DETERMINATION OF PRIORITY PROJECTS IN THE SOCIAL SECTORS

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ABSTRACT

The correct selection of the project is a key element should the investment be the basic element of the social end economic development. The objective criteria and the technical methods are referred in the determination and the preparation of the investment project, respectively. Meanwhile, the objective criteria should be satisfactory and the methods employed should be based on the scientific principles. This is inevitable should the deployment of the limited resources be utilized in an optimum manner.

Keywords: Social Sectors, Investment, Priority Projects

JEL Classification: R42, G11, G31

SOSYAL SEKTÖRLERDE ÖNCELİKLİ PROJELERİN TESBİTİ

ÖZET

Sosyal ve ekonomik gelişmenin kilit unsuru olan yatırımların seçiminde kaynakların optimumkullanımı gündeme gelir. Projelerin doğru seçilmesinde objektif kriterler ve doğru seçilmiş teknikler önemli rol oynar. Bu kriterler bilimsel nitelikte istihdama yönelik olarak ortaya konulmalıdır. Bu çalışmada sosyal sektörlere ait projelerin hangisinin öncelikle yatırıma dönüştürülme kararı verilmesinde ve belirlenmesinde tatmin edici olunmalıdır. Kıt kaynakların optimum kullanımı şarttır.

Anahtar Kelimeler: Sosyal Sektörler, Yatırım, Proje Öncelikleri,

JEL Sınıflandırması: R42, G11, G31

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1. Introduction

In general, profitability, value added, the employment and the like are the main variables anticipated in the selection of the project. The demand factor or the anticipated benefits are taken into consideration for the investment projects.

There are some proven methods established in the field of project evaluation, which are crucial and referred as a common practice. This is because of the fact that the demand can be expressed on a quantitative basis and thus measured. As a conclusion, it is now possible to set the preferences as to which project should be implemented and on what variables and methods could be implemented for the selection among available alternatives, to reach to a reasonable decision in case when the dimension of the priority in the investment is dominant.

Consider the case, for example, the question of the satisfaction of the individual requirements in the society. In fact, these dimensions should also be emphasized in the process of evaluating the investment projects covering the social welfare, which can neither be classified within the economic variables like profitability, the value added, the purchasing power, nor have anything to do with the concept of demand, whatsoever.

2. An Applied to the Theoretical Structure of the Model

The different considerations, assumptions and criteria to be anticipated for making an investment for school, hospital or municipality building among several province or county should each case be the same. Bearing this in mind, the different approaches are taken into account to define a social investment. The determination of the investment priorities has proven to be difficult not only for emerging but also for the developed countries. The resources play crucial role in the determination of the investment priorities, whereas it is the exact satisfaction of the requirements that matters for the developed countries.

In the general description of the investment funds, the amount of the saving out f the revenues that is not spent is called as he capital goods, in addition to the existing capital stock, which form the source for the investment. In such case, there are different categories in the investment, as follows:

<u>Fixed Capital Investment</u>: It is also subdivided as gross and net investments. Gross Investment defines the totality of the investment made within the specific period, whereas net investment excludes the portion of the investment that correspond to the depreciation. This definition corresponds to Keynesian net investment definition (Keynes, J.M:1961).

<u>Financial Investment:</u>The instruments or the capital options that can be included in the values of the wealth. The economic decision makers take the social and cultural factors into consideration in the process of providing mathematics definition and expressions for the investment.

Since the answer provided to of how and in when the investments are funded has something to do with both micro and macro economy, such might be provided on the bases of the same basic methods (Hawkings, C.J: 1971). It is actually an dynamic process. It is also closely related to the production and income.

The investments bring the opportunity of increasing both the production and the revenues. On the other hand, the influence and being the subject to influence are the factors which define the investment on the corporate basis within the general economy. This also yields the profit factor for the entrepreneurs in their input-output analysis (Lerner, A.P:1951).

The project should be established comprehensively. The economical evaluation of the investment project is the process of proving on the technical and economical basis the feasibility of comparing the useful life of the investment within the framework of the cash flow analysis. Care should be observed to base the evaluations only on the economic analysis (Mestene, E.G:1970). The social benefit evaluations and performing the social analysis is unavoidable. No matter any investment project that can be regarded as profitable with respect to the economic analysis might well be turned out to be negative for the public on the social criteria.

To give an example, a fuel-oil fired power plant involving an obsolete technology might be turned out to be profitable on the economic analysis, however, the investment might be abandoned with respect to the negative impacts on the environment. For this reason, the states policies on the investment incentives should take the social benefit into consideration, in addition to the economic criteria.

Based on the cash flow analysis reduced to the shadow priced via correction process made from time to time, the established social benefit-cost approach is actually the key indicator of the investment decisions (Little, I.M.D., Mirrleees, J.D:1977). The study of OECD performed by Little-Mirrlees in 1968 (OECD:1968) brought forward the new techniques on the social benefit-cost approach. This is followed by another study made by UNIDO, United Nations Industrial Development Organization (Dasgupla, H:1972). This approach was further elaborated in another study that followed (Hansen, J.R:1978).

The social and economic targets of the countries cannot be based only for the national requirements. Here, the peripheral economies should also be taken into consideration. The generation of the shadow prices depends on these factors (Van, H.G., Tak. V.D: 1981). Among the public investment in the emerging countries, those investments which are made in the field of the training, health, accommodation, science-technology, sport, potable water, effluent water and municipality services play important role.

The priority of all these investment is up to the planning organizations or political organs, i.e., the decision makers. At this point, however, it is highly crucial to ensure the expert's opinion or the basis on which the political decision makers refer. Such criteria are different at each sector. Take for example, the health sector. In addition to the variables the target population, the income level of the region, the means of transportation and the portion of the prospective patients, etc., whereas it is also necessary to take such valuables into consideration, like the number of students, the cost of the project, income level of the region, existing business and commercial activities in the process of making a decision on the training sector.

The accommodation sector would then call for the consideration of the existing number of the building, income level of the region, the cost of the construction among the possible important variables. Those variables which would be referred for the science and technology sector might be the number of the staff undertaking the researches, their qualifications, the intensity of the equipment, the conformity of the project with the states plans and programs, the cost of project, the completion period, an the like.

The appraisals of the relevant sectors on the basis of the variables at hand call for the availability of methodical analysis. The determination of the priority in the project with respect to the social benefit is performed by a statistical method (Johnson, R.A., Wihchem :1982) that includes more than one variable, which explains the reduction of the variance and co-variance structure of a set of variables by means of the linear combinations of the variables.

p variables that are mutually dependent to each other with the number of measures being **n** are converged to **k** new variables that features the properties that are different than each other. The totality of the variability in the system by represented by **n** variables in (**k p**): **n** size ib explained by **p** variables. New **k** variables are obtained through the liner combination performed within given constraints. The main components are the linear combinations performed in an algebraic manner of **p** variables in **n** measures. In a geometrical manner, however, each one of the main components of **p** variables that form the coordinate axes of the original system now form new coordinate system.

In case when the unit of measure of the variable and their variances are close to each other, then correlation matrix is used, if not covariance matrix is usable. The measure values of the variables being close to each other may not b regarded as normal in practice. In this case, the standard matrix is used as the data matrix, which was driven from the standardized values.

The data matrix of **p** variables with the measure number being **n** can be expressed as follows:

$$X= \begin{bmatrix} x11\ x12\ \ldots\ x1n \\ x21\ x22\ \ldots\ x2n \\ xp1\ xp2\ \ldots\ xpn \end{bmatrix} \qquad (1)$$

In this case, x consists of the vectors, (x1, x2, ..xp). That is, xij is ith variable at jth measure.

If this matrix is to be turned to the standard matrix, then such standard matrix will be formed by (z1, z2, ...zp) vectors at (pxn) level That is,

$$Z= \begin{pmatrix} z11\ z12\ ...\ z1n \\ z21\ z22\ ...\ z2n \\ zp1\ zp2\ ...\ zpn \end{pmatrix} \qquad (2)$$

This matrix is obtained by subtracting the arithmetic average (Xi) from the each value of the variables at a line and ten dividing the standard deviation (Si) of the same variable. The arithmetic averages of the standardized variables thus obtained will be zero, and the standard deviation will be one (Anderson, T:1958).

The standard deviation of ith variable,

$$Si = \sqrt{\sum_{i=1}^{\mathbf{n}} \frac{(Xij-\overline{X}ij)^2}{\mathbf{n}}} \qquad (3)$$

The standardized value of jth observation of ith variable is

$$Zij = \frac{(Xij-Xij)^2}{\mathbf{n}} \qquad (4)$$

Where, i= 1, 2, ... **p**, and
J= 1, 2, ... **n**

Then the correlation between the standardized variables can be calculated as an R matrix as follows,

$$R = \begin{pmatrix} r11 & r12 & r1n \\ r21 & r22 & r2n \\ rp1 & rp22 & rpn \end{pmatrix} \qquad (5)$$

The matrix as an (pxp)th degree correlation matrix. The covariance of the matrix element is: Cov (Zi, Zk) = S_{ik}, then,

$$S_{ik} = \sum_{1}^{\mathbf{n}} \frac{(Zij - \overline{Zj})\,(Zkj - \overline{Zk})}{\mathbf{n}} \qquad (6)$$

The correlation between **i** variable and **k** variable can be expressed as follows:

$$R_{ik} = \frac{Cov\ (Zi, Zk)}{\sqrt{Var\ (Zi)}\ \sqrt{Var\ (Zk)}} = \sum_{İ=n}^{\mathbf{n}} \frac{(Z\ ij - \overline{Zj})\,(Zkj - \overline{Zk})}{\sqrt{\sum_{i=\mathbf{n}}^{\mathbf{r}} (Zij\text{-}Zi)^2}\ \sqrt{\sum_{i=\mathbf{n}}^{\mathbf{n}} (Zij\text{-}Zi)^2}} \qquad (7)$$

Where, i= 1, 2, ..**p**

λ1, λ2, ... λp are core values that satisfy the equation of Delta

(R-λi)=0 in the correlation matrix.

The following relationship is true:

$$\lambda 1 \geq \lambda 2 \geq ... \geq \lambda p \geq 0 \qquad (8)$$

Should the correlation matrix include a core vectors, the condition is,

e = (e1, e2, ... ep) should de different than zero (9)

Besides, $e^t i$, ei=1 should be satisfied in the equation Rei=λi.ei (Kendall, M.G:1961)

$$e1= \begin{pmatrix} e11 \\ e21 \\ \dots \\ \dots \\ ep1 \end{pmatrix} \quad e2= \begin{pmatrix} e21 \\ e22 \\ \dots \\ \dots \\ ep2 \end{pmatrix} \quad Ep= \begin{pmatrix} en1 \\ en2 \\ \dots \\ \dots \\ epn \end{pmatrix} \qquad (10)$$

The **p** linear combination of the standard vectors of Zi, Z2,...Zn will be: linear combination of the standard vectors of Zi, Z2,...Zn will be:

$$Y= a1^t\ Z/\ a11 + a21Z2 + a31Z3+...+anZp \qquad (11)$$

The variance and covariance of foregoing will be:

$$\mathrm{Var}\ (Yi) = \mathrm{var}\ (ai^{t}) = ai^{t}Sa1 = ai^{t}\ Rai \qquad (12)$$

$$\mathrm{Cov} = (YiYk)\ ai^{t}Sa_{k} = ai^{t}Ra_{k} \qquad (13)$$

S in the equation is a standardized data matrix covariance matrix, whereas R is standardized data matrix correlation matrix (R=S).

The sum of the original variables independent to each other and their variances become the linear combinations that can be as far as possible (Hotelling, H:1936).

In short, the following operations are in question:

1. The standardization of the data matrix of **p** variables in **n** measure.

2. The conversion of the standardized matrix into correlation matrix.

3. The calculation of the essential values and essential vectors included in the correlation matrix.

4. Of the core values, the calculation of the explanations rates of the overall variances.

5. The multiplication of each core vector transposed with the standardized matrix to end up with the values of the components.

3. Application Results

The samples Projects of Annual Programs (SPO) are selected to indicate the method of application of a theatrical structure into scientific-technological projects.

The relevant variables are:

1. Number of the researchers to be employed within the project,

2. The number of the publication in relevant issues,

3. Share of the machinery and equipment in the project cost,

4. Conformity to the plans and programs,

5. Approximate completion time of the project,

6. Project cost,

7. The economic viability.

Real reference is made to SPO (State Planning Organization-Turkey) Regional Development General Directorate for the numerical figures in regard to the project implementation. But in this analysis based on figures which created from the SPO's Projects.

Table 1: Scientific and Technological Projects from 2004 Investment Programme.

Projects Name	Variables						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
1. Science and Technology for Ind.	3	27	0.63	10	3	214	5
2. Edu. and Training Sys. of Tur-	4	0	0.64	20	3	70	10
3. Phycial Infrastrucrure equip-	12	45	0.40	10	3	1250	5
4. Defence Supply System	10	123	0.70	10	2	248	5
5. Information and Comm. Techng.	5	0	0,25	20	2	40	10
6. Nuclear Technologies	7	39	0,35	10	6	3329	5
7. Gene Engieering	4	0	0,97	10	3	290	5
8. Industrial Potential of Turkey	6	105	0,52	30	3	650	10
9. National Innovation System.	6	0	0,83	20	2	1800	15
10. Small Scale Industrial Estates.	3	69	0,66	10	2	240	5

End of the results, variances was calculated as follows.

Table 2: Main Vectors Variances of Our Sample Projects and Their Explained Variables

Essential Vectors	Variances	Of the core values, the calculation of explanations rates of overall variances	The multiplication of each core vector transposed standardized matrix to end up with the values component
1	2,33533	33,36186	33,36186
2	1,68021	24,00303	57,36489
3	1,38980	19,85432	77,21920
4	0,77615	11,08786	88,30706
5	0,61715	8,81637	97,12343
6	0,18330	2,61860	99,74204
7	0,01805	0,25796	100,00000

These essential vectors and correlation coefficients are calculated in the following table according to the weights of the essential vectors.

Table 3: Weights of Essential Vectors and Correlation Coefficients

Used Variables	Initial Essential Vector's Weight	Initial Essential Vector's Weight	Initial Essential Vector's Explaining and Correlation Ratio
1	365285	558221	31161
2	194778	252477	06374
3	-279487	-329487	10856
4	-371824	-377575	14256
5	048856	038381	00147
6	433794	185723	03449
7	-430464	-057833	00334

When we examine the structure of the calculated linear vector, we observe that the correlation coefficients vary between 0.3 - 55 per cent. The share of the machinery cost in the total cost, the appropriateness to the program target, economic importance variables are effective to negative.

On the other hand, the relation between the economic importance variable and project duration variable is not high. The data matrix is as follows,

	3	27	0.63	10	3	214	5
	4	0	0.64	20	3	70	10
	12	45	0.40	10	3	1250	5
	10	123	0.70	10	2	248	5
	5	0	0,25	20	2	40	10
	7	39	0,35	10	6	3329	5
	4	0	0,97	10	3	290	5
	6	105	0,52	30	3	650	10
	6	0	0,83	20	2	1800	15
	3	69	0,66	10	2	240	5
Average Value	6	41	0.60	15	3	813	8
Standard Value	3	43	0.21	7	1	998	3
Average / Standart	2.121	0.947	2.852	2.236	2.553	0.815	2.236
Weight of Variables	0.365	0.194	-0.279	-0.371	0.048	0.433	-0.430

Standart Matrix is calculated,

-1.061	-0.320	0.172	-0.745	0.088	-0.601	-0.745
-0.707	-0.947	0.230	0.745	0.088	-0.745	0.745
2.121	0.098	0.935	--0.745	0.088	0.088	-0.745
1.414	1.909	0.512	-0.745	-0.792	-0.566	-0.745
-0.354	-0.947	-1.654	0.745	-0.792	-0.775	0.745
0.354	-0.042	-1.160	-0.745	2.729	2.522	-0.745
-0.707	-0.947	1.778	-0.745	0.088	-0.524	-0.745
0.000	1.491	-0.384	2.236	0.088	-0.163	0.745
0.000	-0.947	1.140	0.745	-0.792	0.989	2.236
-1.061	0.655	0.301	-0.745	-0.792	-0.574	-0.745

After this calculation, the values which are based on the priority order related to the main vectors' values are indicated in the following table.

Table 4: Priority Order of The Scientific and Technological Projects

Priority Degree	Priority Order	Main Vector Value
1	2. Education and Training System of Turkey	-1.4213
2	9. National Innovation System	- 1.3496
3	5. Information and Communication Techng	- 0.8220
4	8. Industrial Potential of Turkey	- 0.8203
5	7. Gene Engieering	- 0.5637
6	1. Science and Technology for Industries	**- 0.1561**
7	10. Small Scale Industrial Estates	- 0.0340
8	4. Defence Supply System	1.0573
9	3. Phycial Infrastrucrure Equipment	**1.8450**
10	6. Nuclear Technologies	2.2648

According to the values of the used projects;

Education and Training System of Turkey project is appeared as the first prior investment. The second prior investment is National Innovation System project. The last one is Nuclear Technology Project.

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