Budget allocation modeling for Isfahan municipality

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Abstract

The goal programming enables organization managers to make better decisions and provides the least deviation from objectives for optimal allocation of budget. The present study deals with the budget allocation of Isfahan municipality with the help of goal programming. So, it is practical in terms of purpose and is descriptive analytical in stating the results. Therefore, the municipality aims were firstly determined to allocate the current budget; so, prioritization of the goals in budget and plan organization was performed by helping the survey of experts in Isfahan municipality and then, the importance of each goal was determined during the hierarchical analysis. In the second stage, the budget allocation model was formulated by combining the weight of goals, appropriation allocated in years 2012 to 2014 and budget approved in 2015 that this data was collected from the budget office of Isfahan municipality, and solved and analyzed with the help of GAMS software; the results showed that which goals have been realized and which goals have (positive or negative) deviations, and finally ten percent change of budget approved in 2015 and its impact on undesirable deviations were investigated.

Keywords: Current budget, Expense reduction, Goal programming, Budget allocation.

1 This study is the conclusion of a memorandum of understanding with Esfahan municipality.
1. Introduction

Budget is the most important financial document of each organization and usually specifies the annual program related to revenue, expenses and the path to achieve the goals of the organization. The optimal allocation of resources is the most important long-term administrative tool of each organization [1, 2]. One of the primary concerns among most governmental agencies is to have appropriate budget approved as early as the beginning of each fiscal year. A good operating budget motivates managers to do their best to reach their objectives while an inappropriate budget could virtually hurt managers’ motivations [3]. Municipalities will not be able to effectively manage cities without the budget management and various revenues. Therefore, addressing issues such as the optimal allocation of budget and reducing the costs associated with them are raised. The municipal budget should be regulated based on programs, tasks, various activities and expenses of each activity. This classification is notable that makes possible the precise control of expenses and provides the possibility of precise and sound estimation of the budget, provides the possibility of comparing the costs conducted with the progress of the work for management and helps to its timely correct decisions, and ultimately emphasizes on aspects of accounting in finance administration[4,5].

Considering the government policies and announcing the self-sufficiency of municipalities and dependency of municipalities to government resources, the importance and necessity of considering the reduce of current expenses are evident [6]. Therefore, the aims of this research for budget allocation include reducing the personnel expenses, reducing the administrative expenses, increasing the capital expenditures, reducing the deferred expenses, and reducing the current budget. Due to the mentioned conflicting goals, some limitations require the detailed knowledge to design an efficient and effective budget allocation model that establishes a balanced harmony between annual objectives; given the importance of construction budget in development and prosperity of cities, organization will be able to optimally allocate the financial resources to the construction appropriation with the optimal allocation of current budget.

The most important efforts to achieve the optimal allocation of resources is programming. Planners can systematically review some relations between factors by using the models. Goal programming is a linear mathematical model in which accessing to the optimal goals is examined with regard to the existing limitations and decision-making conditions. In this model, decisions limitations and conditions, deviation from the goals and decision variables are the principal components of programming model [7, 8]. In the study, this model has been used for the current budget allocation. The main purpose of this article is to present a suitable model for optimal allocation of current budget in Isfahan municipality that helps the decision-makers of the municipality to predict the annual budget for the accessibility to organization's objectives.

2. Research background:

The process of operation research (OR) is used as the application of a scientific approach to optimization [9]. The goal programming (GP) technique has become a widely used approach in Operations Research (OR). GP model and its variants have been applied to solve large-scale multi-criteria decision-making problems. The GP technique was first used by Charnes and Cooper in 1960s. This solution approach has been extended by Ijiri (1965), Lee, and others. The Goal Programming Method is an improved method for solving multiobjective problems[10,11]. Chowdary and Slomp considered goal programming as an appropriate powerful and flexible technique for decision analysis of the troubled modern decision maker who is burdened with
achieving multiple conflicting objectives under complex environmental constraints [12]. The extensive surveys of goal programming by Schniederjans, Tamiz, et al, and Aunis and Kettani, have reflected this [13, 14]. Wikipedia described goal programming as a branch of multiple objective programming (MOP), which in turn is a branch of multi-criteria decision analysis (MCDA), also known as multiple criteria decision making (MCDM). It is also thought of as a generalization of linear programming to handle multiple conflicting objective measures. Each of these measures is given a goal or target value to be achieved [15].

Contini proposed stochastic goal programming (SGP) model. He considered the goals as uncertain variables with normal distribution, that the model maximizes the probability that the consequence of the decision will belong to a certain region encompassing the uncertain goal. Thus, this model tries to generate a solution that is close to the uncertain goals [16]. Keown and Taylor proposed an adoption of the chance constrained for stochastic goal programming model and transforms the model to a non-linear program, and applied it to budget allocation production problem [17]. Dade applied goal programming in revenue budgeting. He pointed out that the concern with the process and outcome of the budgeting has regulated the revenue constraint to a position co-equal with variables [18]. Easton and Rossin proposed a stochastic goal programming model for employee scheduling problem. Their model integrated the labour requirements and scheduling decision. They pointed out that this approach allowed reaching satisfactory result [19].

Shafer and Rogers used goal programming model for formation of manufacturing cells. Minimum setup time, minimum intercellular movements, minimum investment in new equipment and maintaining acceptable utilization levels were identified as the multiple objectives [20]. Nagarur, et al illustrated the use of zero-one goal programming for the development of a production planning and scheduling model in an injection molding factory with an objective to minimize the total cost of production, inventory and storages [21]. Hillier and Lieberman concluded that goal programming and its solution procedures provide an effective way of dealing with problems where management wishes to strive towards several goals simultaneously. The key is a formulation technique of introducing auxiliary variables that enable converting the problem into a linear programming format [22].

Arora and Klabjan in their research provided a purposeful optimal allocation model for multi-unit libraries that its aim was purposeful and appropriate allocation of resources for intended library units [23]. Baneshi designed a model for optimal allocation of development budgetary resources by using the goal programming approach that direction of the objective function of this model is to minimize the deviations from determined targets [24]. Jafari et al formulated goal programming model for rice firm. In their study, the lexicographic goal programming model was considered to identify the optimal compound of agricultural product in the rice farm land [25].

Libby and Lindsay presented the results of two surveys of mid- to large-sized North-American organizations to update the literature on North-American budgeting practices, to collect empirical evidence to evaluate the criticisms, and to start to detect strong tendencies or patterns in budgeting practice to inform future academic research. They reported that the majority of companies that budgets continue to apply for control purposes [26]. Azar, et al dealt with the allocation of credits to small businesses with quick return in major economic sectors (agriculture, industry and services) by using the goal programming model. Some intended purposes include maximizing the economic participation rate in each province, minimizing the number of unemployed in each province, minimizing the unemployment rate in each province and etc. [27]. Zhang et al discussed the multinational capital budgeting problem to choose appropriate project where there were some candidate foreign projects. In their work, special cash flows and value sources of foreign projects were investigated. The work proposed one new uncertain zero–one integer model for optimal multinational project selection and
to handle the resulted problem, a hybrid intelligent algorithm integrating the 99 Methods and genetic algorithm was provided[28].Roper and Ruckes analyzed the optimal capital budgeting mechanism when divisional managers were privately informed about the arrival of future investment projects[29]. Hosseini investigated optimal allocation of construction budget in Isfahan municipality where goal programming model used and it has been attempted to assign budget restrictions to the non-priority sector in case of the goals of the model, the impact of the development budget lines in achieving the goals of a city development strategy and the realization of the goals would be determined by the current budgeting method. In this model, eight budgetary goals and objectives were included in construction strategies [30].

Mousavi Moghaddam, et al provide a model for optimal allocation of financial resources and choosing the projects in water and sewage organization of Mashhad by using the goal programming. The objectives of this model include reducing costs, speed of the implementation, the implementation of the projects according to distinct budgets [31].Dan Dan and Desmond studied the budget allocation at the Emory University in the state of Emo by using the weight goal programming model. In this model, the goals of increasing personnel costs, reducing overhead costs, increasing capital expenditure and reducing total budget were considered that results of the study show that the first, third and fifth goals are achieved with the optimization of objective function, but the third and fourth goals are not met[32].

3. Objectives of the study are as follows:
1- Presenting the scientific model to the current budget allocation
2- Prioritization of each season of the current budget with respect to the objectives of municipality in the current budget allocation
3- Identification of the goal restrictions
4- Applying the goal programming to find a compromise solution between conflicting goals of Isfahan municipality

4. Research hypothesis:
There is no hypothesis, because the research method is descriptive and the purpose of this study is to answer the research questions.

5. Research methodology:
A) The present study is considered a kind of case analysis based on the current budget allocation that its statistical population is Isfahan municipality,

And since it deals with modeling the budget and inferential method is descriptive-analytical, there is no sampling; so, population and sample will overlap on each other. And information contained in performance statement of the years 2012 to 2014 and information approved budget of 2015 in Isfahan municipality have been used as statistical data. Also, expert assistance, planning, data research and technology of Isfahan municipality were considered as the expert statistical population about the surveys of experts for prioritization of the goals. The basis for selecting of these people is that they were involved in budgeting issues and budget allocation.
B) Data analysis:

This study used the goal programming model for the current budget allocation that this allocation has been conducted in a two-step analysis.

1) Goal programming: the process of modeling is focused on goals like the profit background or cost minimization in formulating and solving the linear programming problems, but limiting the organizational goals to one goal is not a good thing in many successful decision-making of the real world; therefore, a more credible method has been created to complete the programming method which called goal programming [33]. Goal programming includes conflicting goals and provides optimal response with respect to priorities of objectives in decision-makers viewpoints. It is obvious that there is not always the possibility of realizing each determined targets, thus the decision-makers will be required to focus their attempts on satisfactory level of several ideas in goal programming instead of achieving to an optimal result for an ideal [34].

The overall form of goal programming is as equation (1):

\[\text{minimize } Z = \sum_{i=1}^{m} P_i (d_i^+ + d_i^-) \quad (1)\]

subject to:

\[\sum_{j=1}^{n} (a_{ij} x_j + d_i^- - d_i^+) = b_i \]

\[(i = 1, 2, ..., m) \quad (j = 1, 2, ..., n) \quad d_i^+, d_i^-, x_j \geq 0\]

In which \(d_i^+\) is positive deviant variable and value of goal \(i\) is more than the ideal value.

\(d_i^-\) is negative deviant variable and value of goal \(i\) is less than the ideal value.

\(x_j\) Are decision variables.

\(a_{ij}\) Are coefficients of decision variables.

In many practical situations, deviations from specific ideals may be more important than the deviation from other deviations. The weight variables of \(w_i^+\) and \(w_i^-\) can be allocated to \(d_i^+\) and \(d_i^-\) variables respectively for such possible situations. Therefore, goal programming is written as equation (2):

\[\text{minimize } Z = \sum_{i=1}^{m} \{w_i^+ d_i^+ + w_i^- d_i^-\} \quad (2)\]

1) The weights method.
2) The Preemptive method.

**The weights method**

In the weights method, the single objective function is the weighted sum of the functions representing the goals of the problem.

The **weights** goal programming model is of the from:

\[\text{minimize } \sum_{i=1}^{n} [(w_i^+ + w_i^-) d_i] \quad (3)\]
s.t:  
\[ \sum_{j=1}^{m} (a_{ij}x_j + d^{-i}_j - d^{+i}_j) = g_i \]  
\((i = 1,2, ..., n) \quad (g = 1,2, ..., m) \quad d^{+i}, d^{-i}, xj \geq 0\)

Where \(w^+_i\) and \(w^-_i\) are non-negative constraints and can be real numbers representing the relative weights assigned within a priority level to deviational variables.

The parameter \(w^+_i\) represents positive weights that reflect the decision maker's preference regarding the relative importance of each goal; while \(w^-_i\) is the negative weights of the decision maker's preference. The determinant of the specific values of these weights is subjective.

The pre-Emptive Method

In this method, the decision maker must rank the goals of the problem in order of importance. The model is then optimized using one goal at a time such that the optimum value of a higher priority goal is never degraded by lower priority goal. This variant is known as lexicographic goal.

The proposed pre-emptive model is given as:

\[ \text{minimize} \quad Z = \sum_{i=1}^{n} p_i (d^{+i} + d^{-i}) \]  
\[ \text{s.t:} \quad \sum_{j=1}^{m} (a_{ij}x_j + d^{-i}_j - d^{+i}_j) = g_i \]  
\((i = 1,2, ..., n) \quad (j = 1,2, ..., m) \quad d^{+i}, d^{-i}, xj \geq 0\)

Where \(P_i\) is the preemptive factor/priority level assigned to each relative goal in rank order (that is \(P_1 > P_2 > \ldots > P_n\)).

The weights goal programming and the preemptive or lexicographic goal programming can be combined in a model, for example weighted lexicographic goal programming. The weights and rank model according to Kwak et al (1991) is given by

\[ \text{minimize} \quad Z = \sum_{i=1}^{n} p_i \sum_{i=1}^{n} \left\{w^{+i}_{ik}d^{+i}_i + w^{-i}_{ik}d^{-i}_i \right\} \]  
\[ \text{s.t:} \quad \sum_{j=1}^{m} (a_{ij}x_j + d^{-i}_j - d^{+i}_j) = g_i \]  
\((i,k = 1,2, ..., n) \quad (j = 1,2, ..., m) \quad d^{+i}, d^{-i}, xj \geq 0\)

Where \(d^{+i}_i\) and \(d^{-i}_i\) are deviational variables;  
\(X_i\) = decision variables;  
\(a_{ij}\) = decision variable coefficients,  
\(w^{+i}_{ik}\) and \(w^{-i}_{ik}\) are non-negative constraints representing relative weights;  
\(P_i\) = Preemptive factor or/ priority level assigned to each relevant goal in rank order (that is \(p_1 > p_2 > \ldots > p_n\)).

3) Structure of the model: The proposed model of the research deals with the issue of conflicting objectives in the current budget allocation of municipality that these goals include reducing
personnel expense, reducing administrative expense, increasing the capital expenditure, reducing deferred expense, reducing the current budget. Some features of the model are as follows [35].

This model is linear and has been provided based on goal programming of the weight kind. So at the beginning of the year, it is capable to determine the positive deviations (more success than goals) and negative deviations (less success than goals). And finally due to set of conflicting goals and performance of the previous years of municipality, it is specified that which ideal (allocations approved in the New Year) is achievable and which ideals should be re-examined and modified.

Mathematical expression of the proposed model is as follows:

\[
\text{Min}(Z) = w_1 d_1^- + w_2 d_2^- + w_3 d_3^- + w_4 d_4^- + w_5 d_5^- \quad (6)
\]

s.t:

\[
\forall i \sum_{j=1}^{m} (a_{ij} x_j + d_i^- - d_i^+) = b_i
\]

\((i = 1,2,3,4,5) \quad (j = 1,2,3) \quad x_j, d_i^+, d_i^-, \geq 0\)

Z: Total undesirable deviations

Wi: Relative importance of goals

\(x_j\): Decision variables

\(a_{ij}\): Appropriation allocated to different chapters (coefficients of decision variables)

\(d_i^+\): Positive deviation

\(d_i^-\): Negative deviation

\(g_i\): Budget approved to the current chapters

i: Goals of the model (personnel expense, administrative expense, capital expenditure, deferred expense, total current budget)

J: Financial year (2012 to 2014)

4- Description of the model:

At first, the objective function is stated, and finally restrictions of the model are defined with respect to

Credits allocated and ideals planned (budget approved).

The objective function in model (6) is a relationship that states the aim of the organization in form of decision variables, and because a certain numeric value is considered as an ideal for each restriction in goal programming and the aim is to achieve the ideal, so objective function of this model minimizes the weighted sum of the deviations from the goals.

The first restriction (\(i=1\)) shows that as municipalities aim at more allocation of reducing the personnel expense, so sum total of appropriation allocated for personnel expenses in the years 2012 to 2014 should be less than or equal to budget approved in 2015 (the goal planned) and \(d_1^+\) is undesirable deviation and is entered to the objective function.
The second restriction (i=2) like the first restriction shows that sum total of credits allocated for administrative expenses in related timeframe should be less than or equal to budget approved (the ideal planned) and $d^+_2$ is entered to the objective function.

The third restriction (i=3) is in line with the purpose of increasing the capital expenditure which shows that the total appropriation allocated for capital expenditure in the year 2012 to 2014 should be greater than or equal to budget approved and $d^+_3$ is undesirable deviation and is entered to the objective function.

The fourth restriction (i = 4) shows that sum total of appropriation allocated to the expense of deferred the intended timeframe should be less than or equal to budget approved (the goal planned) and $d^+_4$ is entered to the objective function.

The fifth restriction (i=5) shows that as the task of municipality is development and prosperity of cities, it should strive to reduce the current budget and increase the construction budget, and sum total of credits allocated for the total current budget should be less than or equal to the related budget approved of this purpose and $d^+_5$ is entered to the objective function.

Values related to the goals ($g_i$) and values related to the coefficients of decision variables ($a_{ij}$) have been extracted from the documents of Isfahan municipal budget.

<table>
<thead>
<tr>
<th>Row</th>
<th>Allocation in year (Million Rials )</th>
<th>Budget Approved (Million Rials )</th>
</tr>
</thead>
<tbody>
<tr>
<td>chapters</td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>personnel expense</td>
<td>595,912</td>
<td>823,488</td>
</tr>
<tr>
<td>administrative expense</td>
<td>693,954</td>
<td>999,425</td>
</tr>
<tr>
<td>capital expenditure</td>
<td>22,616</td>
<td>37,396</td>
</tr>
<tr>
<td>deferred expense</td>
<td>34,145</td>
<td>505,197</td>
</tr>
<tr>
<td>Current budget</td>
<td>1,653,933</td>
<td>2,365,508</td>
</tr>
</tbody>
</table>

Table (1): Coefficients of decision variables

<table>
<thead>
<tr>
<th>Row</th>
<th>chapters</th>
<th>Budget Approved (Million Rials )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>personnel expense</td>
<td>1,185,410</td>
</tr>
<tr>
<td>2</td>
<td>administrative expense</td>
<td>1,855,810</td>
</tr>
<tr>
<td>3</td>
<td>capital expenditure</td>
<td>227,305</td>
</tr>
<tr>
<td>4</td>
<td>deferred expense</td>
<td>1,728,875</td>
</tr>
<tr>
<td>5</td>
<td>Current budget</td>
<td>4,997,400</td>
</tr>
</tbody>
</table>

Table (2): Goals

So, mathematical expression of the purposes is as follows:

(1) $595,912x_1 + 823,488x_2 + 999,530x_3 \leq 1,185,410$ (restriction personnel expense)
(2) $693,954x_1 + 999,425x_2 + 1,661,082x_3 \leq 1,855,810$ (restriction administrative expense)
(3) $22,616x_1 + 37,396x_2 + 157,638x_3 \geq 227,305$ (restriction capital expenditure)
(4) $341,450x_1 + 505,197x_2 + 1,157,617x_3 \leq 1,728,875$ (restriction deferred expense)
(5) $1,653,933x_1 + 2,365,508x_2 + 3,976,869x_3 \leq 4,997,400$ (restriction total current budget)

6. Findings: The results of the prioritization of objectives which collected with the help of questionnaires based on analytical hierarchical paired comparison (AHP) technique is as follows:

http://www.ijhcs.com/index.php/ijhcs/index
Table 3 shows that the objectives in order of importance are reducing the total current budget, increasing the capital expenditure, reducing the deferred expense, reducing the administrative cost, and reducing the personnel expense.

Finally, the model becomes as follows by placing numbers of Table 3 in objective function:

\[
\text{Min } (z) = 0.075d_1^+ + 0.112d_2^+ + 0.266d_3^+ + 0.175d_4^- + 0.372d_5^-
\]

And about restrictions of the model: by adding the positive deviation \((d_i^+)\) and negative deviation \((d_i^-)\) to the left side of inequality, restrictions are become to equal and model is solved by using the GAMS software. And the results obtained of implementing the model is as follows:

<table>
<thead>
<tr>
<th>Row</th>
<th>variable</th>
<th>Variable definition</th>
<th>Optimal value (Million Rials)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(x_3)</td>
<td>Budget approved 2015 compliance with (real value year of (j))</td>
<td>1.117</td>
</tr>
<tr>
<td>2</td>
<td>(Z)</td>
<td>Total undesirable deviations</td>
<td>136156</td>
</tr>
<tr>
<td>3</td>
<td>(d_1^+)</td>
<td>Positive deviation from personnel expense</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>(d_1^-)</td>
<td>Negative deviation from personnel expense</td>
<td>68704.9</td>
</tr>
<tr>
<td>5</td>
<td>(d_2^+)</td>
<td>Positive deviation from administrative expense</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>(d_2^-)</td>
<td>Negative deviation from administrative expense</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>(d_3^+)</td>
<td>Positive deviation from capital expenditure</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>(d_3^-)</td>
<td>Negative deviation from capital expenditure</td>
<td>51186.5</td>
</tr>
<tr>
<td>9</td>
<td>(d_4^+)</td>
<td>Positive deviation from deferred expense</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>(d_4^-)</td>
<td>Negative deviation from deferred expense</td>
<td>435551</td>
</tr>
<tr>
<td>11</td>
<td>(d_5^+)</td>
<td>Positive deviation from current budget</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>(d_5^-)</td>
<td>Negative deviation from current budget</td>
<td>554325</td>
</tr>
</tbody>
</table>
Table 4 shows:

1) $X_3$ : It tells us if we want the personnel expense of less than 1 is 1,185,410, administrative expense of less than 1 is 1,885,810, capital expenditure is more than 227,305, deferred expense of less than 1,728,875, the total current budget of less than 4,997,400 million rials in year 2015, we should cost 1.117 times more than the appropriation allocated in 2014.

2) Because the value of $Z$ (total undesirable deviations) is not equal to zero, at least one of the goals (values of budget approved in year 2015) have been violated.

3) $d_1^+$ Shows the value of budget approved for personnel expense with having the surplus and $d_1^-$ indicates that the budget approved of personnel expense have deficiency, so the goal related to personnel cost (budget approved in 2015) has been violated. However, since the aim of organization is to reduce the personnel expense, we can say that this deficiency is satisfactory.

4) $d_2^+$ And $d_2^-$ indicate that the goal related to administrative expense has been realized.

5) $d_3^+$ Shows that the goal related to capital expenditure has deficiency (realization is less than the expectation) and has not been realized, but because the aim is to increase the capital expenditure, this deficiency is not satisfactory.

6) $d_4^+$ Shows that the goal related to defer expense has deficiency and has not been realized, but because the aim of organization is to decrease the deferred expense, this deficiency is satisfactory.

7) $d_5^+$ Shows that the goal related to the total current budget has deficiency as well and has not been realized, but because the aim is to decrease the total current budget, this deficiency is satisfactory.

<table>
<thead>
<tr>
<th>Row</th>
<th>Chapters budget</th>
<th>Budget Approved 2015 (million rials)</th>
<th>optimal budget 2015 (million rials)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>personnel expense</td>
<td>1,185,410</td>
<td>1,395,184</td>
</tr>
<tr>
<td>2</td>
<td>administrative expense</td>
<td>1,855,810</td>
<td>1,185,810</td>
</tr>
<tr>
<td>3</td>
<td>capital expenditure</td>
<td>227,205</td>
<td>108,596</td>
</tr>
<tr>
<td>4</td>
<td>deferred expense</td>
<td>1,728,875</td>
<td>1,071,319</td>
</tr>
<tr>
<td>5</td>
<td>total current budget</td>
<td>4,997,400</td>
<td>4,431,375</td>
</tr>
</tbody>
</table>

Graph (2): Description goals values with optimal values

Table (5): comparison optimal budget with budget approved
Considering the implementation results of the model, it can be said that if we wish to have the least value of deviation from the budget chapters at the end of year, values of the real budget should be as Table 5. So, the model is able to anticipate the possible surplus or deficit at the beginning of the
year according to the performance of previous years and help to decision makers in municipalities for anticipation of the budget.

6-1- Sensitivity analysis: The main objective of the sensitivity analysis is to identify the quietly sensitive parameters that their estimation to be more carefully performed. This research is in relation to the budget allocation and increase or decrease of budget approved effect on deviations. Therefore, analysis of the right side values of restrictions (budget approved 2015) is performed in a such way that when the right side value of a restriction decreases 10 percent or increases 10 percent, provided that the other restrictions remain constant, how change the optimal value of z and deviations that this analysis has been dynamic sensitivity [36], by using GAMS software in the research.

<table>
<thead>
<tr>
<th>Name restriction</th>
<th>personnel expense</th>
<th>administrative expense</th>
<th>capital expenditure</th>
<th>deferred expense</th>
<th>Current budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right value restriction reducing 10% (gi * 0.9) (Million Rials)</td>
<td>1066869</td>
<td>1670229</td>
<td>204484,5</td>
<td>1555987,5</td>
<td>4497660</td>
</tr>
<tr>
<td>Changes in decline after (Million Rials)</td>
<td>x1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>x2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>x3</td>
<td>1.067</td>
<td>1.006</td>
<td>1.117</td>
<td>1.117</td>
</tr>
<tr>
<td></td>
<td>z</td>
<td>15706.3</td>
<td>18300.4</td>
<td>7569292</td>
<td>13615.6</td>
</tr>
<tr>
<td></td>
<td>d1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d3</td>
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</tr>
<tr>
<td></td>
<td>d4</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d5</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d1'</td>
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<td>180375</td>
<td>68704,9</td>
<td>68704,9</td>
</tr>
<tr>
<td></td>
<td>d2'</td>
<td>82820,7</td>
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<tr>
<td></td>
<td>d3'</td>
<td>59046,3</td>
<td>68798,3</td>
<td>28456,0</td>
<td>51186,5</td>
</tr>
<tr>
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<td>d4'</td>
<td>493269</td>
<td>564883</td>
<td>435551</td>
<td>262663</td>
</tr>
<tr>
<td></td>
<td>d5'</td>
<td>752610</td>
<td>998632</td>
<td>554325</td>
<td>554325</td>
</tr>
</tbody>
</table>

Table (6): budget approved2015 reducing 10%

According to Table 6:
Row 1) shows that the objective function (z) 15% increases by reducing the ten percent of budget approved: personnel expense since the main purpose is to minimize the adverse deviations, this reducing is undesirable. As well as, the negative deviations of personnel expense become zero by ten percent decreasing the budget approved of personnel expense.

Row 2) shows that the objective function 34% increases by reducing the ten percent of the budget approved of administrative expense, so it does not align with the objective function and is undesirable and increases the sum of the adverse deviations.
Row 3) shows that the capital expenditure of the total adverse deviations \((z)\) decreases 44% by reducing the ten percent of budget approved, so it is align with the objective function (minimizing the adverse deviations).

Row 4) shows that the objective function does not change by reducing the ten percent of the deferred expense. Although the total adverse deviations do not change, the negative deviations reduce to the deferred expense.

Row 5) shows that the sum value of adverse deviations \((z)\) does not change by reducing the ten percent of the total current budget, but the negative deviations reduce to the current budget.

<table>
<thead>
<tr>
<th>Name restriction</th>
<th>personnel expense</th>
<th>administrative expense</th>
<th>capital expenditure</th>
<th>deferred expense</th>
<th>Current budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right value restriction reducing 10% ((g_i * 1.1)) (Million Rials)</td>
<td>1066869</td>
<td>1670229</td>
<td>204484,5</td>
<td>1555987,5</td>
<td>4497660</td>
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<tr>
<td>(x_1)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(x_2)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(x_3)</td>
<td>1.117</td>
<td>1.186</td>
<td>1.117</td>
<td>1.117</td>
<td>1.117</td>
</tr>
<tr>
<td>(z)</td>
<td>13615,6</td>
<td>10733,3</td>
<td>19661,9</td>
<td>13615,6</td>
<td>13615,6</td>
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<td>0</td>
</tr>
<tr>
<td>(d^+_2)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(d^+_3)</td>
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<tr>
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<tr>
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<tr>
<td>(d^-_4)</td>
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<td>(d^-_5)</td>
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<td>554325</td>
<td>554325</td>
<td>1054060</td>
</tr>
</tbody>
</table>

Table (7): budget approved increasing 10% 1394

According to Table 7:
Row 1) indicates that the value of objective function does not change by increasing the ten percent of budget approved of personnel expense, but the negative deviations increase to personnel expense.
Row 2) indicates that the value of objective function 21% decreases by increasing the ten percent of budget approved of administrative expense, so this increase is desirable and is align with the objective function (minimizing the adverse deviations).
Row 3) indicates that the value of objective function 44% increases by increasing the ten percent of budget approved of capital expense.
Row 4) indicates that the value of objective function does not change by increasing the ten percent of budget approved of deferred expense, but the negative deviations increase 13% to transmission expense.

Row 5) indicates that the value of objective function does not change by increasing the ten percent of budget approved of the total current budget, but the negative deviations increase 90% to the total current budget.

7. Discussion and conclusion:

Principle art of goal programming is to consider the constraints and goals along with decision variables as well as eliminate and fade out the weak human arguments during planning. This art will have the special effects if we are looking to optimize the several simultaneous factors. In the present study, the optimal allocation of the current budget in Isfahan municipality was studied by using the goal programming. In this model, compliance of the budget forecast for Isfahan municipality in year 2015 was evaluated with each years of 2012 to 2014, and the impact of these years was examined on chapter’s parameters values of the current budget, and the rate of budget deviations was obtained. which its parameters include personnel expense, administrative expense, capital expenditure, deferred expense, and the total current budget which appear in the model. The formulated model was solved with the help of GAMS software and obtained according to the results of solving the model $X_3=1.117$ which this value shows that if we want to achieve the all goals of the current budget (budget approved) in year 2015, we should cost 1.117 times more than the allocations approved in (2014).

According to the other results of the model, it was found that the positive and negative deviations of administrative expense are zero, so this objective has not been fully achieved; and goals related to personnel expense (budget approved in 2015), capital expenditure, deferred expense, and the total current budget have deficiency (realization less than expected) according to the performance of the years 2012 to 2014 (appropriation allocated) which can be said that since this numerical value has been considered as the maximum (achieving to that value or less than it) to determine the goals related to the aim of reducing the personnel expense, reducing the deferred expense and reducing the total current budget, this deficiency is satisfactory, and since the numerical value has been considered as the minimum (achieving to that value or more than it) to determine the ideals related to the aim of increasing the capital expenditure, this deficiency is not satisfactory.

So, we can say that the goal programming model can be used for the current budgeting of municipalities. Shortages and surpluses should be anticipated according to the organization’s objectives in allocating the budgets at the beginning of the year and helped the organization’s decision-makers to meet it. Also at the beginning of the year, we can increase or decrease or even eliminate the rate of budget approved for a goal with the help of this model and evaluate its effect on remaining variables and obtain its change in sum adverse deviations. And, since the weight has been considered for each of the goals in this model, we can apply a greater control over the variables (amount of deviations) by using these weights according to the organization's objectives and ultimately attain to organization's objectives in budget allocation.
References


7. Abedi, Gh. Laghæei, B. Tabibi, SJ. Arya Nezhad, MBG “providing goal programming model for allocation of resources in education department”, Journal of Mazandaran University of Medical Sciences, No. 57, pp. 82-87 (2007).


24. Baneshi, N. “Designing optimal allocation of budgetary construction resources Fars city” Shiraz University, College of Administrative Sciences and Management, Master's thesis has not been published. (2002).


