Management of Balance Sheet Bank Using Goal Programming Model (GP) and Fuzzy Analytic Hierarchy Process (FAHP)

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ABSTRACT

Management of balance sheet bank as well as other forms of management as a necessity in today's world banks and financial institutions more attention. In this study, according to the needs of the banking and financial system, the balance sheets of the banks and after putting its balance sheet in the planning model, performance and the performance of the bank's balance sheet management by results the model is compared to the performance of this comparison is acceptable. In fact, we are in search of answers to these questions, you could be enjoying some models, purposes of allocating resources to follow up on the bank, with the goal of common risk, the yield was acceptable? The purpose of this study, some limitations to the bank or the banking system or the procedures of the study was and most important targets of the bank officials had come in models and results with the same priority, the match is part of the Bank's aspirations are.
KEYWORDS: Balance Sheet management, Goal Programming, Fuzzy Hierarchical Analysis Process, Refah-e- Kargaran Bank

1.   INTRODUCTION

There are some main reasons for the need for non- financial performance criteria Husain and Gunasekaran (2002) summarized these reasons as follows: competition pressure, technological and economic developments, and legal regulations within top managements, socio-economic and political situation, top management and corporate culture Bank asset and liability management is defined as the simultaneous planning of all asset and liability position on the banks' balance sheet under consideration of the different bank management objectives and legal, managerial and market constraint, for the purpose mitigating interest rate risk, providing liquidity and enhancing the value of bank (Gup and brooks, 1993).A professional organization composed of several experts in the field of finance and risk management, balance sheet management is either operation of the business' assets and liabilities statement defines management and business so that decisions on assets and liabilities are coordinated with each other, or the ongoing process of formulating, implementing, monitoring and evaluating strategies related to assets and liabilities in an effort to achieve the financial goals and risk tolerance limits of normal "(Corsaro et al,2010)

Today, the dramatic growth in the globalization process and the subsequent development of financial markets, as well as increased competition in the domestic banking and financial markets log international and diverse course of complex products, has led to a higher risk in these markets. Further development of the information society, quick and easy access to a variety of information, any delay in the occurrence of an event and the impact of that event on the international stage is eliminated. Considering the above issues has become a crisis in their financial planning. Most investors are looking for long-term investment strategies and to secure them against the uncertainty. However, the assessment of long-term investment strategies requires multiple components and elements that are not available yet so common. We have developed a method to be consistent and logical scenario-based course provides the basic principles of economics. In addition to these parameters, Creators of this scenario should be consistent with past trends and data (Kosmidou, Zopoundis, 175, 2004)

Based on the analysis of current and future economic conditions and the liquidity policy and legal constraints that banks are facing, Bank executives and bankers to determine if any changes should happen, should be what combination of assets and liabilities on the balance sheet of the bank (brodt , 1987). Determine the optimal size and composition of the balance sheet is one of the most important issues facing their bank managers This issue with new rules and increasingly competitive, the importance of asset management - debt and its related models of financial institutions in recent years has doubled (Gerstner et al ., 2007). Globalization and integration of financial markets stormed the financial crisis in developed and developing countries has increased. The recent financial crises in Asia, Russia, Latin America and Turkey extent of vulnerability to changes in global financial markets have shown. The role of the banking sector and mitigate the effects of the

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global crisis and the national and local level during the crisis clearly seen. Therefore D develop appropriate strategies and policies to reduce the harmful effect of banking crises, it is necessary (Arzu taktas., 2005). One of the methods and strategies of harm reduction and contingency in such a crisis bank balance sheet management

This study tries to combine Fuzzy hierarchical analysis model for planning with resources and the bank uses the optimal way to achieve the highest possible efficiency, the system incurs minimal risk can arise.

1-1-Fuzzy Analytic Hierarchy Process (FAHP)

Analytic Hierarchy Process (AHP) is one of the well-known Multi-criteria decision making techniques that was first proposed by Saaty (1980). Although the classical AHP includes the opinions of experts and makes a multiple criteria evaluation, it is not capable of reflecting human's vague thoughts. The classical AHP takes into consideration the definite judgments of decision makers (Wang & Chen, 2007). Different methods for using fuzzy to AHP have been proposed in the literature. Experts may prefer intermediate judgments rather than certain judgments. Thus the fuzzy set theory makes the comparison process more flexible and capable to explain experts' preferences (Kahraman, Cebeci, & Ulukan, 2003).

2.   LITERATURE REVIEW

The first study on FAHP was carried out by Van Laarhoven and Pedrycz (1983) and in this study; fuzzy ratios which were defined by triangular membership functions were compared. Buckley (1985) used the comparison ratios based on trapezoidal membership functions. Stam, Minghe, and Haines (1996) revealed how to use artificial intelligence techniques in the determination or quasi-determination of preference ratings in the analytic hierarchy method. Chang (1996) proposed the extent analysis method based on the utilization of triangular fuzzy numbers for pair-wise comparisons.

Cheng (1997) put forward a new algorithm for the assessment of tactical missile systems using fuzzy AHP. Kahraman, Ulukan, and Tolga (1998) proposed a fuzzy objective and subjective method based on fuzzy AHP. Deng (1999) presented a multiple criteria analysis with fuzzy pair wise comparisons to consider qualitative evaluations. Lee, Pham, and Zhang (1999) revised the main ideas underlying AHP and proposed a methodology based on stochastic optimization to ensure global coherence and to take into account the fuzzy character of the comparison process. Cheng, Yang, and Hwang (1999) used AHP based on linguistic variable intervals and proposed a new method for the assessment of weapon systems. Zhu, Jing, and Chang (1999) started a discussion on the extent analysis method and implementation of the fuzzy AHP method. Having quantified both tangible and intangible benefits in fuzzy environment Chan, Chan, and Tang (2000) provided a technology selection algorithm. Leung and Cao (2000) proposed a fuzzy coherence definition that considered tolerance deviations for the alternatives in the fuzzy AHP. Kahraman et al. (2003, 2003) solved facility location problems using fuzzy AHP. Kahraman, Cebeci, and Ruan (2004) realized multiple criteria comparisons of catering companies using the fuzzy AHP method. Kulak and Kahraman (2005) made a selection among the transportation companies by using fuzzy axiomatic design and fuzzy AHP. They developed fuzzy multi-attribute axiomatic design approach and compared it with fuzzy AHP. Wang, Chu, and Wu (2007) made a choice in optimum maintenance strategies using fuzzy AHP. Different maintenance strategies were evaluated for different machineries in this study. Buyukozkan (2004) applied the fuzzy AHP method in Multi-criteria decision making for e-market selection. Bozbura, Beskse, and Kahraman (2007) proposed a fuzzy AHP model to improve the quality of the prioritization of human capital measurement indicators under fuzziness. Ertug˘rul and Karakas_og˘lu (2009) used fuzzy AHP for performance evaluation of Turkish cement firms and ranked the involved companies in terms of their performances by applying the TOPSIS method. Lee, Chen, and Chang (2008) utilized the fuzzy AHP and Balanced Scorecard method for assessment of an IT department in the manufacturing sector in Taiwan.

3.   RESEARCH METHODOLOGY

The proposed approach is based on the integration of the fuzzy AHP and the GP. First, the fuzzy AHP is applied to determine the relative weights of main prefers for bank .Next, the GP is utilized to develop a mathematical model for ALM, which includes the determined weights of goals as the input parameters.
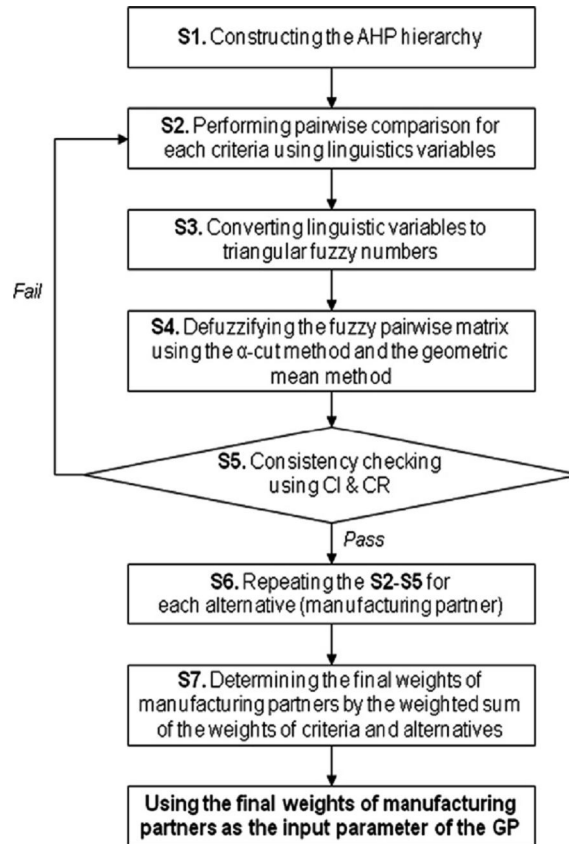
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┌─────────────────────────────────────┐
│ S1. Constructing the AHP hierarchy  │
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│ S2. Performing pairwise comparison  │
│  for each criteria using linguistics│
│  variables                          │
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│ S3. Converting linguistic variables │
│  to triangular fuzzy numbers        │
└─────────────────────────────────────┘
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                  ▼
┌─────────────────────────────────────┐
│ S4. Defuzzifying the fuzzy pairwise │
│  matrix using the α-cut method and  │
│  the geometric mean method          │
└─────────────────────────────────────┘
                  │
                  ▼
        ◇ S5. Consistency checking
            using CI & CR ◇
                  │ Pass
                  ▼
┌─────────────────────────────────────┐
│ S6. Repeating the S2-S5 for each    │
│  alternative (manufacturing partner)│
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│ S7. Determining the final weights of│
│  manufacturing partners by the      │
│  weighted sum of the weights of     │
│  criteria and alternatives          │
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│ Using the final weights of          │
│ manufacturing partners as the input │
│ parameter of the GP                 │
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Fail (feedback loop from S5 back to S2)

Fig. 3. The steps of the fuzzy AHP.

3-1-Fuzzy AHP for determination of relative weights of criteria

The first step of the fuzzy AHP is to construct the decision hierarchy using the important criteria and possible alternatives (i.e., liquidity). The hierarchy is usually structured from the overall goal of the problem (top level), through the evaluation criteria (intermediate level), to the list of goals (bottom level).

Since most decision makers cannot simultaneously handle more than seven to nine factors when making a decision (Miller, 1956), most of the past research recommended four to five criteria to make a decision hierarchy among the large number of factors (Chan & Kumar, 2007; Guneri et al., 2009; Ozgen, Onut, Gulsun, Tuzkaya, & Tuzkaya, 2008). For reference, Guneri et al. (2009) summarized various supplier selection criteria using the related literature published between 1966 and 2008.

In order to build the hierarchy, we selected six important criteria: revenue performance, Capital adequacy, the deposit facility ratio, Liquidity, Asset growth and fixed assets using interview with experts in bank. We utilized the regulations of central bank.

Once the hierarchy is created, the assessment of criteria is performed by pair-wise comparison. In some situations, the decision makers can specify preferences in the form of an AHP numerical pair-wise comparison introduced by Saaty (1980) using a nine point of scale of importance between two elements. If the decision makers cannot choose their preferences by numerical values, they can also express their preferences by natural language. In this research triangular fuzzy numbers $(\tilde{1}, \tilde{3}, \tilde{5}, \tilde{7}, \tilde{9})$ are used to indicate relative importance of each pair of elements (i.e., criteria or alternatives).

A triangular fuzzy number $\tilde{a}$ can be defined by the closed interval [l, u] including its mean m as follows:

(1)

$$\mu_a(x) \begin{cases} \dfrac{x - I}{n - I}, & l \leq x \leq m \\ \dfrac{u - x}{u - m}, & m \leq x \leq u \\ 0, & otherwise \end{cases}$$

Also, the triangular fuzzy number can be characterized by defining the interval of confidence level α as follows:

$$\bar{a}^{\alpha} = \left[l^{\alpha}, u^{\alpha} \right] = \left[(m-l)\alpha + l, u - (u-m)\alpha \right] \forall \alpha \in [0,1].$$

(2)

This is a α-cut method that is known to incorporate the experts or decision-makers confidence over his/her preference or the judgments (Gungor et al., 2009). As shown in (2), the α-cut method yields an interval set of values from a fuzzy number: the lower limit and upper limit of the fuzzy numbers with respect to α-cut. In general, the value of α is set between 0 and 1. If α =0, it indicates that the degree of uncertainty is greatest and the degree of confidence is least. If α is near to 1, the degree of uncertainty decreases and the degree of confidence increases (Pan, 2008).

The five triangular fuzzy numbers $(\tilde{1}, \tilde{3}, \tilde{5}, \tilde{7}, \tilde{9})$ and the corresponding membership function and linguistic terms are shown in Fig. 2 and Table 1.

According to the pair-wise evaluation of the decision maker, a fuzzy comparison matrix, $\tilde{A}$ representing fuzzy relative importance of each pair elements can be given by

$$\tilde{A} = \begin{pmatrix} 1 & \tilde{a}_{12}^{\alpha} & \cdots & \tilde{a}_{1n}^{\alpha} \\ \tilde{a}_{21}^{\alpha} & 1 & \cdots & \tilde{a}_{2n}^{\alpha} \\ \vdots & \vdots & \vdots & \vdots \\ \tilde{a}_{n1}^{\alpha} & \tilde{a}_{n2}^{\alpha} & \cdots & 1 \end{pmatrix}$$

(3)

$$where, \tilde{a}_{ij}^{\alpha} = 1, if\, i = j, and\, \tilde{a}_{ij}^{\alpha} = \tilde{1}, \tilde{3}, \tilde{5}, \tilde{7}, \tilde{9}\, or\, \tilde{1}^{-1}, \tilde{3}^{-1}, \tilde{5}^{-1}, \tilde{7}^{-1}, \tilde{9}^{-1}, if\, i \neq j.$$

After constructing the fuzzy comparison matrix, $\tilde{A}$, we need to convert interval matrices into crisp values. This can be done by applying the index of optimism, μ which also represents the attitude of the decision-maker (Vahidnia, Alesheikh, & Alimohammadi, 2009). A larger value of μ indicates a higher degree of optimism (Ayağ & Ozdemir, 2007).
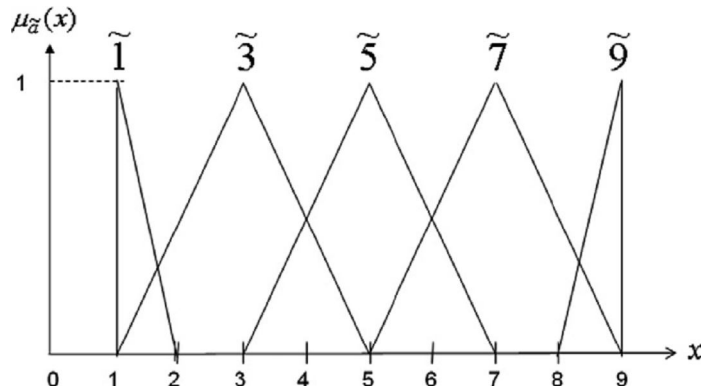

Fig. 2. Membership functions for linguistic values

Table 1 Fuzzy important scale.

Linguistic judgments		Fuzzy number
Equally important	Equally preferred	(1, 1, 2)
Moderately more important	Moderately more preferred	(1, 3, 5)
Strongly more important	Strongly more preferred	(3, 5, 7)
Very strongly more Important	Very strongly more Preferred	(5, 7, 9)
Absolutely more important	Absolutely more preferred	(8, 9, 9)

$$C(\tilde{a}_{ij}^{\alpha}) = \mu a_{iju} + (1-\mu)a_{ijl}, \forall \mu \in [0,1].$$

(4)

Where $C(\tilde{a}_{ij}^{\alpha})$ is the crisp value corresponding to $\tilde{a}_{ij}^{\alpha}$ considering the index of optimism μ.

Once the comparison matrix with crisp values is obtained by applying (4) to $\tilde{A}$ a geometric mean method is utilized to compute their priorities.

The brief description on the geometric mean method is as follows (Saaty, 1980):

$$g_i = \left(\prod_{j=1}^{n} C(\tilde{a}_{ij}^{\alpha}) \right)^{\frac{1}{n}}, i=1,...,n$$

(5)

Where $\tilde{g}_i$ the geometric is mean of criterion or alternative i.

For each of the alternatives or criteria, the weights can be computed as follows:

$$w_i = g_i \bigg/ \sum_{i=1}^{n} g_i, i=1,...,n$$

(6)

After defuzzification of each pair-wise matrix, it is necessary to calculate the consistency ratio (CR) for each matrix. The deviations from consistency are expressed by the following consistency index (CI):

$$CI = \frac{(\lambda_{\max} - n)}{(n-1)}$$

(7)

Where $\lambda_{\max}$ is the largest eigen value of $\tilde{A}$ and n is the size of matrix.

Using the CI, the CR is utilized to estimate directly the consistency of the pair-wise comparisons. The CR is computed by dividing the CI by a value obtained from a table of Random Consistency Index (RI), which is the average index for randomly generated weights (Saaty, 1980).

$$CR = \frac{CI}{RI}$$

(8)

In general, if the CR is less than 0.1, the comparisons are acceptable Otherwise; it is not acceptable (Ayag̃ & Ozdemir, 2007; Saaty, 1980).

After the relative weights of criteria are determined, the priorities of the alternatives are also obtained from the pair-wise comparisons and the consistency check. In the final step of the fuzzy AHP, the priority weights of each manufacturing partner can be calculated by weights per manufacturing partner multiplied by weights of the corresponding criterion.

3-2- Goal Programming for ALM

There is no way simultaneously to maximize returns (or profits) and minimize risks but banks can only make risk/return tradeoffs and attempt to maximize returns for whatever aggregate level of risk they choose to undertake (Uyemura and Van Deventer, 1993). The objective of goal programming is to reach a satisfactory level of multiple objectives whenever it is not possible to achieve every goal to the full extent, so that the decision maker may come as close as possible to reaching goals.

Goal programming model (GP) is preferred to find the optimal composition of a bank's assets and liabilities in the Turkish banking sector. Choice of GP best describes the multi-objective nature of the problem and it eliminates the computational difficulties as well as practitioner's unfamiliarity experienced with stochastic models. Flexible nature of GP enables the decision maker to incorporate a number of goals under a set of constraints. GP minimizes deviations between set goals and what can actually be achieved within the given constraints.

In GP, the objective function (1) minimizes the sum of deviations (di) from each goal (Gi). Each goal is assigned a priority weight (Pi) that shows its relative importance among other goals. Therefore, goals with higher Pi values are achieved before the others. The goals (2) reflect the objectives that are set by decision makers. Constraints (3) represent the availability or upper/lower limits of resources.

Determine $X = (x_1, x_2, ..., x_j, ..., x_n)$ such that:

$$MinZ = f(d_i^+, d_i^-) = \sum_{i=1}^{I} P_i(d_i^+, d_i^-) \tag{1}$$

Subject to:

$$\text{Goals } (G_i) \sum_{j=1}^{n} a_{ij} x_j + d_i^- + d_i^+ = b_i \quad \text{for } i = 1, ..., I \tag{2}$$

$$\text{Constraints } \sum_{j=1}^{n} C_{mj} x_j \leq r_m \quad \text{for } m = 1, ..., M \tag{3}$$

where:

xj : mean value of variable j;

a_{ij} : technological coefficient of x_j in goal i;

b_i : target value of goal i;

C_{mj} : consumption coefficient of xj in constraint m;

r_m : available amount of resource m;

d_i^+ : overachievement of the target for goal i;

d_i^- : underachievement of the target for goal i; and

P_i : priority weight of the deviation variables of goal i.

4. MATERIALS AND METHODS

Firstly, using items on the balance sheet and financial statements such as cash flow, profit and loss account, Decision variables identified using the database of experts to answer questions, according to the analysis of hierarchical fuzzy priorities are derived. By entering parameters in the objective function is linear and therefore also limits the central bank's rules or practices of central banks gathered into the planning model, The output of the model are estimated using 11 lingo software. The data obtained from the model with actual data presented in the financial statements compared to bank

5. Conceptual model of research

Model is having 21 constraints, structural constraints, 15 and 6 is the ideal constraints. Of 15 constraints structured, 3 limits fixed in time is incorporated in the model with 42 decision variable is the 30 variables, variables) of the balance sheet (and 12 variables, variable tilt (6 variables deviation positive and 6 variables negative deviation (to be provided in the model limitations, mainly through questionnaires distributed among experts of the Bank, refer to the financial information of the Bank, the requirements set by the central bank balance sheet associated with it are explained.

5-1- Decision variables

The items in the balance sheet planning model are derived variables. In this regard the decision variables and the variables that have been identified deviations from the ideal.

Table 1 Group I; variables of the decision

Assets	Variables	Debt and Equity	Variables
Cash holdings	X_1	Liabilities to Central Bank	Y_1
Receivables from central Banks	X_2	Liabilities to banks and credit institutes	Y_2
Receivables from other banks and credit institutes	X_3	Deposits	Y_3
Facilities granted and demands of the government sector	X_4	Savings deposits and similar	Y_4
Facilities granted and demands of the public sector	X_5	Term investment deposits	Y_5

Letters of credit and term Bara vat	X_6	Other Deposits	Y_6
Investment and partnerships	X_7	Deposits and other liabilities	Y_7
Fixed assets	X_8	Items on the Way	Y_8
Other assets	X_9	For accepting credit Bara vat term debt	Y_9
Items on the Way	X_{10}	**Total Liabilities**	
Total assets	X_{11}	**Equity**	Y_{10}
		Capital	Y_{11}
The commitments for letters of credit	X_{12}	Deposits	Y_{12}
		The profit (loss) Accumulated	Y_{13}
The liability for warranty	X_{13}	**Total liabilities and equity**	
		Commitments for Credit	Y_{14}
The other commitments	X_{14}	Warranty obligations	Y_{15}
		Other commitments	Y_{16}
Managed funds and similar items		The managed funds and similar	

Table 2 Group II; variables deviation from ideal

Target set	Over achievement	Under Achievement
Performance Revenues	d_1^+	d_1^-
Capital adequacy	d_2^+	d_2^-
The deposit facility ratio	d_3^+	d_3^-
Liquidity	d_4^+	d_4^-
Asset growth	d_5^+	d_5^-
Fixed assets	d_6^+	d_6^-

5-2-Assets and Liability management
5-3-Constraints

Constraint for the two groups combined balance sheet constraints and binding constraints are present. Binding constraints to limit the expression is too high or low limitations of the positive and negative deviation from the target set is expressed the main purpose and function of the objectives expressed an inclination to depending on the target, reducing the positive deviations and negative deviations, or both are specified.

5-4- Ideal constraints (goals)

The financial statements of banks and banking practices in accordance with the regulations of the Central Bank interview with director of central bank objectives, such as maximum use of resources, ensure liquidity, capital adequacy, asset growth and investment and partnerships were the key objectives that was one of our goals.

1. Performance Revenues: Revenue Performance and bank indicator as a measure of the impact of macroeconomic policies on banking institutions. The main source of income is income from bank loans, revenue bonds and fees, particularly fees are warranties. The major banks are also paying interest costs. The ideals of the Profit Facility, is written for each year separately. Suspicious claims for costs recoverable under section 85 a year, equivalent to 1.5 percent, the central bank facilities granted is calculated and stored. This causes an increase in the marginal income of 5 percent from the previous year will be considered.

2009

$$0.12\sum_{i=4}^{5} x_i + 0.11x_7 + 0.02x_{12} - 0.1588y_5 - 0.015\sum_{i=4}^{5} x_i + d_1^- - d_1^+ = 1.05 \times 160463$$

2010

$$0.14\sum_{i=4}^{5} x_i + 0.2x_7 + 0.02x_{12} - 0.174y_5 - 0.015\sum_{i=4}^{5} x_i + d_1^- - d_1^+ = 1.05 \times 161341$$

2011

$$0.14\sum_{i=4}^{5} x_i + 0.2x_7 + 0.02x_{12} - 0.188y_5 - 0.015\sum_{i=4}^{5} x_i + d_1^- - d_1^+ = 1.05 \times 176300$$

2. Capital Adequacy: This ratio is used by the banking laws, banks will be calculated as follows:

Capital adequacy ratio= $\dfrac{\text{Capital Base}}{\text{(Risk Factors) (FCR)(Below the Line items)+(Risk Factors) (Top items on line)}}$

The ratio of 8% and is now on the banks.

2009, 2010, 2011

$$\sum_{i=11}^{12} y_i - 0.08(0*(x_1 + x_2) + 0.2x_3 + x_4 + x_5 + 0.2x_6 + x_7 + x_8 + x_9 + 0.2x_{10} + 0*x_{11}) + d_2^- - d_2^+ = 0$$

3. Facility to deposit ratio: The ratio of the efficient use of resources, the Bank suggests, be considered the equivalent of 85% of the bank's resources.

$$x_4 + x_5 - 0.85\sum_{i=1}^{6} y_i + d_3^- - d_3^+ = 0$$

4. Liquidity: The scheme of 1.5% of total bank deposits into cash resources with a high degree of liquidity account.

$$x_1 - 0.015\left(\sum_{j=1}^{6} y_j - y_2\right) + d_4^- - d_4^+ = 0$$

5. Growth Assets: The asset growth is a natural expectation The growth of 15% for 33% per year over the previous year to consider average growth rate in 86 years to take over total assets Is.

$$\sum_{i=1}^{11} X_i + d_5^- - d_5^+ = 1.33*62,879,869,347,424$$

6. Long-term investors are banking law, 30 percent of the equity in those assets is allocated.

$$x_8 - 0.30\sum_{i=10}^{12} y_j + d_6^- - d_6^+ = 0$$

5-5-Structural constraints (binding)

1. Cash: Cash to cash is deposited with the bank (Treasury Branches) be kept available. This amounts to 2% of total deposits at Refah-e- Kargaran banks and the central bank's debt. Banking regulations in the country to be at least 3 percent of total bank deposits and debt to the central bank to have cash.

$$x_1 \leq 0.02(y_1 + \sum_{3}^{6} y_j)$$

$$x_1 \geq 0.03(y_1 + \sum_{3}^{6} y_j)$$

2. Legal deposit: The central bank is relative to the demands of an obligation is determined by the Money and Credit Council, about 17 percent of all resources other than equity balance is.

$$x_2 = 0.17\sum_{j=3}^{6} y_j$$

3. Receivables from banks and other credit institutions: the assets and needs for interbank transactions, which generally is at least 3% of total deposits, are held.

$$x_3 \geq 0.03\sum_{j=3}^{6} y_j$$

4. Credit facilities and the demands of the public sector: the balance of total bank deposits and credits from Central Bank centered from 018% to 058% of public sector facilities has been provided.

$$x_4 \geq 0.018(\sum_{j=1}^{6} y_j - y_2)$$

$$x_4 \leq 0.058(\sum_{j=1}^{6} y_j - y_2)$$

5. Credit facilities and receivables from private sector:

$$x_5 \geq 0.727(\sum_{j=1}^{6} y_j - y_2)$$

$$x_5 \leq 0.825(\sum_{j=1}^{6} y_j - y_2)$$

6. Bara vat letters of credit and term: the relative prosperity of the bank from 0.004 to 0.005 of the total balance sheet resources.

$$x_6 \geq 0.004\sum_{j=1}^{12} y_j$$

$$x_6 \leq 0.005\sum_{j=1}^{12} y_j$$

7. Investment and Partnership: According to the provisions of paragraph 3 of Article 34 of Law 3 instructions and monetary investment banking 01/18/1386 Money and Credit Council approved the purchase of bonds and investments through the roof or through a capital base of the bank is up 40 percent;

$$x_7 \leq 0.40\sum_{j=10}^{12} y_j$$

8. Fixed assets: The assets of the banking law are a maximum of 30% of the capital base.

$$x_8 \leq 0.30\sum_{j=10}^{12} y_j$$

9. Other assets: This ratio is considered to be equivalent to 3% of balance sheet resources.

$$x_9 = 0.03\sum_{j=10}^{12} y_j$$

10. Item on its way: the balance sheet of the bank's core capital ratio ranged from 1 to 3 percent.

$$0.01\sum_{i=10}^{12} y_j \leq x_{10} \leq 0.03\sum_{i=10}^{12} y_j$$

The following line items in the balance sheet as well as the structural constraints can be equally opposed to teaching customer commitments and obligations to the Bank or the obligations assumed as equal to 4 is as follows:

11. $x_{11} = y_{13}$
12. $x_{12} = y_{14}$
13. $x_{13} = y_{15}$
14. $x_{14} = y_{16}$

15. other structural constraints that must be considered in the present model planning in accounting principle of equality of resources and expenditure balance sheet or statement of assets and liabilities and equity is equality.

$$\sum_{i=1}^{10} X_i = \sum_{i=1}^{12} y_j$$

5-6- The objective function
Minimizing the undesirable deviations from the ideals of the bank balance sheet management is concerned; the objective function can be formulated as follows:

$$\min z = P_1 d_1 + P_2 d_2 + P_3(d_3^+ + d_3^-) + P_4 d_4 + P_5 d_5 + P_6(d_6^+ + d_6^-)$$

6. Finding

6-1- Prioritization and weighting of objectives

In order to obtain the desired priority for many of the main objectives of the Bank made up the balance sheet of the questionnaire used in the form of hierarchical analysis using fuzzy logic to provide 20 tons of bank financing domains were professionals. This questionnaire was designed based on the Chung model) in the attachment process and questionnaire data and also presented (after considerable study was collected from a questionnaire, 11 of the respondents. Of course, it Consistent Rate (CR = .026) and is acceptable.

Table 3 The results of questionnaires

Priority level	Criterion	Priority (normalized)	Degree
P_1	Performance Revenues	0.395	
P_2	Capital adequacy ratio	0.186	
P_3	Liquidity	0.18	
P_4	Asset growth	0.091	
P_5	The deposit facility	0.075	
P_6	**Fixed assets**	**0.074**	

In table 3 show that Importance of each of the objectives and priorities of each of them shows which of the goals of this research are more important

6-2- Solving the model

After defining priorities and weight restrictions and obtain any one of them to solve the model using Lingo software 11 and the results compared with what is reflected in the balance sheet of banks actually put. Nevertheless, in the hands of the bank balance sheet management, we are changing the role of foreign such as social and economic parameters or any other parameters that are out of balance with the way the banking system is considered constant and the only variable we have examined the issue of the balance sheet.

Table 4 The results for the model year, and 2009.2010and 2011 items Riyal)

VARIABLES	VALUE 2009	VALUE 2010	VALUE 2011
X_1	1582139	1263543	1524595
X_2	12314943	7246822	9418779
X_3	3819479	4608850	4144773
X_4	1621923	3469916	1454815
X_5	42024890	4897794	62493252
X_6	368270	293760	489576
X_7	479637	524002	669036
X_8	1471397	1724123	1893324
X_9	2117147	2192239	3644466
X_{10}	745155	0.00000	2611000
X_{11}	1901110	2084465	1592838
X_{12}	4163243	3392649	3169850
X_{13}	1119012	936345	669963
X_{14}	879996	718615	562009
Y_1	3064017	87371	9
Y_2	70507	978074	3875057
Y_3	19900860	20457301	28442192
Y_4	8127223	8507341	14303081
Y_5	2382708	28484341	3570255
Y_6	2807561	1764983	1232076
Y_7	6476338	6979935	3143972
Y_8	-	474714	0.00000
Y_9	495689	401774	173241
Y_{10}	895000	895000	895000
Y_{11}	514387	538588	565034
Y_{12}	366322	731834	11406
Y_{13}	1901110	2084465	1592838
Y_{14}	4163243	3392649	3169850
Y_{15}	1119012	936345	669963
Y_{16}	879996	718615	562009

Table 4 presents the model results for the three years 2009, 2010 and 2011 show a good basis for comparing the results of the model implies

Table 5 Results of the deviations of 2009, 2010 and 2011 model years

VARIABLE	VALUE2009	VALUE2010	VALUE 2011
d_1^+	766714.5	1602952	1293519
d_2^-	3015417	3359078	5151877
d_3-	5480845	1210359	7073651
d_4^+	716237.9	374022.9	329396.4
d_5-	0.8363016E+14	0.8363015E+14	0.8363014E+14
d_6^+	938684.3	1074496	1451892

(Figures in millions) (Deviation of zero is not included)

For each model there is a deviation from the standard deviation of the matter is that it is not more than a certain amount. In Table 5, the standard deviations for model years 2009, 2010 and 2011 is shown

7. Conclusion

The main purpose of this study was Management of assets - liabilities maximize returns through efficient allocation of resources at the level of acceptable risk. Current research fallowing this purpose with investigation balance sheet and goals set by Practitioners

The study confirm   results Taktaz and Azkan Gvnay (2005) sequenced the Bank's balance sheet to reach the targets is desirable .But on the deposit facility, which has a positive or negative deviation is different in that it shows a complete lack of coverage reflects the aspirations of the desired goals. The study Mzyky (1384) predicted that the balance sheet of a newly established bank pays the balance sheet value of the bank's real and what is predicted by the model confirms

By examining the values of the model and the variables in the balance sheet of the real bank, in only one case and that the variable Y5 depositor's durable deviant negligible amount of 3 million rails is observed, which indicates that should be borne in the above three million in bank balance sheets to be added.

However, the objective function and the deviations from the model of the objective function represents deviations 7693976 estimated that the values of limits is ideal 3015417 Riyal deviation is caused by the amount of capital adequacy, which have negative impact Why has the objective function of the objective of minimizing the adverse deviations is the number indicating a lack of bank capital adequacy as required but must be observed by the bank.

Balance sheet as compared to the 88 we know that the actual balance in the bank that provided the model shows aberration is not only noticeable deviations in the objective function that it causes lack of coordination of banking procedures and standards appropriate to the economic situation and the resulting chaos is the norm in these banks. If you look in 1388 with the Table 5 also shows that the deviation in the income how to use the bank's earnings and profits are therefore a positive deviation of 1602952 million rails show that the performance of the bank's income from the previous year amounted to 836,237.5 million rails has increased. Capital adequacy levels, as well as having a negative deviation should be considered undesirable. 1210359 Riyal deposit facility rate of surplus seen that it can be taken from the bank's credit policy however, given that the facility should be biased towards zero as was stated in the statement of its limitations and it requires more attention is beloved by bankers. Liquidity to banks as well as some more show and how it is expressed 374,022.9 million riyals of course it's not the lack of liquidity or low liquidity of the bank's problems banking system are always in tension and the risk of a liquidity risk to overlook the importance of the left margin.

The bank's balance sheet of 89 years, like two years ago is no significant deviation however, the standard deviation of the ideal expressed their bank banking professionals already seen the ratio of loans to deposits in the 89 years before the fall of the same year, we have witnessed however, the figure is 82.5% of the total balance sheet resources will increase. Was determined by computing the ratio the 88-year bonds was 78.4 percent in the following year this amount has declined the model is also solved in the negative deviation d3 clearly shows why.

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