loser, but if I owe fifty million dollars, it is the bankers that are the losers"². The deferred and expired loans are outstanding examples of credit risk and are among the banks' problematic assets³ The report issued by the US Senate in 1977 states, "the survival of the international financial system is based on the assumption that all the actors play their roles efficiently on this stage; banks should keep granting loans, and debtors should pay off their loans so that money would not get off circulation. The biggest threat for the system is that a major debtor refuses to repay their debts"⁴. Many studies conducted in different countries on banks' bankruptcy have emphasized the problem of deferred loans as a significant factor⁵. If necessary provisions are made for taking back deferred loans, the shortage of bank resources could be considerably overcome. Thus, investigating the etiology of banks' deferred loans and introducing ways of dealing with it seems vital. The present

paper sets out to introduce the factors contributing to the development of deferred loans. The first section is concerned with the theoretical issues; the second section involves the methodology of the study, and the third section presents the findings, followed by conclusion and suggestions.

Although banks and financial institutions act as an intermediary between depositors and the loan applicants, their most important operation is to grant loans. To this end, they need an efficient system so that loan granting is done quickly and effectively and also the likelihood of the return of the allocated resources (i.e., granted loans) would grow.

In the terminology of deferred loans, the term 'loan', which is regarded as the customer's deferred commitment, means 'to want back', and the term 'deferred' means 'delayed'. In banking, 'loan' is referred to banks' asking for the facilities granted to customers, which, based on different time periods, are of different types: overdue loans, deferred loans, doubtful loans, and expired loans. At an international level, various standards and regulations have been set to identify overdue and deferred loans; for example, Basel Committee on Banking Supervision (BCBS) issued a 26-item instruction in 1999, including ways for proper maintenance, identification, and disclosure of loan accounts. Moreover, the Institute of International Finance (IIF), which is an official standard-setting institute, published its comments in this respect in 1999. This

institute, in its proposed standard, has divided the granted loans into five classes: i. Standard (Pass/Normal): This class of loans is satisfactory, as all the installments (the loan and interest) are paid off promptly. Under standard conditions, no loan repayment problem is anticipated and full repayment is expected. ii. Watch (Special Mention/OLEM): Under certain conditions, there may be worries about the full repayment of loan. More care is required over such loans on the part of the credit authorities. iii. Substandard: Due to lack of sufficient support (special value of the mortgagor or collaterals), full repayment of the loan is open to doubt, and the expired loan or its interest is more than 90 days overdue. iv. Doubtful: The loan whose repayment or whose getting cashed under the prevailing conditions is anticipated as impossible. The expired loan or its interest is more than 180 days overdue. v. Loss: In the bank managers' view, the repayment of loan is impossible. The loan or its interest is more than a year overdue⁶.

Based on existing standards, the loans whose installments are promptly paid off are identified under the current class. If the installments are more than two months overdue, they are classed as expired loans. If the loan applicant fails to repay their debts more than 6 months, the loan is recorded under deferred class. All loans that are deferred more than 18 months will be referred to as doubtful loans¹.

In general, banks' deferred loans stem from two general groups of reasons: internal and external: Internal reasons: i. Failure to identify the applicant of loan facilities: when granting loans, some important factors are normally examined: the capital, capacity, cash flow, collateral, creditworthiness, career and conditions. ii. Lack of a centralized system of identifying applicants in the registry office, iii. Inattention to the circulars about loan granting and failure to observe the regulations made by the bank authorities, iv. Periodical change in the management of the bank branches for exercising internal supervision, and new authorities' lack of sense of responsibility inhibits serious follow-up of the deferred loans. v. Lack of sufficient and constant supervision in granting loans, vi. Easy conditions for granting loans at times when business is thriving and motives of increasing the benefit has led to excessive growth of giving loan facilities, which under unfavorable conditions, is likely to promote deferred loans. vii. Write off of the damage caused by the customers who are not prompt is somehow regarded as a penalty for the prompt customers and might negatively affect customers' attitude.

External reasons: As regards external factors, major economic variables such as reduction of economic growth, inflation, unemployment, and periodical trade imbalances exert strong effects on the reduction of banks' inflow from used resources (i.e., granted loan facilities), making banks face cash problems and lose the possibility of re-granting loans.

In addition to the above-mentioned factors, the following factors, which are out of banks' control, could also contribute to

the rise of deferred loans: i. economic and structural factors, ii. the mortgagor, and iii. international conditions and changes.

Economic and structural factors: i. Difference between the interest rate in the unconsolidated monetary market and the one set by banks⁷, ii. Economic recession⁸ may cause many mortgagors to lose their jobs and thus fail to repay their loans promptly. iii. Assigned and noted facilities, which are assigned to banks: the receivers of such facilities sometimes regard it as a sort of donation given by the government or parliament, thus failing to take its repayment seriously⁹, iv. The requirements imposed by the government on banks concerning write-off of deferred loans. v. Lack of regularities and policies for the write-off and write down from balance sheet about expired loans. vi. Complete failure of insurance companies in covering the granted facilities¹⁰.

The mortgagor: i. Lack of appropriate financial planning by the mortgagor¹¹, ii. Lack of confident prediction for the market risk¹² appearance of new producers, saturation of the market, and reduction of the share of the market receiving the facilities, iii. Mortgagors' awareness (and abuse thereof) of the long process of banks' legal proceedings for taking back loan facilities.

International conditions and changes¹³: i. The recent international financial crisis is one of the important reasons for the increase of banks' deferred loans across the world. ii. Fluctuations in foreign exchange rate have brought about serious loss for some economic activists so that they have had trouble making their commitments¹⁴.

Methodology

The present study is a basic-applied one whose main objective is to introduce methods for reducing deferred loans and it is a research paper that using the system dynamics model. The minor objectives pursued by the study include: i. Identifying the reasons behind Mellat Bank's deferred loans in West Azarbaijan Province, ii. Prioritizing the reasons behind Mellat Bank's deferred loans in West Azarbaijan Province, iii. Introducing methods/techniques for reducing Mellat Bank's deferred loans in West Azarbaijan Province.

The population of the study is all the managers, documents, and data bases of Mellat Banks across the West Azarbaijan Province. Data were collected through library research and interview. The validity of the interview was confirmed by some university professors as well as by the managers of Mellat bank. To calculate the reliability of the instrument, the test retest method was used. The Pearson Product Moment Correlation (r) showed a reliability of over 70.

The system dynamics method, proposed by Forster (1961), Sushil (1993), and Sterman (2000), was employed in this study. The method involves several steps: i. statement of the problem, ii. statement of dynamic hypothesis, iii. formulation of model,

iv. test of model, and v. policy design and evaluation¹⁵ J. W. Forster, a proponent of this scientific method, believes that any dynamic system which undergoes change over time is of a foursome hierarchical structure: closed boundary, feedback loops, surface or state variables, and rate variables.

The principles that warrant attention when forming the model boundary require that all transactions and important decisions be within the model boundaries¹⁶. Each model boundary is made up of a number of feedback circles. The feedback loops are the foundation stone of the system dynamics. The formation of the feedback loop entails at least one state variable and one rate variable. The state variable shows the state of the system at any point of time, and defining it is not subject to the passage of time. The rate variable indicates the system activity through displaying changes in the state variable¹⁷.

Result and Discussion

Banks' deferred loans could be the cause of many monetary and financial crises in the world and could bring about many harmful effects on banks, economic sectors, and in wider dimensions, on the people of a country. Thus, investigating the issue seems really essential. All the variables related to banks' deferred loans which have been obtained from past research, statistics, interview with banking experts, books and articles, were included in the interview of this study. Using the t-test, the key variables causing the problem (deferred loan) were selected and the rest were excluded.

After determining the key variables, the time horizon should be sufficiently extended along the history¹⁶. The choice of the time horizon considerably affects the perception of the problem. The time span of this study is the past 5 years, and for the next year, a simulation has been carried out.

The second step involved in the system dynamics process is the statement of dynamic hypothesis. Understanding the real reasons for the development of deferred loans is not a static problem and requires continuous re-examination of the previous reasons. System dynamics consists of some kinds of tools which help us establish relationship with the model boundary and present its causal structure¹⁸. These encompass the boundary model diagrams, causal loop diagrams, and the stock-flow diagrams.

The model boundary diagram that is shown in table-1 summarizes the model range by listing the key variables of three types: endogenous, exogenous, and excluded variables. Model boundary diagrams show the model architecture and boundaries.

These diagrams do not show the relationships among the variables. The causal loop diagrams (CLDs) are flexible and helpful tools for drawing the structure of the feedbacks of the system. The causal diagrams depict causal relationships among

the variables. These relations are shown with arrows drawn from a cause towards an effect¹⁵.

Table-1
Model boundary

Endogenous variables	Exogenous variables	Excluded variables
Bank resource	Demand deposit rates in banks	Government policy
Paied loans	Demand for bank loans	International condition
Expired loans	Interest rates on bank deposite	Unexpected events
Deffered loans	Interest of bank loans	Insurance company
Doubtful loans	Money market interest	Customer rating company
Loans have been liquated	Market interest rate	-
Pressure to fallow up paye back	Legal deposite	-
-	Abilit of customer to pay back loans	-
-	Delay punishment rate	-
-	Need for money	-
-	Effect on customer credibility	-
-	Promotion system	-
-	Training and update employee information	-
-	Non – bank relationship with customer	-
-	External pressure	-

In this model that is shown in figure-1, there are one positive loop and three negative loops. The loop R1 is a positive loop. In this loop, with the increase of the bank resources, the granted facilities will also increase, since facilities are a function of resources. The more facilities banks grant, the more the liquidated loans will be. Therefore, in this loop, all variables have direct relationship with each other, which makes the loop positive. In the loop B1, the more loans banks award, the more the expired loans will be, and the more the expired loans are, the less the liquidated loans will be. Consequently, this variable will have an inverse effect on bank resources, making the loop negative. In the loop B2, the expired loans may not be liquidated, and after 6 months, may turn into deferred loans. The more the deferred loans are, the less the loans are liquidated. Hence, there is an inverse relationship between these two variables and thus this loop is negative, too. The loop B3 is also concerned with the loan facilities that are not repaid after 18

months, and are transferred to the content of doubtful loans. The more the number of deferred loans is, the more the number of doubtful loans will be, and the increase of doubtful loans will, in turn, give rise to the decrease of liquidated loans. Therefore, this variable exerts an inverse effect on bank resources, making the loop negative. The causal loop diagrams lay emphasis on the feedback structure of the system, while stack-flow diagrams emphasize the physical structure. The stacks designate the level of a system and create information based on key decisions. The

stacks are the cause of difference between the inflow and outflow of a process and are thus a source of imbalance in the system dynamics. The decisions change the flow rate, causing stacks to change and the system's feedback loops to close¹⁸ in this study, stack variable include bank resources, total paired loans, liquidated loans, expired loans, deferred loans, and doubtful loans. The rate variables consist of bank interest rate, interest of bank loans, settlement rate of deferred loans, and the rate of doubtful loans. These are shown in figure-2.

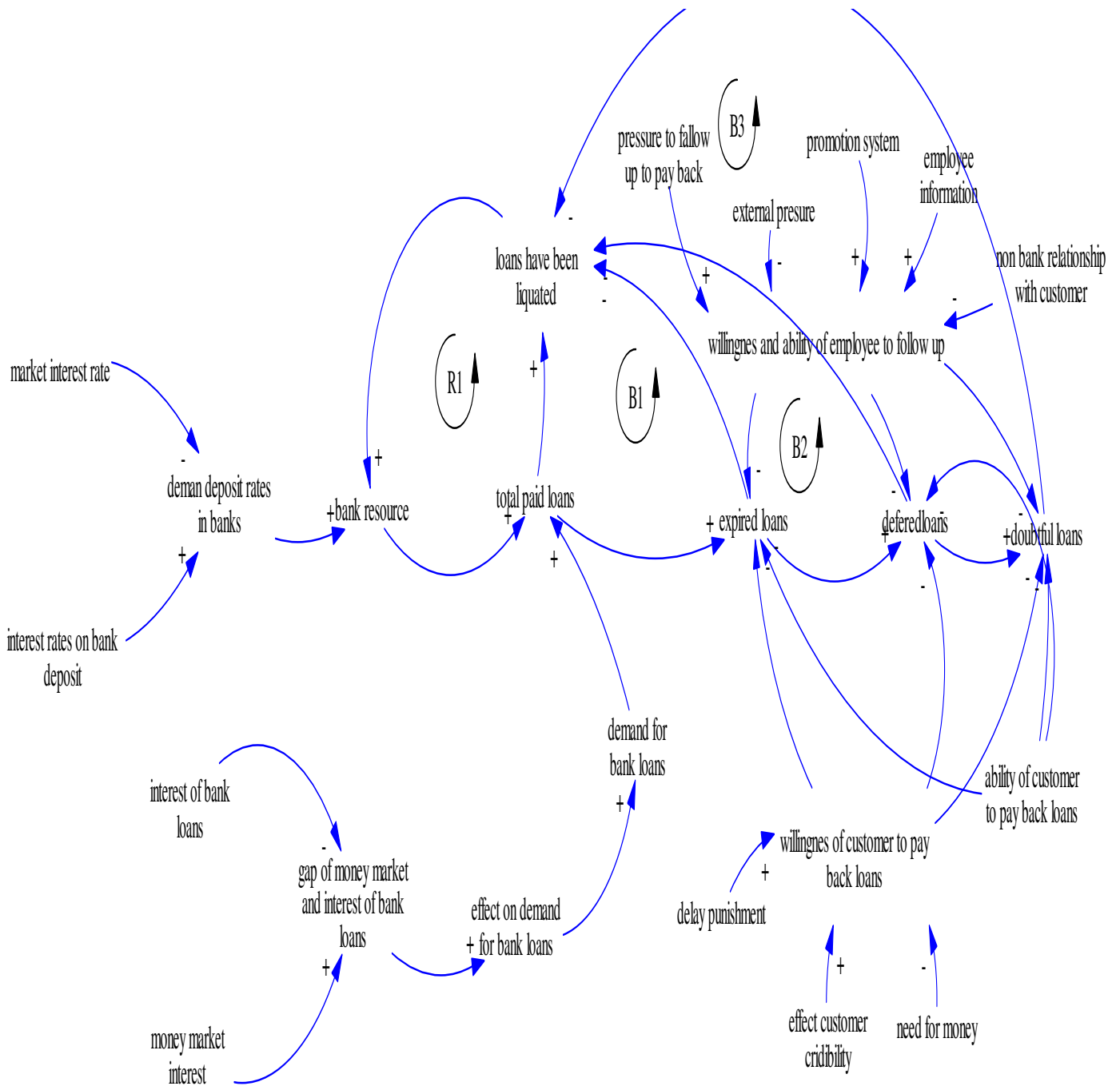


Figure-1
 Causal loop diagram

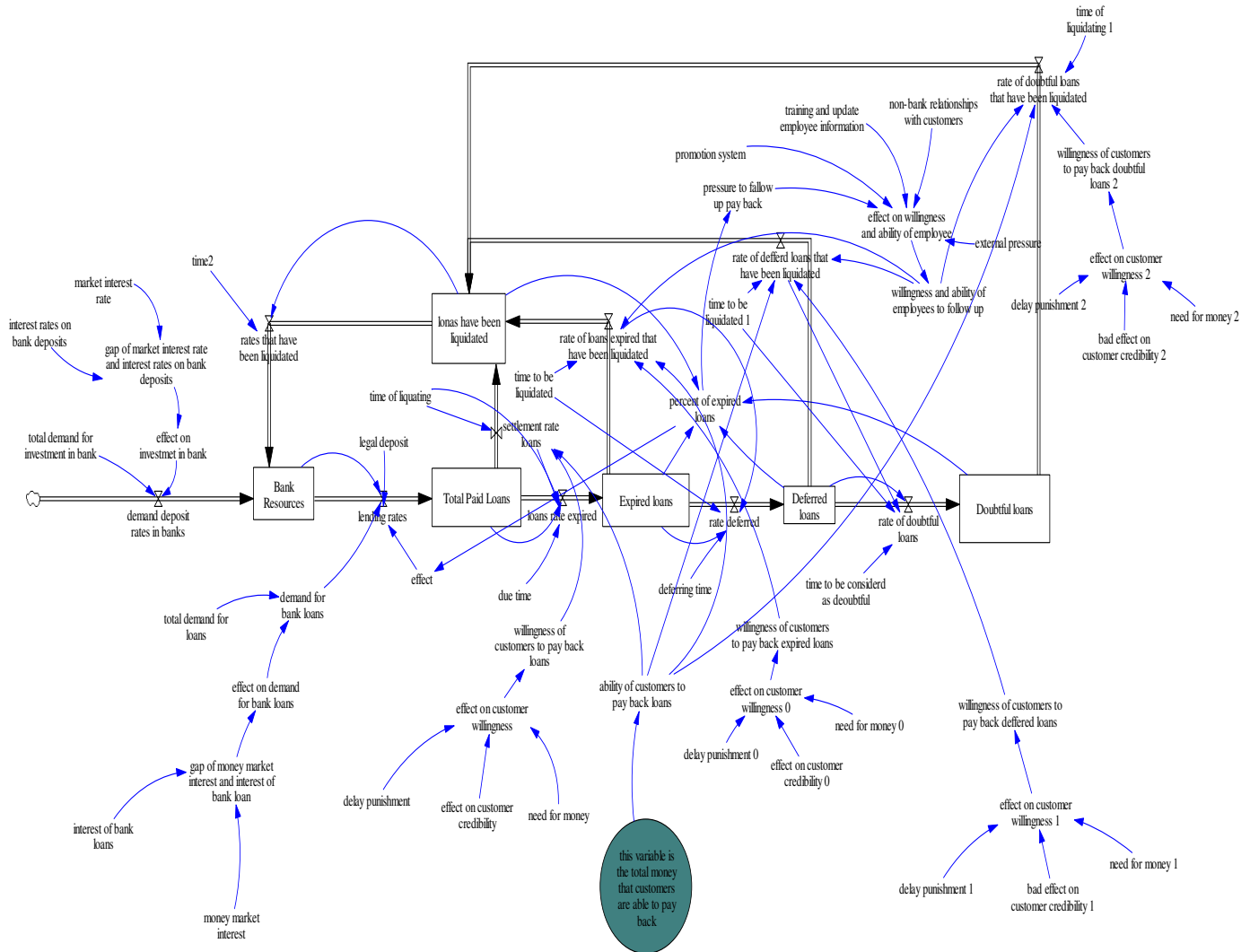


Figure-2
 Stack and flow diagram

According to system dynamics, after designing the casual loop diagram and stack and flow diagram, it is necessary to formulate the model to quantify it and simulate different policies²⁰

Each stacks variables are formulated as follow:

Bank Resources= ∫demand deposit rates in banks+ rates that have been liquidated-lending rates dt

Initial value= 572.000.000.000.000

Total Paid Loans= ∫lending rates-loans rate expired-settlement rate loans dt

Initial value= 446.421.000.000.000.000

Expired loans=∫ loans rate expired-rate deferred-rate of loans expired that have been liquidated dt

Initial value= 22.563.500.000.000.000

Deferred loans= ∫rate deferred-rate of deferred loans that have been liquidated-rate of doubtful loans dt

Initial value= 42.515.700.000.000.000

Doubtful loans= ∫rate of doubtful loans-rate of doubtful loans that have been liquidated dt

Initial value= 10.539.400.000.000.000

Loans have been liquidated=∫rate of deferred loans that have been liquidated+ rate of loans expired that have been liquidated+ rate of doubtful loans that have been liquidated-rates that have been liquidated+ settlement rate loans dt

Initial value= 370.802.000.000.000

Each of the flow variables are formulated in this way:

Demand deposit rates in banks= effect on investment in bank*total demand for investment in bank

Lending rates=IF THEN ELSE(Bank Resources>=legal deposit*Bank Resources, demand for bank loans*effect, 0)

Loans rate expired = (Total Paid Loans-(settlement rate loans*time of liquating))/due time

Rate deferred=(Expired loans-(rate of loans expired that have been liquidated*time to be liquidated))/deferring time

Rate of doubtful loans= (Deferred loans-(rate of deferred loans that have been liquidated*time to be liquidated 1))/time to be considered as doubtful

Rate of doubtful loans that have been liquidated= (willingness and ability of employees to follow up*ability of customers to pay back loans*willingness of customers to pay back doubtful loans 2)/time of liquidating 1

Rate of deferred loans that have been liquidated= (ability of customers to pay back loans*willingness of customers to pay back deferred loans*willingness and ability of employees to follow up)/time to be liquidated 1

Rate of loans expired that have been liquidated= (ability of customers to pay back loans*willingness of customers to pay back expired loans*willingness and ability of employees to follow up)/time to be liquidated

Settlement rate loans= (ability of customers to pay back loans*willingness of customers to pay back loans)/time of liquating

Each constant variables are formulated as follow:

Gap of market interest rate and interest rates on bank deposits= interest rates on bank deposits-market interest rate

Effect on investment in bank= gap of market interest rate and interest rates on bank deposits

look up: $(((-1,0)-(1,1)),(-1,0.01),(-0.437309,0.254386), (0.278287,0.614035),(0.5,0.7),(1,0.95))$

gap of money market interest and interest of bank loan= money market interest-interest of bank loans

Effect on demand for bank loans= gap of money market interest and interest of bank loan

look up: $(((-1,0)-(1,1)),(-1,0.1),(-0.5,0.3),(0,0.5),(0.443425,0.7), (1,0.9))$

Demand for bank loans= effect on demand for bank loans*total demand for loans

Effect on customer willingness= (delay punishment+ effect on customer credibility+ (1-need for money))/3

Willingness of customers to pay back loans= effect on customer willingness

Look up : $((0,0)-(1,1)),(0,0),(1,1)$

Effect on willingness and ability of employee= ((1-external pressure)+(1-"non-bank relationships with customers") +pressure to fallow up pay back+ promotion system+ training and update employee information)/5

Willingness and ability of employees to follow up= effect on willingness and ability of employee

Look up: $((0,0)-(10,10)),(0,0),(1,5)$

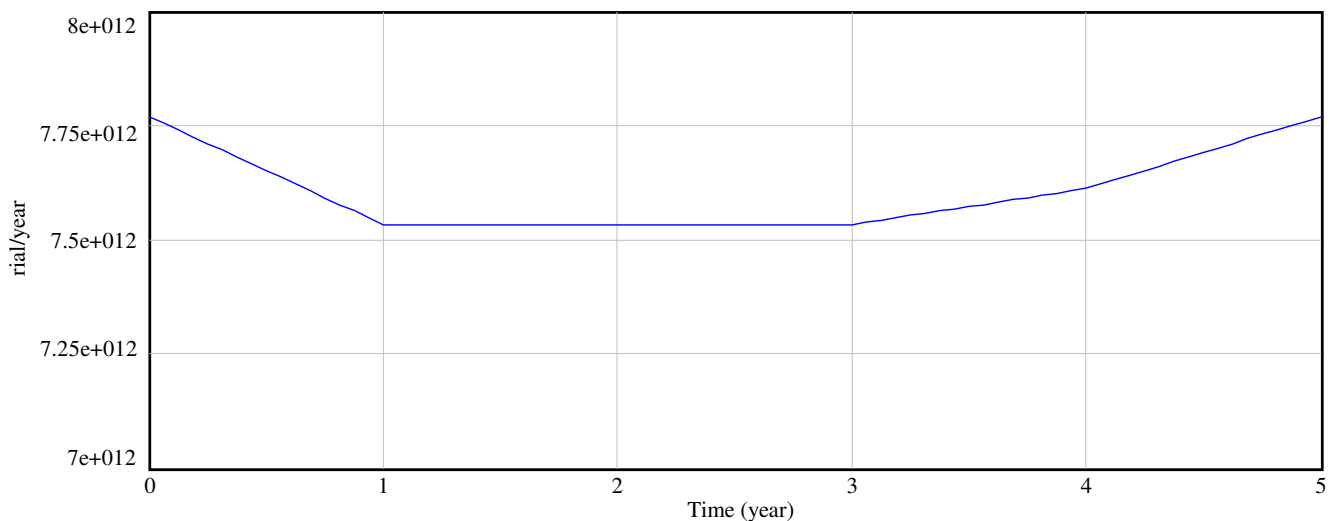
Percent of expired loans= (0.15*Expired loans+0.45*Deferred loans+0.25*Doubtful loans)/loans have been liquidated

Effect= percent of expired loans

Look up: $((0,0)-(10,10)),(0,0.9),(0.2,0.7),(0.5,0.5),(0.8,0.4), (0.9,0.1)$

After drawing the flow diagram and determining mathematical relations among the variables, validity tests of the systemic dynamics model are used to ensure the validity of the model ²¹ the current study used two types of tests. One was the extremity limit test, in which the amounts of some of the model's main variables in extremely high and extremely low states are changed and the model's sensitivity to the changes are investigated. In this test, the rate of investment interest in the free market is increased against the rate of investment interest in the bank. The logical result is that the investment rate in the bank decreases.

Thus, with the increase of investment interest rate in the free market, the investment interest rate in the bank declines.



demand deposit rates in banks : 1

Figure-3
Demand deposit rates in bank in 5 years ago

The other test was to tap experts' ideas, in which the results from the system simulation with the managers of the target institute were investigated. According to the institute's executives, the results obtained from the model conformed to their experiences in the real world.

After testing the model by using the feedback mechanisms defined for the model, different scenarios were considered as to the reduction of deferred loans that is shown in table-2.

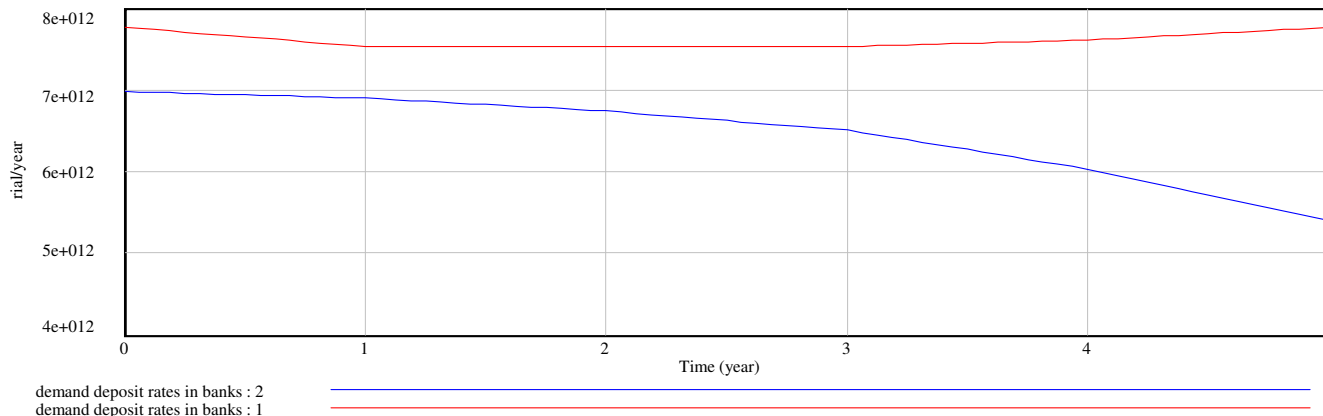


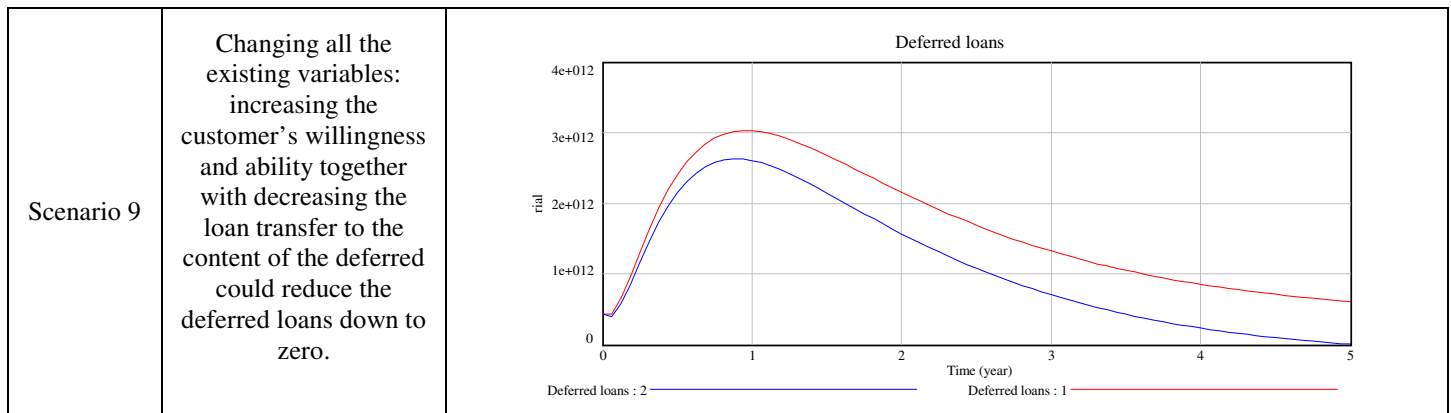
Figure-4
 Demand deposit rates in bank with the increase of investment interest rate in the free market

Table-2
 Scenarios

Scenarios	Explain of scenarios	Figure and including Deferred loans
Scenario 1	Increasing the rate of delay penalty results in the reduction of deferred loans.	
Scenario 2	Reducing the time when loans are transferred from the content of loans to the deferred loans cuts down the deferred loans.	

<p>Scenario 3</p>	<p>Increasing the customer's tendency for loan repayment, which is influenced by three factors of need for money, customer's credit, and amount of delay penalty, leads to the reduction of deferred loans.</p>	
<p>Scenario 4</p>	<p>The increase of the customer's ability of repayment contributes to considerable reduction of deferred loans.</p>	
<p>Scenario 5</p>	<p>Training and encouraging employees are also effective factors of contracting deferred loans.</p>	

<p>Scenario 6</p>	<p>Reducing the average time of loan liquidation through encouragement policies (providing incentives) could also cut down the amount of deferred loans.</p>	
<p>Scenario 7</p>	<p>The institute is affected by the variables which are controlled by the bank: by increasing training, encouragement system, and internal pressures exerted by the authorities for reclaiming the loans, and also through curtailing non-banking relations and pressures, deferred loans could be lessened.</p>	
<p>Scenario 8</p>	<p>The variables involved in Scenario 7 along with those under the control of the Central Bank: the delay penalty rate and the time of the transfer of loans to the content of the deferred loans change: with the increase of penalty rate and reduction of repayment time, the deferred loans decrease.</p>	



Conclusion

Factors affecting the deferred loans were divided into two types of customers' willingness and ability and employees' willingness and ability, each of which resulted from other variables. The variables affecting employees' willingness and ability include training, encouragement system, non-banking transactions, internal and external pressures. The variables affecting customers' willingness and ability consist of delay penalty rate, the customer's need for money, and the customer's credit. The customer's ability is also a result of customers' income and deposits. The cause-effect diagram simply demonstrates the relations among variables. For quantification and behavior production, stack-flow diagram has to be drawn. After the stack-flow diagram was drawn, this model was simulated and, by changing each of the variables, a number of scenarios were constructed. The best scenario, according to Mellat Bank managers was the scenario 8, suggesting that deferred loans could be reduced by increasing staff training, encouragement, and internal pressures exerted by bank employees to persuade mortgagors to repay their loans, to reduce external pressures and non-banking transactions, all of which were under the bank's control. Also, by increasing the delay penalty rate and decreasing the time of transfer to the expired, deferred and doubtful loans' content under the supervision of the Central Bank, the deferred could be cut down quickly and efficiently. To lessen the deferred, it was also suggested that: i. the staff receive the necessary training in reclaiming the granted facilities, ii. delay penalty rate be raised in a stepwise fashion or by getting clearance from the Central Bank, iii. solid and highly cashable collaterals be taken from mortgagors, iv. accredited sureties be introduced by the mortgagors, and v. special offices for reclaiming loan facilities be established in different regions' supervision branches.

References

- Allahdad M., 21st annual seminar on Islamic Banking, Tehran, 40-46 (2011)
- Saghafi and Kordestani, survey of relation between profit and market reaction to change of profit, Tehran, 37(1), 51-72 (2001)
- Jibin, M., Cheng Yi., "research on risk management of bank loan and loss provision based on Markov chain", *Developments in E-Business and Information System Security (EBISS)*, 1-5 (2009)
- Spetton, A, moneylenders, Tehran, 240 (2008)
- Shelak, H., new Banking, 136 (2008)
- Kollman .R, Enders .Z, Muller .G, Global banking and international business cycles, *European Economic Review*, 55(3), 407-410 (2011)
- Huanmei Qin, The analysis on the deposit poor credit under the anticipation of the central bank, *System Science, Engineering Design and Manufacturing Information (ICSEM)*, 122 – 125 (2011)
- Safdari, M., and Ramzan Gholami, A., Economic the symmetric effect of government spending on economic growth, *Research Journal of Recent Science*, 1(10),51-58 (2012)
- Dermine,J & Neto de Carvalho., Bank loan-loss provisioning, central bank rules vs. estimation: The case of Portugal, *Journal of financial stability*, 4(1), 1-22 (2008)
- Frances, C., Using System Dynamics as a Tool for Decision Making in Higher Education Management- U.S. Experience", in Kennedy, M. (ed)., *Selected papers presented at an international seminar on 'Using System Dynamics as a Tool for Decision Making in Higher Education Management'*, Royal Society, London and South Bank University, under the auspices of the Society for Research into Higher Education, South Bank University Technical Report SBU-CISM-12-00, London UK, June (2000)
- Mpardis G., Kotsilieris T., Bank Loan Processes Modeling using BPMN, *Developments in E-systems Engineering (DESE)*, 239 – 242 (2010)
- Stephen J., money and banking, Tehran, 155 (2011)
- Hale G, Bank relationships, Business cycles and financial crises, *Journal of International Economics*, 88(2), 315-325 (2012)

14. Hsiu-Yun Lee & Wen-Ya Chang, Central bank intervention and exchange rate dynamics :A rationale for the regime-switching process of exchange rates, *Journal of the Japanese and international Economics*,(21)1, 64 (2007)
15. Sterman J.D., All Models Are Wrong: Reflections on Becoming a Systems Scientist, *System Dynamics Review*, 18(4), 501-531 (2002)
16. Sushil, *Systems Dynamics: A Practical Approach for Managerial Problems*, Wiley eastern limited, (1993)
17. Fartookzade., H, Review of system dynamics, *journal of management science* (1992)
18. Forrester, J. W, Learning through System Dynamics as Preparation for the 21st Century, *Systems Thinking and Dynamic Modeling Conference for K-12 Education, Concord, MA* (1994)
19. Hasret NUHOLU, System Dynamics Approach In Science and Technology Education, *Journal of Turkish science education*, 4(2),1-18 (2007)
20. Ghobadi SH., system dynamic on application of system thinking Tehran, 36-37 (2011)
21. Mohaghar ., M and Rahmani H, modeling relation between research and development with accumulation of organizational by using dynamic system, *Bulletin of processing and management*, 1(1),1-15 (2012)