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Determining the Optimal Structure of Tehran Municipality Income Basis Based on Risk and Returns

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Abstract: The financial health of municipal budgets is of great importance, and its feedback is the ability of the municipality to provide optimal and continuous services to citizens. In recent decades, due to the lack of financial resources of municipalities, the key problem in the development of the cities of the country was the non-compliance of municipal expenditures and income from the structure of the city economy. The metropolitan municipality, unlike the state that is dependent on oil revenues, has no source of income but urban economy (sales of congestion, dues, etc.) Moreover, the survival of the organization and its services depend on the dynamism and reliability of its economy. Given the importance of municipal revenue structure, in this study, the income and expenditure structure of Tehran Municipality was compared with selected municipalities, then, using Tehran Municipality data during the period of 2001-2015 and Markowitz's model, the share of each income code based on minimizing risk, maximizing expected returns, and Sharp's benchmark in the income portfolio of Tehran Municipality was estimated. The results showed that Tehran Municipality's revenue structure is not suitable and has a significant difference with estimated weights based on the maximization criteria of expected returns, risk minimization and Sharp's benchmark.

Keywords: Budget Optimization, Local Government, Income Portfolio, Risk and Returns, Tehran Municipality

JEL Classification: C58, E02, H72, C61

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1-Introduction

Optimal urban management is affected by the quantity, structure and composition of municipal funding sources. On the one hand, the provision of services to citizens and, on the other hand, the implementation of urban development projects, the construction and development of infrastructure and development activities will require adequate and sufficient sources of income. The inadequate municipality's revenue structure will have disturbing effects on economic sectors and households and will reduce the efficiency and effectiveness of the urban economy and municipalities. The most basic issue of urban management in the third millennium will be affected by the appropriate and effective cost structure and the creation of income will be the focus of policy-making at the local management level. At present, major of the municipality's revenue is funded by local revenue (within the city). Reducing the dependence of municipalities' revenues on the federal state and intensifying city problems and issues, due to increasing demand for urban services and the reliance on unsustainable incomes, made it more difficult for municipalities to perform their duties. One of the main problems of developing cities in Iran was the mismatch between the costs and incomes and the volatility of the municipal budget. The alignment and self-financing of the municipal budget and the macroeconomic structure of the city's economy have led to the development of urban economy and citizens' welfare. With minimal disruption, it can lead to the improvement of urban economic indicators, and, in addition to achieving the priority goals helps to the integrity of the National and local Comprehensive Plan in the city level. The

issue of urban finance has not been sufficiently addressed in the Iranian law since the beginning of legislation in urban affairs, especially in the income section. Even in the Municipal Law of 1954, there has been no specific statement on how income is provided to municipalities. The proposition of self-sufficiency and financial independence of the municipality in 1983 without accurate examining the theoretical foundations governing the financial relations of the government and the municipality, and the continuation of this policy in the years that followed, placed the municipalities in an inappropriate situation, which resulted in the reliance of the municipalities on unsustainable earnings. Sustainable development for metropolises, especially in Tehran, is an unavoidable and necessary need, and the most important factor in achieving sustainable development is the availability of sustainable income sources. In order to increase the sustainability and development of Tehran Municipality revenues, answering the following questions is necessary:

1. What is the composition and structure of municipal revenues that has the least risk and fluctuation? 2. Is it possible to increase the revenues of the municipality by changing the share of revenue bases in the Tehran Municipality budget? 3. What is the contribution of each of the municipality's revenue bases in its income portfolio to the best possible combination in terms of risk and returns (income growth)?

To answer these questions, in this study, the variance and returns of Tehran municipality revenues have been modeled and using the Markowitz model, optimal weights are determined based on each criterion.

2- Literature Review

a) *Foreign Researches*

Dye (2008) examined the link between the dynamics of municipal income sources and local and state affiliation in New England. His analysis showed that urban governments are more dependent on property taxes than the national government.

Garrett in his research in 2009 used the portfolio method to evaluate the government's tax revenue variability. In his research, he proposed a nonparametric model to minimize the variability of government tax revenues and, based on his model, calculated the optimal weight of the various bases of government tax revenue.

In a study conducted in 2012 by Yan, examined the effects of increasing the income diversification on its sustainability from a theoretical and applied perspective during the years 1986-2004 in Georgia, and concluded that although income diversification, has increased the stability and sustainability of income, but its effect depends on economic stability and changes in business cycles.

DiNapoli (2014) reviewed the planning and financing in New York, and pointed out that over the past decade, about \$ 81.7 billion had been spent on New York Capital projects.

Maudos published a paper on profitability and risk in 2017, which looked at the structure of bank revenues in European countries during the period 2002-2012. The results of this study showed that increasing the share of non-interest incomes of banks during the economic crisis has had a negative effect on their profitability and has led to an increase in financial risk.

Mirihay et al., (2017) studied the sources of income of the municipality in a

study. To reach to this aim, they analyzed data from the Shabestar municipality during the years 2004-2014. The results of their analysis showed that during the study period, about 39 percent of Shabestar's municipality revenue was from the general tolls and 25 percent from other sources. They also reported that about 43% of the municipality's revenues in this city have low utility, about 11 percent, average utility and 46 percent high utility.

Mozafari et al. (2016), in a research using elite interviews and income data of Tehran municipality during the period of 2008-2013, and using models, tried to find solutions to the problems financing of the municipality of Tehran (unstable and unhealthy Being). The results showed that controlling, decreasing and gradually eliminating unsustainable and unhealthy resources and better management, expanding and increasing the role of sustainable income sources lead to stabilize the income system in the medium and long-term.

Hosseinzadeh et. al. (2015) evaluated Tehran Municipality's sustainable financing strategies in a five-year horizon. The results show that most of Tehran's municipality financing methods do not have an appropriate sustainability.

Ghorbani & Azimi (2014) investigated the effect of municipality's revenue structure on urban development using correlation coefficient and factor analysis in Mashhad. According to the results of factor analysis and taxonomy analysis, 61.5% of the urban areas of Mashhad, in terms of sustainable urban development indicators, are not in a desirable situation. As a result, the volatile structure of municipality revenues has had an impact on the deepening and severity of instability in urban development in Mashhad.

Danesh-Jafari et al. (2013) studied the sustainability of Tehran Municipality financial resources and income assessment and concluded that the most stable income source in Tehran was the transfer of taxes from the central government to the municipality, either in the form of a value-added tax, whether it is a percentage of the national tax.

Ziari et al., (2012), in a study conducted in Mahabad, suggested ways to improve the sustainability of municipality revenue. The results showed that the municipality of Mahabad faces many problems, which is rooted in the absence of the mechanism and strategies for sustainable income generation.

Mahmoudi et al., (2011) introduced the four important and influential factors as a strategy for reaching Tehran Municipality to sustainable and stable revenues: 1. Increasing the rate of toll on land value, which is proposed to replace instability tool such as tool on Density 2. The system of recognition and collection of the tolls of the Tehran municipality 3. Financial relations between the government and the municipality of Tehran 4. Access to monetary and financial markets.

Hassanzadeh & Khosroshahi (2009) proposed a model for financing municipalities that included local taxes on land and real estate (renovation tools, city level tools, tools on construction permits, floor space surplus, tools on separation of land and buildings, tools on abandoned land and real estate in city, etc.), the prices of goods and services, government grants, loans and borrowings, grants and aids by individuals and legal entities and incidental incomes. The results indicated that the municipality should consider renovation tolls as the main local tax to cover the municipal expenditures due to the

relatively its stability and efficiency and gradually and in time intervals in the medium term replaces the tolls on construction licenses and surplus congestion that are unstable with renovation tolls, so that the share of renovation tolls in municipality's revenues will exceed 16%.

Akhundi & Hadi-Zenoz (2005) reviewed the world's income generation system of municipalities, especially the OECD countries. In the following, they evaluate the laws and methods of diagnosing and collecting the costs and costs of urban services in Iran based on the criteria obtained in the previous stages of the research. At the end, they have presented suggestions for reforming the Tehran Municipality revenue system.

Sarzheie et al., (2006), in a study, showed that in municipalities in other countries, the use of resources such as local taxes and tolls is prioritized. In addition, resources such as the sale of services and borrowing, the use of specialized funds or grants, and the receipt of government grants are among the main sources of revenue for the municipalities of the world. In addition to the above, urban development funds or specialized banks that are used in some cities in the world give credit to local governments and provide a good source of revenue for municipalities.

Hadi-Zenoz (2002) presented a number of suggestions for the elimination of unsustainable earnings, including the reform of the urban renewal and urban development law, with the approach of the role of the municipality and city council, determining the rate of renovation tolls (property tax) with regard to the economic situation and The social status of each city and the city council, recognition

of the presence of the municipality and city council in the evaluation and determination of the price of urban land, the mechanization of the real estate database and the use of geographic information system for property auditing, updating property information and reforming the law Related letters were based on specific and general rules of urban planning.

The comparison of previous studies shows that the present study is completely new in methodology and attempts to take steps to improve the income structure of Tehran municipality by taking financial economic theories.

3- Theoretical Background

Investors use different methods to minimize risk while optimizing returns. Among the various ways to optimize risk and efficiency, the Markowitz model, introduced by Harry Markowitz in 1952, was developed independently by Treynor, 1962, Sharpe, 1964, Lintner 1965 and Mossin in 1966 (Lee et al., 2016) is widely used.

The Markowitz model tries to maximize expected returns for a certain level of risk by assigning the optimal weights to different assets, or minimizing the risk for a certain level of expected returns. This model assumes that investors are rational and markets are efficient and the standard deviation of returns is considered as a risk indicator. By combining different assets in a portfolio whose returns are not fully positive correlated, the modern portfolio theory seeks to reduce the total variance of portfolio return. The most important role of this theory is to create a risk-return framework on the portfolio for decision makers (Sadeghi & Farzaneh, 2012). Markowitz presented a mathematical

approach to investor in asset selection and portfolio management with quantitative definition of investment risk. Markowitz assumes in the choice of his standard portfolio that all investors make their choices based on two criteria of return and risk. The most important work of Markowitz was to consider the standard deviation of return's basket as a benchmark for measuring Portfolio risk. He assumed that every investor at each risk level wants the highest returns. In efficient baskets, it has to be more risky to obtain more returns, so investors face a trade-off relationship between risk and return. The relationship between risk and return is represented by a curve called the efficient frontier curve. Funding from various sources will diversify the income basket, which eliminates the risk of non-systematic assets, as well as portfolios.

By applying Markowitz's theory, if the total income of a municipality is considered as an income basket consisting of different sources of income (with different returns and risks), we can by minimizing the basket variance or maximizing the return, optimal weight of each Income items will calculated in the basket of municipal revenues.

An Overview of the Structure of Income and Expenditure in Selected Municipalities in the World

In some countries, such as the United States, Canada, Britain and South Africa, the major reliance on municipal revenue is Taxation on immovable assets (similar to renovation tolls in Iran); Countries such as Finland and Sweden provide an important part of their income by receiving a share of the income tax on individuals and corporations. In Austria and Germany, an important part of the municipal income comes from receiving the tolls of profits

institutions and businesses, while in Italy the main part is indirect costs.

As it is shown in Table 1, in Uganda, about 15 percent of municipal revenues are of tolls and about 66 percent of Central Government Transfers, while in Zambia and Ghana has only 3% of government aids. Grant and gifts in the Ugandan municipalities' revenues have contributed 11%, while in Ghana, Swaziland and Zambia; municipal funding from this source has not been made.

Table 2 compares income sources in 4 developed countries. In the UK, the share of municipality tolls is much lower than of the other three countries, and is

about 16%, while in New Zealand; about 54% of the municipality's revenues come from public tolls. The share of Central Government Transfers from municipal revenues also varies in these four countries from 11 to 46 percent. In the countries of the Oceania (New Zealand and Australia), the contribution of government aids has been far lower. By comparing the structure of municipality revenues in African and developed countries, it can be concluded that the structure and share of municipality revenues in Africa with developed countries is different.

Table1. The comparison of municipality revenue sources in several African cities – Percent

| Income bases | Municipal tolls | Use costs | Income from funds and property | Central Government Transfers | Subsidies and gifts | Loans | Other issues |
|--------------|-----------------|-----------|--------------------------------|------------------------------|---------------------|-------|--------------|
| Ghana | ۲۲ | ۲۳ | ۱۸ | ۳ | ۰ | ۰ | ۳۴ |
| Uganda | ۱۵ | ۵ | ۰ | ۶۶ | ۱۱ | ۰ | ۳ |
| Swaziland | ۶۷ | ۵ | ۱ | ۱۷ | ۰ | ۵ | ۵ |
| Zambia | ۲۱ | ۲۳ | ۱۸ | ۳ | ۰ | ۰ | ۳۵ |

Source: (Municipal Finance (Report prepared by Mr Ilias Dirie, 2005))

Table2. The Comparison of municipality revenue sources in 4 cities in developed countries – percent

| Income | Municipal tolls | Investment income | Selling goods and services | Central Government Transfers | Business surplus | Use costs | Commercial redistribution rates | Other cases |
|-------------|-----------------|-------------------|----------------------------|------------------------------|------------------|-----------|---------------------------------|-------------|
| Australia | ۳۸ | - | - | ۱۳ | ۳۲ | - | - | ۱۵ |
| Canada | ۴۱ | ۳ | ۱۵ | ۴۱ | - | - | - | - |
| New Zealand | ۵۴ | ۷ | ۱۹ | ۱۱ | - | ۹ | - | - |
| England | ۱۶ | - | - | ۴۶ | - | ۱۲ | ۱۶ | - |

Source: (Municipal Finance (Report prepared by Mr Ilias Dirie, 2005))

A comparison of the structure of income and expenditure of several selected cities in Iran

The ratio of current expenditures to total municipal expenditures in Tehran in 2006 was 32.9, while in Hamedan, Isfahan and Shandiz cities it was 43.9, 22.7 and 29.9 respectively (Table 3); therefore, on

Based on this ratio, in 2014, Hamedan has allocated more of its budget to current expenditures than other cities, and has more limited resources for development expenditures. Nevertheless, by comparing the changes in the share of current credit to total credits during 2013-2014, it can be deduced that in Tehran during this

period, this index has increased more than other cities (15.2%). However, in all of these cities in 2014 compared to 2013, the share of current expenditure has increased compared to construction expenditure. One of the reasons for this is the relatively large recession that has occurred on economic activity in Iran, and due to the dependence of municipal budgets on the economic conditions and the inability to change current currencies, the amount of development credits in cities has decreased (at least in relation to Current credit has risen to a lesser extent). In recent years, such a situation has seen at the national level and the central government budget. Increasing shares of the current budget in municipal budgets shows that the size of municipalities in these provinces has increased. The current budget has direct connection with administrative costs and employee compensation. Increasing

current costs has been inevitable due to the increasing population of cities and the need for more employees to perform urban services. However, the growth of current expenditures in the municipalities of Iran has not been the same. According to Table 3, in Hamedan, the ratio of current expenditures in 2013 was 37.3% of the total budget of Hamedan Municipality, while it increased to 43.9% in 2014 (more than 6%). In this period, Isfahan Municipality, Tehran and Shandiz experienced an increase of 2.9%, 15.2% and 5% respectively in their current expenditures. These figures indicate that although the municipality of Hamedan has a higher ranking in terms of the current expenditures to total expenditures ratio than other provinces, but in 2013-2014, the Tehran municipality, compared to other municipality, experienced an increase in current expenditures.

Table3. The ratio of current credit to total credits in some municipalities in Iran

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|----------------|------|------|------|------|------|------|
| Hamedan | - | - | - | - | 37.3 | 43.9 |
| Isfahan | 30.2 | 33.7 | 28.5 | 30.7 | 19.8 | 22.7 |
| Tehran | 26.6 | 27.2 | 26.7 | 15.2 | 17.7 | 32.9 |
| Shandiz | 18.1 | 12.1 | 14.8 | ۲۳ | 24.9 | 29.9 |

Source: (The statistics of municipalities)

According to Table 4, most of the municipal revenues in each of the 4 cities surveyed in Iran in 2014 are attributable to public tolls. The income dependency of Isfahan municipality is higher than other cities to this resource. The share of donations and gifts and assets in creating income in the municipality of Tehran and Hamedan is much higher than the Isfahan and Shandiz municipality. This revenue base in Tehran's municipality in 2014

accounted for nearly 30 percent of the municipality's income, while it had in the municipality of Isfahan only a 0.5 percent share. The share of incomes from special tolls in Isfahan municipality in 2014 is 10%, which is higher than other municipalities. This ratio was 1.7% in the municipality of Hamedan, which shows that the municipality of Hamedan has had less success in generating revenue from the source of specific tolls than other municipalities.

The share of income generated from the source of government aids and organizations depend on municipality in Shandiz was

higher than other municipalities and the municipality of Tehran and Hamadan did not earn any income from this source.

Table4. The comparison of the Share of Income Resources to Total Municipality Revenues in 2014

| Revenue Codes | 1- Public incomes | 2- Income of private tolls | 3- Service fees and earnings of profit institutions | 4. Income from the funds and property of the municipality | 5. Government grants and affiliated organizations | 6. Grants and gifts and assets | 7. other sources |
|---------------|-------------------|----------------------------|---|---|---|--------------------------------|------------------|
| Tehran | ۵۷ | 2.6 | 1.6 | 8.5 | • | 29.7 | 0.1 |
| Isfahan | 67.1 | ۱۰ | 2.1 | 1.1 | 0.2 | 0.5 | ۱۹ |
| Hamedan | 55.7 | 1.7 | 4.9 | 1.4 | • | 20.9 | 15.4 |
| Shandiz | ۶۴ | ۳ | ۱۰ | ۲ | ۱ | ۱۱ | ۹ |

Source: (The statistics of municipalities)

4- Research Method

The data of the present study were collected from the statistics of Tehran Municipality. In order to analyze the data, first, using the central indicators and dispersion, we describe the income situation of Tehran municipality. In order to determine the optimum composition of Tehran Municipality revenues, the Markowitz portfolio model (1952) will be used. Following the Markowitz approach, if the municipality of Tehran has the possibility to creating revenue from the N method, which r_{it} and $\sigma_{i,t}^2$ are returns and variances of options generating income, respectively and $\rho_{ij,t}$ be correlation coefficient between income base i and j,, the expected returns and variance of the income basket can be defined as:

$$rincome_{p,t} = \sum_{i=1}^N rincome_{i,t} w_{i,t} \quad (1)$$

$$\sigma_{p,t}^2 = \sum_{i=1}^N w_{i,t}^2 \sigma_{i,t}^2 + \sum_{i \neq j} 2w_{i,t} w_{j,t} \sigma_{i,t} \sigma_{j,t} \rho_{ij,t} \quad (2)$$

So that $rincome_{it}$ and $\sigma_{i,t}^2$ are return rate and variance of various sources of municipality revenue. W is the weight of each source in total municipality revenues. In equation (1), $rincome_{it}$ is the return rate and growth of municipality revenues, which is calculated based on

the relative changes of each source of income in different years. Mathematically, the return rate of municipal revenues is calculated as follows:

$$rincome_{it} = \frac{income_{it} - income_{i,t-1}}{income_{i,t-1}} \quad (3)$$

Which $income_{it}$ is the income from each source in municipality in period t.

According to the relationship (3), the relationship between the various incomes bases, including general, specific tolls, and ... is calculated. The following equation is used to calculate the variance of return rate for each income base:

$$\sigma_{it}^2 = \frac{\sum_{t=1}^T (rincome_{it} - \overline{rincome}_{it})^2}{N} \quad (4)$$

That:

$\overline{rincome}_{it}$ is the average growth of various income sources in Tehran Municipality.

After calculating these indices, based on the Markowitz portfolio theory, optimizing the income basket with three approaches: 1- minimizing risk at a certain level of expected return, 2- maximizing the expected return on a constant level of risk and 3- Based on Sharp's criteria, it's done:

A) Minimizing Risk of the Municipality's Revenue Basket Approach

$$\begin{aligned} \text{Min } \sigma_p^2 \quad \text{s.t: } \sum_{i=1}^N r_{tax_{i,t}} w_{i,t} = \\ \overline{rtax}_{p,i}, \sum_{i=1}^N w_{i,t} = 1 \end{aligned} \quad (5)$$

B) Maximizing the Expected Returns of the Municipality's Revenue Basket

$$\begin{aligned} \text{Max } r_{p,t} \quad \text{s.t: } \sigma_p^2 = \bar{\sigma}^2, \\ \sum_{i=1}^N w_{i,t} = 1 \quad w_{i,t} \geq 0 \end{aligned} \quad (6)$$

C) Optimal Weights Based on the Sharp Criterion

In each of the previous approaches, optimizing and determining optimal weights was performed based on a single criterion (risk and return). In fact, with the assumption of risk or return on a certain level, the weight of income sources was determined. However, there is no comment on the weights that simultaneously have the lowest risk and the highest returns. In 1966, Professor William Sharp introduced the index known as the Sharp Indicator in the financial economy. In short, the Sharp criterion is obtained by dividing the expected return of an asset basket into its standard deviation. The Sharp index indicates whether the return on an investment option has been a high risk factor or not? Whatever the size of this

indicator is higher; it shows that the returns were less risky. For a set of income baskets (with different shares for resources and income codes), the basket with the highest Sharp criteria, will be optimized simultaneously In terms of risk and return. In fact, the baskets selected based on Sharp's criteria, at each level of risk, have the highest returns, and at each level of specific returns, they have the least risk.

5- Results

The descriptive analysis of Tehran Municipality revenues during the period of 2001-2015 shows that on average, most revenue of Tehran Municipality is from the public tolls (code1) and other sources (code 7) has been little share. By considering the dispersion coefficient as a relative risk indicator, it can be deduced. That the income code 3 (price Municipality services) and income code 7 (other) are less risky than other income codes, while Revenues code 4 and 6 (funds and property of Municipality and gifts & grants) were the most volatile during this period.

Table4. Central and Dispersion Indicators and Revenues of Tehran Municipality by Separation

| Types of municipal revenues | Mean | Median | SD | Range | Coefficient of change |
|---|-------|--------|-------|-------|-----------------------|
| 1- Public incomes | ۳۳۶۹۲ | ۲۸۹۸۹ | ۲۷۶۷۰ | ۸۲۶۹۳ | 0.8 |
| 2- Income of private tolls | ۹۸۶ | ۵۰۵ | ۱۱۴۳ | ۳۹۸۱ | ۱,۲ |
| 3- Service fees and earnings of profit institutions | ۱۱۲۰ | ۱۰۵۳ | ۶۲۱ | ۲۱۳۳ | 0.6 |
| 4. Income from the funds and property of the municipality | ۲۱۲۹ | ۳۹۰ | ۳۷۷۳ | ۱۲۹۳۶ | 1.8 |
| 5. Government grants and affiliated organizations | ۲۱۴ | ۶۸ | ۲۵۸ | ۶۵۰ | 1.2 |
| 6. Grants and gifts and assets | ۱۰۱۹۳ | ۳۱۴۱ | ۱۶۵۷۴ | ۴۵۱۵۸ | 1.6 |
| 7. other sources | ۱۲۷ | ۱۱۰ | ۶۰ | ۲۰۶ | 0.5 |

As can be seen in Table 4, despite the lower risk of code 7, its share in Tehran's municipality's revenue is negligible. This indicates that the structure of the Tehran municipality's revenue is not appropriate and steps should be taken to reduce its fluctuations.

In order to get a better understanding of how Tehran Municipality revenue changes, it is better to check the link between income codes of Tehran Municipality. For this purpose, the variance-covariance matrix is calculated between income codes. In Table 5, the variance-covariance matrix of income codes of the municipality of Tehran during the period 2001-20115 is calculated. The variance-covariance matrix is a symmetric matrix that numbers are on the main diameter are the variance of each of the income codes, and other elements of the matrix, the covariance between the various income codes. Negative covariance, between the two

income codes indicating the opposite direction and positive covariance; indicate the movement of variables in one direction. Accordingly, other revenue are positively associated with specific tolls and price of Service and has negative covariance to other sources income; in other words, on average, as this revenue code increases, income from specifics tolls and goes up. The source income from gifts and grants has been negatively related to specific tolls and has positively correlated with other income codes. Based on the variance-covariance matrix, the structure of public and specific tolls is such that, with increasing public tolls, the incomes of specific tolls is decreasing and vice versa. Revenues from the price of goods and services have a negative relationship with the specifics tolls and have a positive correlation with other sources of income.

Table5. Covariance-variance matrix between income codes of Tehran Municipality

| Types of municipal revenues | Public tolls | Private tolls | The cost of services and earnings of profit institutions | Income from municipal funds and property | Government grants and affiliated organizations | Subsidies, gifts and assets | Other sources |
|--|--------------|---------------|--|--|--|-----------------------------|---------------|
| Public tolls | 0.083 | | | | | | |
| Private tolls | -0.05 | 2.65 | | | | | |
| The cost of services and earnings of profit institutions | 0.039 | -0.11 | 0.2 | | | | |
| Income from municipal funds and property | 0.59 | 0.4 | 0.35 | 16.6 | | | |
| Government grants and affiliated organizations | 0.029 | 0.17 | -0.009 | -0.8 | 0.33 | | |
| Subsidies, gifts and assets | 0.66 | -0.94 | 1.01 | 7.5 | 1.16 | 18.98 | |
| Other sources | -0.08 | 1.23 | 0.14 | -0.98 | -0.8 | -0.56 | 1.56 |

The existence of a positive covariance between the public tolls and the price of

services and revenues of nonprofit institutions indicates that with increasing revenue

from public tolls, the Tehran municipality has earned higher revenues the price of services and revenues of nonprofit institutions. On the other hand, the negative covariance between the public and specific tolls suggests that with the increasing revenue of public tolls, revenues of specific tolls have declined. Other coefficients of covariance can also be analyzed in the same way. Now it is time to calculate the optimum weight of each income code in the Tehran Municipality's budget based on the risk, return, and Sharp criteria and using the

Markowitz model. Table 6 presents the optimal weights based on these criteria. According to Table 6, it can be said that in order to minimize the risk in the Tehran municipality's revenue portfolio, the share of public tolls should be 67%, Service price and Profit institution Incomes, 12%, Government & organization depend on municipality aids, 14% and the other class has a 7% share, and there is no share in the specifics tolls, Income from the funds and property and Grants and gifts and assets.

Table6. Estimated Weights of Income Codes of Tehran Municipality

| Income codes | ۱ | ۲ | ۳ | ۴ | ۵ | ۶ | ۷ |
|---------------------------|----|----|----|-----|----|----|----|
| Minimum Risk | ۶۷ | ۰ | ۱۲ | ۰ | ۱۴ | ۰ | ۱۴ |
| Maximum return | ۰ | ۰ | ۰ | ۱۰۰ | ۰ | ۰ | ۰ |
| Sharp criterion | ۶۰ | ۱۱ | ۲۸ | ۱ | ۰ | ۰ | ۰ |
| Grow at least 30% | ۶۳ | ۱۰ | ۲۷ | ۰ | ۰ | ۰ | ۰ |
| Grow at least 60 percent | ۳۲ | ۲۵ | ۳۳ | ۵ | ۰ | ۵ | ۰ |
| Grow at least 100 percent | ۰ | ۴۵ | ۳۲ | ۱۱ | ۰ | ۱۲ | ۰ |
| Weight in 2011 | ۸۶ | ۲ | ۲ | ۱ | ۱ | ۹ | ۰ |
| Weight in 2015 | ۶۹ | ۲ | ۲ | ۷ | ۰ | ۱۹ | ۰ |

Considering that during the period under review, the funds and property of the municipality have grown enormously, in the basket of income with the highest return, the share of 100% has been allocated. If the Tehran municipality is inclined to grow its expected revenues of at least 30% and have the least variance for it, public tolls should be 63%, specific tolls, 10.2%, Service price and Profit institution Incomes, 26.7% and the share of funds and property of Municipality is

0.1%. In Table 6, for the expected returns, at least 60% and 100% in the municipal revenues, the weights of the municipal revenues with the least risk are calculated. However, given Sharp's criteria to take risks and returns at the same time, it is more efficient. Based on Sharp's criteria, the optimal weight of the public tolls is 60%, the specific tolls, 11%, Service price and Profit institution Incomes will be 28%, and the funds and property of the municipality will be 1%.

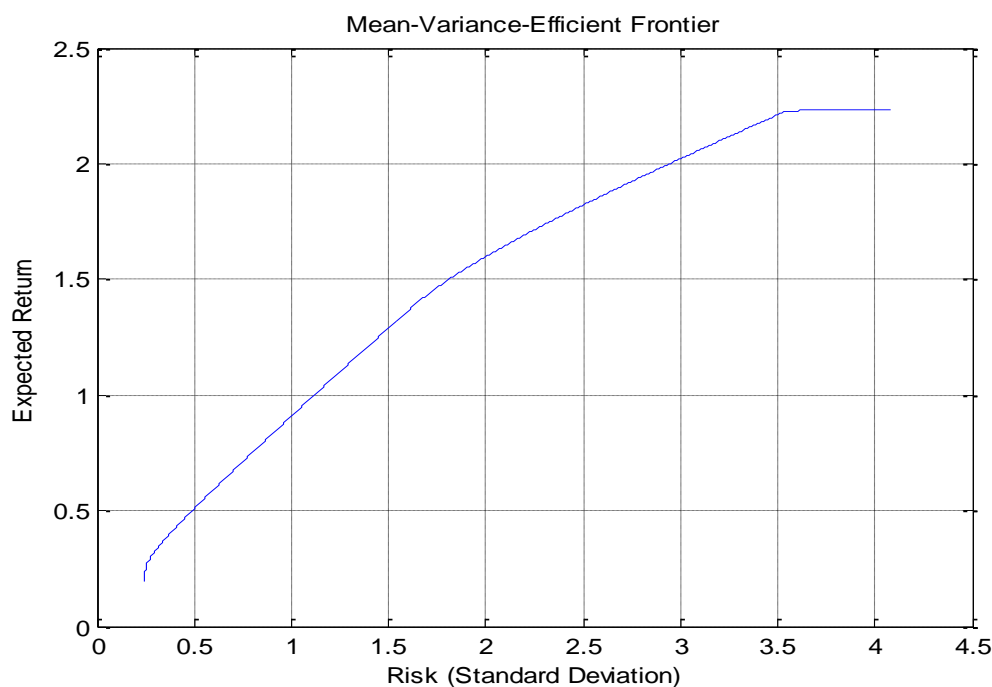


Fig1. Different Risk and Efficiency Combinations for Different Weights for Income Resources

In fig1, the risk and return on income portfolio have been calculated by allocating different weights to the revenue codes of the Tehran municipality. Each point in this chart indicates an income basket. To draw this chart, 500,000 different income portfolios have been investigated in MATLAB software, and the chart has been drawn based on the calculated risk and returns. Also, in calculating the weights of Table 6, the same number of income portfolios is considered. In fact, in this chart, different weights are given to each of the municipality's income codes, and based on the assumed weights, different baskets are formed for the municipality's revenue bases. Moreover, each of these baskets has its own standard deviation and averages. Based on standard deviations and returns in each income basket, a set of points will be available. If the expected rate of return is considered and based on this return, only the points

with the least standard deviation are considered, a graph with the name of the "Efficient mean-variance frontier" will be obtained. In other words, the effective boundary curve, for each expected return level, calculates the minimum risk (standard deviation) that can exist for each income basket. Based on the chart, with increasing expected returns, the risk level of Tehran's municipality's revenue portfolio will increase. However, the slope of this curve is not constant, and is slightly reduced by in standard deviation about equal 2, with a standard deviation about 3.5, there is a nearly horizontal curve. Analysis of this graph shows that, despite the direct trade-off between risk and the expected return on the portfolio, the intensity of the relationship will vary in different levels of returns and standard deviations. Horizontally of the chart at the level of 3.5 standard deviation means that after the standard deviation level of

3.5, the expected returns will not change significantly with the increased risk of the municipality's portfolio.

6- Conclusion and Discussion

The lack of a comprehensive approach to the sources of income of the municipalities within the framework of the economic system of Iran, the implementation of self-reliance and self-governance policies of municipalities and the lack of proper management of municipal income, has made the municipality's incomes sector in instable situation. So that the continuation of these conditions will have adverse effects and consequences, as well as social, cultural and infrastructure costs for municipalities and urban management. Considering the importance of the municipality's revenue structure, this study compared the structure of revenues and expenditure of some of the municipalities of Iran, and then, with focusing on the income structure of the municipality of Tehran, the weight of each income source of Tehran municipality were estimated .based on Risk and returns. By comparing estimated weights with existing weights, it can be clearly stated that the revenues structure of Tehran Municipality did not have a good balance.

At present, a large part of the Tehran municipality's revenue portfolio is devoted to income code (1), and since income code 1 more often includes building tolls, floor space surplus, renovation tolls, etc. This income base is heavily influenced depression and prosperity, so a high share of Tehran's municipality's revenues depends on unsustainable revenue. By comparing the weight of income codes in 2011 and 2014, it becomes clearer that, with the expansion of the recession in the Iranian economy, the share of income code 1 also

decreased in Tehran's municipality basket (from 86% in 2011 to 68% in 2014). Based on the Sharp criteria, the optimal share of the public tolls should be 60%. Although over the course of the four years from 2011 to 2014, the weight of public tolls is approaching the optimal weight of the Sharp criterion, but these changes seem to be more due to the recession and the decline in the housing and building sector, not improving the income structure of the municipality of Tehran; In other words, because of the decrease in Tehran's municipality revenues from construction and floor space surplus tolls, its focus is on other sources of revenue. However, these changes have led to improvements in the revenue structure of the Tehran municipality in terms of risk and returns. It is recommended that the Tehran municipality check the optimal weights calculated in this research and, if possible, put them into operation to have a more stable income structure and can be more resistant to changes and economic changes. The point is that the Tehran municipality may have limitations on the financing of some resources, making it difficult to achieve computational weights in this study. The solution in this regard is that the municipality can integrate its constraints into the optimization models of this research and again estimate the optimal weights in the framework. As noted, the revenue code 1, i.e., public tolls, has the largest share in the municipality's revenue portfolio. Why this topic can be explained from a variety of perspectives. The first issue is the combination of this revenue code. Most of this code is related to the tolls on buildings and land (tolls on building permits, overcompensation floor space surplus, Segregation of land construction,

complications on the balcony and outpacing, etc.). The reason for the focus of the municipality on this income base can be due to several factors: ease of access, lack of suitable alternative resources, lack of adequate supervision over the performance of the municipality, lack of attention of the municipality's managers to the future of the city and short-term view, and lack of familiarity with the principles Municipal Finance Management. Similarly, issues such as the issue of self-sufficiency and self-reliance of municipalities in 1983 and, consequently, the reduction of the income dependence of municipalities on the government and the increasing problems of cities as a result of population growth and migration, large volumes Demand for urban services has affected on this issue.

Considering the instability of income from the effects of tolls on buildings and lands and the serious problems of these type of income in the city administration on the path to sustainable urban development and also because of the macro policies of the country and, consequently, the municipalities is achieving sustainable development, the necessity Based on the principles of financial optimization, selected a more sustainable structure for the municipality's revenue portfolio. In this research, efforts were made to take steps to achieve this goal.

Based on the latest information published by the Tehran Municipality on the budget in 2015 and the research findings, suggestions can be provided. Based on the results of the research and considering both the risk and return criteria (the Sharp criterion), it is proposed to shares of municipal revenues public tolls (code 1) and Income from the funds and property (code 4) decrease and

shares of specific tolls (Code 2) and Service price and Profit institution Incomes (code 3) increase (compared to weights in 2015). In this case, the municipal budget will have a better balance. Regarding the composition of code 1, it can be said that a large share of the revenues of this code is attributed to tolls on building permits and floor space surplus. Both of these sources are affected by periods of recession and boom, and if not managed properly, they will have a negative impact on urban texture.

Income Code 3 is mainly based on municipal services to citizens, such as road asphalt and road restoration services, waste collection services, commercial and transportation services, municipal services, educational services, etc. Emphasizing and focusing on this income code will also help to improve the municipality's revenue portfolio by providing more favorable services to citizens and increasing theirs satisfaction.

Income code 4, mainly includes income from municipal investment and property lease. The results showed that by reducing the revenue from code 4, the municipality's revenue portfolio would have a higher sustainability. This shows that the investment of the municipality has not had a stable and acceptable return and there is no proper investment management in the municipality. The reason for this can be ease of access and access to other sources of income. If the municipality of Tehran can take the appropriate investment management, it will be able to solve an important part of its financial problems.

The most important components of income code 2, the municipalities' share of the centralized tolls (the value added tax) and the tolls of motor vehicles, are

usually fluctuating due to the government deficit. In this context, it is suggested that certain rules be laid down for paying municipalities' contributions of tax that collected by the government.

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