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Employing Objective Programming in the Banking Field (National Bank) as a Model

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The study, titled employing objective programming in the banking field (Ahli Bank), aimed at introducing modern quantitative methods in banking and applying modern technical mathematical models in an easy and simple way to enable decision makers and analysts to have full knowledge in all aspects. One of the objectives of the research is to know the extent of achieving the objective programming of the optimal solutions and strategies in the management of the bank. A model was built for this objective programming and included 12 decision variables and 17 constraints, in addition to the objectives of maximising return and the secondly, to reduce investment risk. Using the program In QSB, it was concluded that the use of objective programming technique in planning yields better results.

Key words: *Objective Programming, National Banks, Commercial Banks, Economic Activity.*

Introduction

The job exercised by financial intermediation institutions in economic activity, especially banking institutions, is an important and sensitive job at the same time. The reason is due to their multiple roles in collecting savings and providing credit to all other economic institutions. Therefore, if these banking institutions do well in carrying out their work, they have a high share in the development of the economic process, and if they fail, they have a significant negative impact on the economy of the country (Jonathan, and Christopher Udry, 2007). Therefore, banking procedures and laws seek to create clear policies for establishing rules for

monitoring, evaluation and reporting, in order to reduce risks that can arise from banking institutions as a result of mismanagement (Greenbaum, 2019).

These imposed laws and rules seek in one way or another to put in place sound working procedures for the bank in order to invest in it better by limiting lending operations and limiting them in a legal way. They also aim to restrict lending to senior employees of the bank who have a relationship with major shareholders, in addition to their families (Tim and Simon Butt ,2020).

This is in addition to following up on the risks resulting from the presence of an imbalance in liquidity and inconsistency between the terms of the assets and the obligations incurred by the bank, and the result of these risks of non-fulfillment and payment to creditors and depositors at the same time.

This of course requires "the presence of management capable of managing these risks within an integrated scientific approach based on the design and implementation of measures that minimize the possibility of loss or its financial impact" (Greenbaum, 2019).

Commercial banks perform different functions. Commercial banks, by the nature of their functions, are multi-service institutions. The primary goal for decision makers in these banks is to maximise their profits and at the same time reduce the criterion of investment risk. This conflicting situation leads naturally to thinking on how to achieve multi-goal optimisation in investment plans of commercial banks using technology (programming objectives). In this research, we will use new methods in optimising planning for investment aspects in investment banks (Tim and Simon Butt ,2020; Jonathan, and Christopher Udry, 2007).

Research Problem

The research problem is to find the best investment plans in a bank (National Bank), which is represented in greater return and reduction of investment risks so that the bank, through its decision makers, can make the right decisions.

The Importance of Research

There is no doubt that the primary goal pursued by all profit institutions, in public and private investment banks in particular, is financial return and continuity of profit for the longest possible period. The importance of research is reflected in helping decision makers to take a set of complex and interrelated decisions that in turn serve their decisions that lead to increased investment on the one hand and reduced risks on the other hand. This is a difficult equation that can only be achieved using advanced scientific methods, including this method (target

programming) which is concerned with helping the decision makers to increase their investments and consequently their profits and returns on the one hand, and reduce investment risks on the other hand.

Research Objective

The current research facilitates employing targeted programming in the banking field (Al Ahli Bank) as a model.

The Second Topic: Theoretical Framework and Previous Studies

First: Targeted programming:

Goal Programming Method (GP)

Operations research is widely used in decision-making as this research seeks to improve the decision-making processes and choose the appropriate allowance from among a set of alternatives provided in addition to choosing the appropriate alternative from them. This research is also committed to some conditions that you cannot deviate from (Xiaowei Xu and Prasanta, 2010).

Objective programming methods in their various forms have sought to characterise problems by the presence of one target in them, but it is noted that most decision-making cases do not require the presence of one goal, but that they often require the presence of primary and secondary target levels, some of which complement each other (Xiaowei Xu and Prasanta, 2010).

For example, the target of raising the quality and level of service directly interferes with cost reduction, and therefore we will face a contradiction and a clear and acute problem, especially if the issue is limited to one target. It will also produce results that are not consistent with reality.

Therefore, a mathematical method was developed in 1952, which seeks to address the problem of linear programming with multiple targets, and this programming is called multi-target programming. With the passage of time this method has evolved to include the problems of non-linear programming and numerical programming. This treatment is consistent with the decision makers' desire to reach realistic solutions that approach a set of different targets. This means that programming aims in one way or another to deal with decisions that do not contain one target, but rather a set of goals, some important and some secondary (Thomas L. and Luis, 2006). Objectives may be conflicting and inconsistent and herein lies the importance of this

programming. It should be noted that this technology is as important and vital as providing a convincing solution to a decision maker in the absence of the best solutions.

The mechanism that controls the target programming method is based on directing the model to choose the values of decision-making variables that give the slightest deviations about the target. For example, if we assume that we seek to reach a specific target, it is natural that there will be multiple deviations around this target. These deviations are grouped around it with a degree of flexibility, and this flexibility helps to direct its value in the direction that achieves the desired target, (According to the limitations of the model) so that its values can be reduced in the direction that achieves the desired goal, and therefore two types of deviations can be assumed: - (Thomas L. and Luis, 2006).

Positive Deviations

Positive deviations are deviations whose values are higher than the target value. They are also called upper deviations.

Negative Deviations

Negative deviations are deviations whose values are less than the target value. They are also called lower deviations .

In both cases, the target programming method tends to reduce the values of these deviations, that is, the goal is to reduce the minimisation of the deviations.

Definition of the target programming method

Targeting programming is defined as a representation of the problem by means of the mathematical model, as it seeks to reach the nearest and easiest solutions provided by the goals. Therefore this mathematical model seeks to reduce the sum of deviations to the lowest possible extent, and therefore target programming can be seen as a mathematical model that seeks to achieve several goals within a specific decision environment. The decision environment is determined by the main elements of this model through decision variables and limitations. (Xiaowei Xu and Prasanta, 2010).

Objective Programming is Characterised by a Number of Features that Provide More Flexibility than Linear Programming (Burcu and Metin, 2011).

1. The ability to address decision-making problems by having one or several goals at the same time in an organised manner, and here it must be pointed out the importance of arranging objectives according to their importance in decision-making, as they are logically arranged and therefore we can summon target programming in sequential linear programming.
2. Objective programming is a successful way of dealing with the state of contradiction or the contradiction of multiple goals that cannot be fully achieved using the linear programming method.
3. Deviation variables are used for each target constraint imposed by the target level, and thus each constraint turns into equality where the goals are placed in the form of a mathematical equation representing a constraint that includes positive deviation and negative deviation.
4. Objective programming includes two types of restrictions:
    A - Object restrictions that contain the variables of positive deviation (Ui) and negative deviation (Vi) from the target.
    B - Real constraints (the constraints of linear programming) are considered absolute goals and failure to achieve them leads to an unacceptable solution.
5. The process of achieving the goals begins in a sequence from the goals with the highest priority (absolute) to the goals with the lowest priority. The process of setting priorities, or the relative importance of goals, is one of the important things in formulating the problem of programming goals, as an error in them leads to an incorrect solution.

General formula for the objectives programming model (Al-Ziyadi, 2003)

Min a = {P1 (d1-, d1 +), P2 (d2-, d2 +) ……. Pk (dk-, dk +)
Subject to:

$$\sum_{i=1}^{n} Cijxij + d\,i\_\ di = bi \qquad j = 1,2,\ldots\ldots\ldots m$$

$$di\,, di\ \geq 0 \qquad i = 1,2,\ldots\ldots\ldots n$$

As:
a = represents the completion function, k = the number of targets,
Xij = decision variables, bi = the value of the target function (i) in the target constraints, and in the non-target constraints are available resources.
Cij = coefficient of variables, n = number of variables, m = number of constraints, Pk = targets,
di- = deviation variable indicating the minimum achievement of the target function i
di + = deviation variable indicating the highest achievement of the target function i

Prioritised or Ranked Goal Method

The method of targets with weighted weights is characterised in practice from the difficulty of reaching accurate values for weights for each goal. For example, how does the company's management know that the importance of the goal of raising profits is twice the importance of the goal of avoiding the use of additional time.

The best solution to this difficulty is to use the priority method, i.e. setting a priority instead of weight, as the idea of this method depends on giving priority to the target in a degree commensurate with the administration's view of the importance of that (pi) for each variable variance. Thus (P1) is a priority given to the most important goals with the next priority being given p2 and the next p3. Where the target function is:
Minimise total deviation = p1 (d1-) + p2 (d2-) + P3 (d3 +) + P4 (d4-)
(Karim, 2012: 44).

Priorities and Goals

After defining the four goals, a comparison was made between them using the matchmaking method where the significance of each goal is compared to all other goals. The goal that appears the most number of times the largest gets the highest priority and so on to the rest of the goals (Burcu and Metin, 2011)

Second: Previous Studies

The topic of achieving multi-goal optimisation or (multi-goal decision-making) is one of the important topics, which took place on a large scale in many areas (industrial, commercial and economic .... etc.). The beginnings of this topic were in 1951, with (Kuhn & Tucker) publication of the first proposal on multi-goal optimisation problems using the optimisation vector concept (Kuhn and Tuker, 1951).

Also found in the works of (Charnes & Copper 1961) the beginnings of programming linear targets, which sought to find a way to solve the problem of linear programming, is not solvable and that arises from the interactions of source restrictions or targets.

(Sartoris and Spull, 1974) pointed to the use of one of the methods of achieving multi-objective optimisation (Goal Programming) in the field of administrative and financial planning by applying the current decision model for one period, which included two goals. Namely, maximising cash liquidity and profit.

The researchers (Jimenes et al., 2006) published a paper on the problems of multi-objective fuzzy linear programming with the presence of fuzzy numbers. The research included how to use the best methods to solve the flexible problem of multi-objective linear programming with the presence of fuzzy parameters so that it gives the best satisfactory solutions to the decision maker.

The researchers (Burcu and Metin, 2011) concluded using a common concept of device selection through the use of the F-PROMETHEE method that uses a technique to evaluate multiple criteria in device selection and the use of the results of this method as limitations in building a target programming model (A zero - one). The researchers have proven successful in how the ZO GP model is associated with the F-PROMETHEE method and used for a real world application problem as an aid for equipment selection.

The researcher (Gang, 2012) developed using the fuzzy aiming programming method based on the researcher model (Tiwari et al., 1987) in which the collective model method (An additive Model) and various models for solving fuzzy goal programming have been proposed. One of the well-known models was proposed by Tiwari et al. in 1987, model that deals with the sum of weighted negative deviations between the desirable achievement degree and the common target. Here, properties of the model are proposed., and the researcher has prepared the characteristics of the proposed model and its numerical application.

The Third Topic: The Applied Side

The main objective of the research is to build a mathematical model for planning investment in the National Bank, in order to achieve the bank's goals and its multiple purposes by achieving the highest possible return and at the same time reducing the risk standard:

Study Data

In order to determine the optimal investment plan for the bank, the researcher made a set of repeated visits to the bank in order to obtain the required data, in order to determine the transactions of the multi-purpose programming model, which can be summarised in the following table:

Table 1: Multivariate programming model operands

No Investment type demand	Rate of return	Investment risk	Investment
1 Accounts receivable	0.11	Yes	36 (million)
2 Discounted commercial papers	0.15	Yes	20 (million)
3 Short term loans	0.11	Yes	10 (million)
4 Long term loans	0.15	Yes	10 (million)

5 Other credit	0.06	Yes	110 (million)
6 Credits	0.14	NO	23 (million)
7 Letters of guarantee	0.14	NO	125 (million)
8 Treasury transformations (million)	0.05	NO	109
9 Night investments	0.05	NO	20 (million)
10 Letters of credit	0.12	NO	48 (million)
11 Around	11 Around	NO	47 (million)
12 Sell dollars	0.01	NO	30 (million)

In order to build the multi-purpose model, the following was defined:

First: Decision Variables

The decision variables for the studied problem are:

Cash Credit Includes

X1: Receivables current accounts
X2: Discounted commercial papers
X3: Short term loans
X4: Long term loans
X5: Other loans

Undertaking Credit, which Includes

X6: Credits
X7: Letters of guarantee

Financial Investments, which Include

X8: Treasury diary
X9: Night investment

International Credit and Includes

X10: Documentary credits
X11: Yearbook
X12: Sell dollars

As for the model parameters, they are:

Cij = 1…….12: The coefficients of the function represent the first goal, which is the return per investment, as in Table 1.

C2j: Represents the investment risk standard which is equal to 5% of the value of the allowed investment amount.

bi ,J = 1 , 2,……17 ,: the right side of the restrictions, which represent investment demand and available capital.

Second: Formulating the First Goal Function

This represents the expected return to obtain maximising return, and is written in the following format:

Max Z1 = 0.11X1 + 0.15X2 + 0.11X3 + 0.15X4 + 0.06X5 + 0.14X6 +0.02X7+ 0.05X8 + 0.12X9 + 0.11X10 + 0.01X11

Third: Formulation of the Function of the Second Goal:

This represents the expected amount of investment risks, and there are multiple methods in calculating the risk criterion. The researcher relied on the ratio of the risk standard based on the opinion of the bank's administration, which represented (0.05)

Min Z2 = 0.05X1 + 0.05X2 + 0.05X3 + 0.05X4 + 0.05X5

Fourth: Writing the Limitations of the Problem

1. Entry of the total portfolio, where the total investment amounted to (930) million:

X1 + X2 + X3 + X4 + X5 + X6 + X7 + X8 + X9 + X10 + X11 + X≤930000000

2. Cash credit is recorded, as the total amount allocated for cash investment in the bank reaching 97 million:

X1 + X2 + X3 + X4 + X5 ≤ 97,000,000
X1 ≥ 36,000,000
X2 ≥ 20,000,000
X3 ≥ 10,000,000
X4 ≥ 10,000,000
X5 ≥ 11,000,000

3. Entrepreneurial credit restrictions, where the total amount allocated to the pledge investment is 280 million:

X6 + X7 ≤ 2800000000
X6 ≥ 23,000,000
X7 ≥ 125 000,000

4. Restrictions on financial investments, as the total amount allocated to financial investments is 148 million:

X8 + X9≤ 148000000
X8 ≥ 109,000,000
X9 ≥ 20,000,000

5. Restrictions on the international section, where the total amount allocated to the international section is 380 million:

X10 + X11 + X12≤ 380 million
X10 000000 48,000,000
X11 ≥ 47,000,000
X12≥ 300 million

As for the conditions of non-passivity: X1, X2, ……., X12 ≥0

Fifth: Solving the Problem

Using the ready program (win QSB), the target programming model was solved above to find the decision variables and target functions. The following results were obtained:

1. Resolution variables:

X1 = 47,000,000, X2 = 20,000,000, X3 = 11,000,000, X4 = 10,000,000, X5 = 11,000,000, X6 = 17,000,000,000, X7 = 12,000,000,000, X8 = 119,000,000, X9 = 44,000,000, X10 = 44,000,000, X11 = 53,000,000, X12 = 31,000,000

2. Target Functions

Z1 = 70000000, Z2 = 4000000

Conclusions

1. The different goals (increasing in revenue and reducing risk) cannot be considered as restrictions in relation to the high adequacy of the problem of dealing with target programming, but it can be noted that the two goals (reduce investment risk and maximising return) are considered natural constraints in the programming environment.

2. The objectives extracted in the bank are not convincing, but with the use of target programming technology in planning, it will give better results for decision makers
3. We suggest that the National Bank adopt targeted programming technology in its management of the bank as it is programming that leads to better results and solutions.

Recommendations

1. Working on the use of modern statistical techniques in the banking field, because it saves a lot of time, effort and money.
2. The need to adopt the banking system for modern methods and strategies that its management can enable to develop business continuously.
3. Adopting trends and attending conferences and workshops that shed light on the most important tools for developing banks and increasing their profits.

REFEENCES

Conning, Jonathan, and Christopher Udry. "Rural financial markets in developing countries." *Handbook of agricultural economics* 3 (2007): 2857-2908.

Greenbaum, Stuart I., Anjan V. Thakor, and Arnoud WA Boot. *Contemporary financial intermediation*. Academic Press, 2019.

Lindsey, Tim, and Simon Butt. "Indonesian financial laws: banking, insolvency and taxation." *Research Handbook on Asian Financial Law*. Edward Elgar Publishing, 2020.

Ho, William, Xiaowei Xu, and Prasanta K. Dey. "Multi-criteria decision making approaches for supplier evaluation and selection: A literature review." *European Journal of operational research* 202.1 (2010): 16-24.

Saaty, Thomas L., and Luis G. Vargas. *Decision making with the analytic network process*. Vol. 282. Springer Science+ Business Media, LLC, 2006.

-BurcuYilmaz ,MetinDegdeviren(2011) "A Combined Approach for Equipment Selection : F –PROMETHEE method Zero –one Goal Programming " , Expert system with Application 38 , pp: 11641-11650 .www.ivsi.org

- Charnes A.& Copper, W.W., (1961)"Management the Industrial Applications of Linear Programming " , John Wiley, New York .

-Famuyiwa Oluwafemi.,LeslieMonplatsir and Bimal Nepal (2008), "An integrated Fuzzy – Goal – Programming – based framework for selecting suppliers in strategic Alliance .Formation "Int.J.ProductionEconomicsVol.113 ,PP:862-875.

-Gang Li (2012) ," Fuzzy goal programming – A Parametric Approach" ,Information Sciences 195 ,pp :287-295 , www.ivsi.org.

-Jimenz ,M., Arenas ,M., Bilbao, A. and Rodrigues , M.V.(2006) "Solving Afuzzy Multi objective Linear Programming Problem through the Value and the Ambiguity of fuzzy Numbers " MopGp 06 :7th ,Int. Conf. in Multi-objective Programming and Goal Programming ,www.ivsl.org.

-Kuhn , H.W and Tucker , A.W (1951), "Nonlinear Programming ",

J.Nymon (ed) pp.481-491 , VRL

-Taha , Hamdy A., (2011)"Operations Research An Introduction "ed- 9th, Inc , Publishing as prentice Hall.

-Wan – Lung , Stephen C.tl – Leung , 2007 , " Agoal Programming Model for Production Planning of Perishable Products with Postponement" Journal of Computer and Industrial Engineering , Vol.53,Issue .3 , pp. 5-10