Estimating Housing Prices Using Automatic Linear Modeling in the Metropolis of Mashhad, Iran

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[1]

***Abstract*—**Market-transaction price for housing is the main criteria for determining municipality taxes and it is determined and announced on an annual basis. Of course, there is a discrepancy between the actual value of transactions in the Bureau of Finance (P for short) or municipality (P′ for short) and the real price on the market (P″). So, the aim of this research is determining the housing real prices in the Mashhad metropolis and pinpoint on the price gap with aforementioned apparatuses and identify the affecting factors on it. To reach this practical objective, we have used of Automatic Linear Modeling, which calls for an explanatory research. The population of the research were consisted of all residential units in Mashhad metropolis that they have selected from 317 residential units randomly. Through cluster sampling, out of the 170 income defined blocks by the municipality, three blocks form high-income (Kosar), middle-income (Elahieh), and low-income (Seyyedi) strata were surveyed using questionnaires during February and March of 2015 and the information's were gathered regarding the price and specifications of residential units. In order to, the estimate of affecting various factors on the housing price, the relationship between independent variables (8 variables) and the dependent variable of the housing price were calculated using Automatic Linear Modeling in the framework of SPSS. The results showed that the average for housing price index is 788$ per square meter, compared to the Bureau of Finance's prices which is 10$ and that of municipality's which is 378$. Correlation coefficient among dependent and independent variables was calculated to be R^2=0.81. Out of the eight initial variables, three were omitted. The most influential affecting factor on the housing price is the quality of construction (Ordinary, Full, Luxury). The least housing price important factor is the number of variable sides. The price gap between low-income (Seyyedi) and middle-income (Elahieh) districts was not confirmed via One-Way ANOVA but it was confirmed with the high-income district (Kosar). Finally, it is suggested that Mashhad city can divided into two low-income and high-income sections, as opposed three, in terms of housing prices.

***Keywords*—**Automatic linear modeling, housing prices, Mashhad, Iran.

I. Introduction

HOUSING has turned into one of the complex issues in every country, including Iran. The increase of housing prices and the rise of population in one side and on the other side, makes the issue of housing more challenging [1]. House is not solely regarded as a shelter, but also as a commercial and political good. In addition to being the major asset for every family, who resort to owning houses due to their reluctance for taking higher risks in other financial markets, it is a basic and irreplaceable need, so studying it is of paramount importance; however, this sector has been experiencing booms and busts, due to inflation, together with skyrocketing of the prices. So, modeling the patterns of its change is one of the major scientific issues [2]. The emergence of various modeling techniques for a wide range of activities from design and agriculture to engineering, social and economic sciences have yielded a useful tool for increasing the efficiency in design patterns and determining the efficacy of managerial factors. Environmental modeling techniques provides us with an opportunity thorough which we can easily evaluate various characteristics and by keeping some parameters constant while changing others, determine the most efficient value [3]. Many of the researchers engaged in transportation and land use make a lot of effort for modeling, the majority of which is done with the purpose of reproducing human behavior, performance of mechanical systems or a combination of both to make predictions or validations so that decision makers can make better decisions [4]. Developing an operational model deals with more complex issues, in comparison with the process of developing a housing model, and involves various aspects and variables, thus modeling is always faced with limitations and expresses a part of reality [5]. Until now, there have been far-reaching efforts to develop new strategies to overhaul the existing urban models toward high-quality ones, considering social, economic, environmental and etc. factors.

These are all examples of spatial models [6]. On the other hand, development of non-spatial models, such as prediction models, requires certain assumptions. There might be assumptions about the return of an investment, construction costs of a project or the completion time of a specific activity. Due to the predictive nature of such assumptions, it is possible to find their real value. There is a possibility for prediction according to historic data and past experiences. Although prediction is useful to development of a model, due to the estimation of an unknown value, it is accompanied with risks and inherent uncertainties [7]. Housing is a complicated good with many aspects. The final price of a residential unit hinges upon such factors as structural quality, neighborhood characteristics, access to central business districts (CBD) and distance to various amenities [8].

With considering all advantages and weaknesses of modeling techniques, the present paper aim is estimate the housing price for both houses and apartments in the Mashhad metropolis during February and March of 2015. Regardless of the extensive studies concerning estimation of the prices and identification of the various affecting factors on it using varied models such as simple and multivariate regression and time

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series by different researchers in various areas [9]. Scholars such as Orford (2001) have estimated housing price using multilevel models. He has studied the gap between theoretical and experimental approaches and in his paper he mentions the contradictions of these two approaches using multilevel modeling for housing prices. Using the housing prices in Cardiff, he investigated the way which a multilevel approach can evaluate a spatial structure of housing market dynamism. The criteria which it was used by Orford are: number of bedrooms, number of living rooms, number of bathrooms, number of garages and renovation [10]. Kong and colleagues (2007) studied the effect of urban green space on housing prices using GIS in china. Their findings show that urban green space leads to an increase in housing prices. Green space variables, including distance to jungle landscape; access to parks and green urban space; and the percentage of green space, were statistically significant ($p = .05$). They, also, proved that neighborhood and educational facilities are influential factors in determining housing prices [8].

Brasington (2005) studied the relationship between housing prices and environmental factors in Ohio, U.S.A using spatial statistics, emphasizing that proximity to sources of pollution reduces the housing price [11].

In another study, conducted by Ozus and Dokmeci (2007) in Istanbul, spatial distribution of housing prices in Istanbul, the biggest city in Turkey and an important economic and social hub with a long historical background was investigated. Various factors influencing the housing prices were studied in their research. The samples were collected from three districts: central, middle and marginal. Housing prices were obtained from real-state agencies and were analyzed using regression. Housing price was adopted as dependent variable and ratio of road surface, distance to the beach, distance to the city center, and ratio of floor surface, overall square footage, and the value of integrated access constituted the independent variables for spatial index [12].

Their findings revealed that floor area ratio was the most influential factor in determining of housing prices. The second most influential factor was identified to be the ratio of road surface and the third one was distance to the beach. The latter factor is the most important one for the cities surrounded by the sea. Other factors such as distance to the city center were not important.

Ozsoy and colleagues (1996) have studied the spatial distribution of housing prices in Istanbul and investigated the spatial changes in housing prices in 5 districts of Istanbul, considering ownership and sub-bazars in order to identify the local factors. Municipality boundaries were considered as effective boundaries in spatial distribution of housing prices. In the initial part of the study, general housing specifications, all over the city and under the Grand Bazar were investigated. Then regression analysis was conducted for the entire city and for the districts. Their findings confirmed the hypothesis that prices are determined by three factors: 1-structural, 2-local and 3-enviornmental, while the most important factor for the overall city was determined to be sub-bazars. Other variables varied from one district to another. Among the seventeen factors that we have considered, only the distance to CBD was of inconsequential importance which it was related to the spatial attraction of the districts beneath the center, in areas with high degree of importance. Their findings were similar to those of cities with multiple centers. In addition, seventy to eighty percent of the observed price changes in these areas were within their first and second circles. Coefficient of determination and the number of significant variables for core and dwelling areas were lower. One of the reasons for this is that local housing market is not influenced by identical variables, which can be either due to the difference in preferences of the consumers or in initial specifications [13]. Housing cannot be regarded as a homogeneous service, but rather a combination of specifications and services including its structure, quantitative and qualitative features and neighborhood specifications [14].

From nearly the 60s onward, the issue of housing in Iran has turned into an important one and recent years can be regarded as the height of the housing crisis (especially with regards to prices and fees). This crisis has caused housing fees to take up the highest percentage, compared to other expenses, among Iranian families who leave in cites [15].

At the moment, the ratio of home ownership in Iranian cities is, on average, 68 percent. This figure for the lowest income decile (the lowest) is 56 percent and for the highest income decile is 85 percent. On the other hand, the ratio of housing price index to annual income of urban families, which is supposed to be between 3-5 times more than the overall family income, is approximately two times more in Iran [16].

The Mashhad city is the second largest metropolis of Iran, with a population about 2766258 in 2011, an average family size was 3.4 people and a ratio of 1.02 families per residential unit. Between 2006 and 2011, nearly 151349 immigrants have entered Mashhad [17]. Nearly 30 percent of residential units are rental ones. From the entire population of the city in 1390, 66.3% were born in the city of their abode (Mashhad) and the rest (33.7%) were born in other urban places (72%) and rural places (28%), which is a testament to it's being an immigration destination [18].

Low capacity for construction, which is determined by the number of construction licenses issued by the municipality, has increased the gap between offer and demand and created an inclination toward rental housing, to a degree that the number of issued construction licenses by the municipality in 2013 was 5907. The ratio of residential construction licenses to all the issued licenses is 87%. The total number of residential units in the issued residential construction licenses was 20687 units. Considering the average number of people per bedroom and the average family size, the city faces a housing shortage of 58000 residential units. Thus the increasing gap between demand and offer is, in itself, a reason for soaring house prices. In addition to the previously mentioned reason, arrival of millions of pilgrims and tourists per year has exacerbated the housing shortage. The number of tourists in 2013 in the Mashhad metropolis is estimated to 23250000 [19]. Similarly, 796066 foreign pilgrims and tourists entered the city in 2013 [17]. The presence of a large

number of real-estate agencies is an indicator of housing activities in terms of buying, selling and renting in Mashhad city. The number of legal real-estate agencies in Mashhad is estimated to be 8500 and nearly 20% of real-estate agencies in Mashhad are running illegally. A 30% reduction in the number of real-estate agencies in recent years testifies to a recession in housing market [20]. All these points are emblematic of the problems the city is grappling with and necessitate real identification and scientific modeling of housing market, for both buying and selling.

Thus this research tries to answer to the following questions:

1. There is no significant gap, in terms of price, among the estimates of Bureau of Finance (P), municipality (P′) and the real market price (P″).
2. There are no significant changes regarding housing prices in high-income, middle-income and low-income districts.
3. The factors effecting housing prices are not very different from one another.

II. Methodology

The present research is an applied one, in term of its findings, and explanatory (descriptive-analytical), in terms of methodology. The research population consists of real-estate agencies in Mashhad. Considering the number of real-estate properties and statistical blocks, within a confidence level of 95% according to Cochran equation, 317 samples were estimated to be required. The distribution of samples was done using city master plan during February and March of 2015, with a legend of 1-2000, considering a three-category income classification: high-income, middle-income and low-income (figure 1). Using questionnaires designed by the author, information regarding the real-estate properties was gathered thorough field work in three districts (Kosar, high-income district; Elahieh, middle-income district; Seyyedi, Low-income district). The Questionnaire's reliability was measured using Cronbach's Alph (0.67) which yielded an acceptable value.

For the analysis, Automatic Linear Modeling was used. Considering the aim of the study, which is to determine the relation among housing price index as a dependent variable (Y) and 8 other variables as independent ones (1. Apartment area 2. Land area 3. Number of sides of the apartment 4. Width of street 5. Quality of the apartment (ordinary, full and luxury) 6. Number of floors 7. Number of units per floor 8. Number of units), this relationship was described in terms of Equation (1):

$$y = c + b_1x_{1+} + b_2x_2 + \cdots + b_nx_2n \qquad (1)$$

Where, y= dependent variable (housing price index), c= constant, b_1, b_2 = beta, x_1, x_2, x_n = independent variables (square footage, etc.).

First, formula (1) was defined for the SPSS. Then, Automatic Linear Modeling was used as the research model. Housing price variable was introduced as the target variable and the other 7 variables were introduced as predictor variables. Finally, forward stepwise model and coefficient of determination (R^2) were calculated.

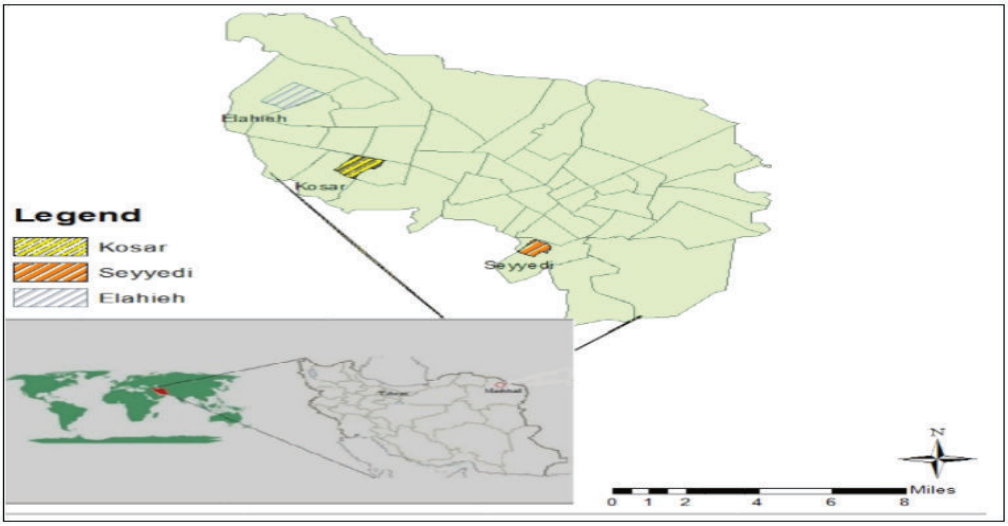


Fig. 1. A view of case study region and Mashhad Metropolis.

III. Results

The findings of the study, in two descriptive and analytical sections, are as follows:

Descriptive findings: average family size per residential unit in Mashhad, according to the census of 2011 was 3.4 people. Approximately 50.4% of families are living in apartments and the rest (49.6) live in houses. The distribution of families in bedrooms in Mashhad is depicted in table 1. 75% of families occupy up to 3 bedrooms [18].

Similarly, according to the findings of population and housing census conducted in 2011, nearly 71% of families live in residential units measuring up to 100 square meters.

The average price of one square meters of an apartment in Mashhad in 1993 was 17.85 $ and in 2013 was 333$. The increase in apartment prices during this period has been

tantamount to its annual increase which is 23.4 percent. (Figure 2). The increase in inflation rate for the entire country for this period (1993-2013) is also depicted in figure 3. The inflation index has increase from 4.5 to 175.9 and the average rate for inflation increase has been 20.1% per year. The average increase in housing price is almost similar to that of inflation index for the same period. Thus, not only has the national inflation rate influenced the increase or decrease in housing prices, but the changes in housing prices in the metropolis of Mashhad have been more influenced by national factors, specifically the inflation rate, much more than any local ones [21].

Fig. 2 Comparison of inflation index and the average price for one square meter of an apartment in Mashhad during the statistical period of 1993-2013

In Table I, the status of the variables under study has been depicted. As can be seen in the table, the most salient difference is that of the physical indexes in middle-income district of Elahieh with the two other districts, which are more than the two others in terms of street width, land area, and number of units per floor. The findings have revealed that Elahieh is not in a good condition, although Elahieh is a newly-built and modern district which it has master plan. Maybe according to these findings, Seyyedi and Elahieh can be merged into one stratum, changing the municipality districting scheme.

TABLE I
SPECIFICATIONS OF THE VARIABLES UNDER STUDY

Row	Variables	Mean	High-income (Kosar)	Middle-income (Elahieh)	Low-income (Seyyedi)
1	Width of street	13.99	12.18	19.71	11.11
2	Land area	396.94	361.17	576.51	273.95
3	Sides	1.13	1.04	1.34	1.04
4	Number of floors	4.29	4.84	4.35	3.66
5	Number of unites	8.96	7.88	13.40	6.42
6	Number of units per floor	2.05	1.60	3.01	1.72
7	Apartment area	125.95	161.97	113.55	98.23
8	Quality of construction(Ordinary, Full, Luxury)	1.92	2.47	1.97	1.30
9	The real price of properties(P″)	2758.14	4800.86	1547.58	1605.45
10	Market transaction value of properties(P)	2.25	3.73	1.03	1.71
11	Municipality price(P')	1321.50	2393.10	737.36	610.00

The price gap among districts: the price gap among the three districts under study, according to various departments is as follows:

1. Market transaction value of properties (P): as mentioned earlier, each year Iranian National Tax Administration, in line with article 64 of the Law of direct taxes, calculates and publishes the transaction value of urban assets, both residential and commercial, through a committee of representatives from Islamic City Council, State organization for Registration, Bureau of Houses and urban development and Agriculture Jihad [22]. So, the Mashhad city has been divided into 76 tax blocks. Pricing usually is done in accordance with the street width index, and distance from major and wider streets. The price assigned by the Bureau of Finance forms the basis for all executive branches in calculating legal tolls, property conveyance fees, and even the tolls for construction licenses within legal constraints. In order to prevent inflation and increase in prices, the price of the district and market transaction value was calculated by the Bureau of Finance is lower than the actual price of the property, which has been shown by P. Its status in the three areas of under study is shown in figure 4. The average price for market transactions is 7$. The highest amount, 10.6$, belongs to Kosar district (high-income) and the lowest, 3$, belongs to the middle-income district of Elahieh. Figure 4 shows the status of property valuation gap, for each category, with the assigned value by National Tax administration being the lowest among and very different from other apparatuses.
2. Municipality price (P′): in addition to the market transaction value, which it is annually calculated and announced by the National Tax Administration and constitutes the basis for determining legal construction tolls and infringements of commission on article 100 of the law of municipalities, the municipality to calculate illegal infringements that they are out of sync with the city master plan and it is lead to the dismissal of commission on article 100 of the law of municipalities, through tacit agreement with the owner of the property converts the penalty into a fine. Due to rejection of the market transaction value of a property as its real value by municipality, through its experts, it set a price for properties which is depicted by P′. In this paper, the local price layer for P′ in the year 2013, available on the website of Mashhad Municipality, has been used and the result is depicted in figure 3. As can be seen in figure 3, the average district price of P′ throughout the three blocks equals 378$, with a maximum of 683$ for Kosar and a minimum of 174$. Based on a myth, municipality with the intention of helping people in deprived areas has divided city into 5 income categories, each with its own coefficient, and it has reduced the fine prices in deprived areas in comparison with the well-to-do ones, but the reality is s.th different. The real price of properties in these districts is not less than districts with middle-income

citizens. In practice, the municipality is helping violators, exacerbating the trend of infringements.

3. The real price of properties (P″): as mentioned earlier, the main objective of the study is to determine the real price of properties throughout the city of Mashhad, which was accomplished through selecting three blocks with various income levels (based on income classification of Mashhad Municipality) via field work and completion of questionnaires. The results can be seen in graph 4. The average real price of one square meter of an apartment is 788$, where the highest amount belongs to Kosar, with 1372$, and the lowest belongs to Elahieh and is 442$. The findings of the research reveal that first, Elahieh district, in terms of housing prices, is lower than Seyyedi and second, the seemingly deprived district of Seyyedi and middle district of Elahieh can be combined with one another, creating one block.

Fig. 3 depicts the price gap among the three studied areas. As can be seen, there is no significant difference between Elahieh and Seyyedi districts and their difference with Kowsar district is quite clear. Moreover, market property prices presented by Bureau of finance, municipality and the prices obtained in the process of the present research are quite different and show a price gap.

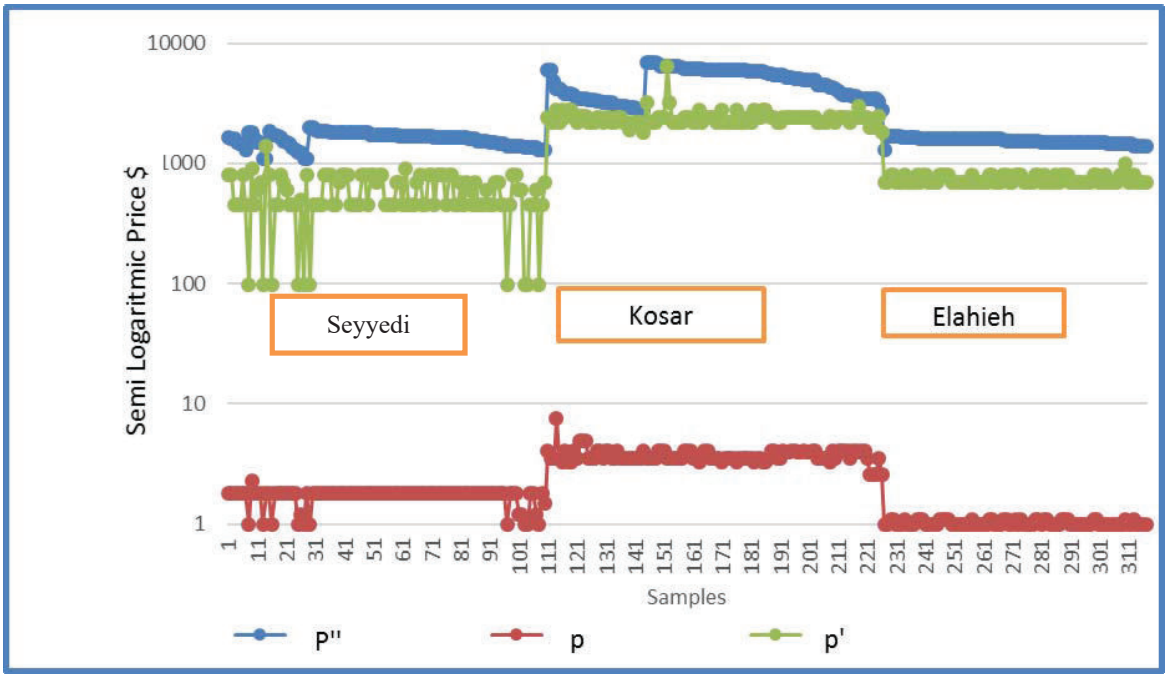


Fig. 3 Housing-price gap in areas under study

In addition to figure 4, using One Way ANOVA in SPSS, the hypothesis that there is no significant difference between the market prices for housing properties, in the areas under study, was tested and the output is shown in table 2. As can be seen, the difference between Elahieh and Seyyedi districts was not confirmed but the difference between these two districts and Kosar was confirmed with a confidence level of 95%.

Analytical results: Analysis the relationship between independent variables and the dependent (target) variable of housing price. So, to analyze the relationship among *these* variables, Automatic Linear Modeling was used. This technique involves the following steps:

1. First step, outputs of model: after creating a conceptual model and entering the data as target and predictive variable and doing the adjustments, a summary of the analysis process, as depicted in figure 4, it is presented which it is includes of the target, price of one square meter (Per_meter_price), forward stepwise regression and information criteria. The lower information criteria are better in the final model. The following chart depicts the coefficient of determination between predictive and target variables which is 81.2 percent (R^2*100=81.2%), meaning that these variables account for 81.2 percent of changes in the target variable, and the rest is influenced by other factors.

2. Predictor importance: this graph, (figure 5) helps to identify the relative significance of each predictive variable in the model. Since the coefficients are relative, the sum of these coefficients equals 1. The predictive model has nothing to do with the accuracy of prediction model and deals with the significance of each of the predictors in the prediction. As depicted, 5 of the variables have been used and three of them were omitted. Quality of construction, apartment area, land area and etc. are the most significant variables respectively. The negative or positive effect of these variables cannot be determined in this step and will be done in the next step.

TABLE II
One Way Analysis of Variance for the Price of Housing Properties in the Areas under Study

Multiple Comparisons

Dependent Variable: Housing price(per_meter_price)

LSD

(I) Area	(J) Area	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Seyyedi	Kosar	-3195.40752*	105.50185	.000	-3402.9874	-2987.8276
	Elahieh	57.87213	112.33425	.607	-163.1509	278.8951
Kosar	Seyyedi	3195.40752*	105.50185	.000	2987.8276	3402.9874
	Elahieh	3253.27965*	111.01117	.000	3034.8599	3471.6994
Elahieh	Seyyedi	-57.87213	112.33425	.607	-278.8951	163.1509
	Kosar	-3253.27965*	111.01117	.000	-3471.6994	-3034.8599

*. The mean difference is significant at the 0.05 level.

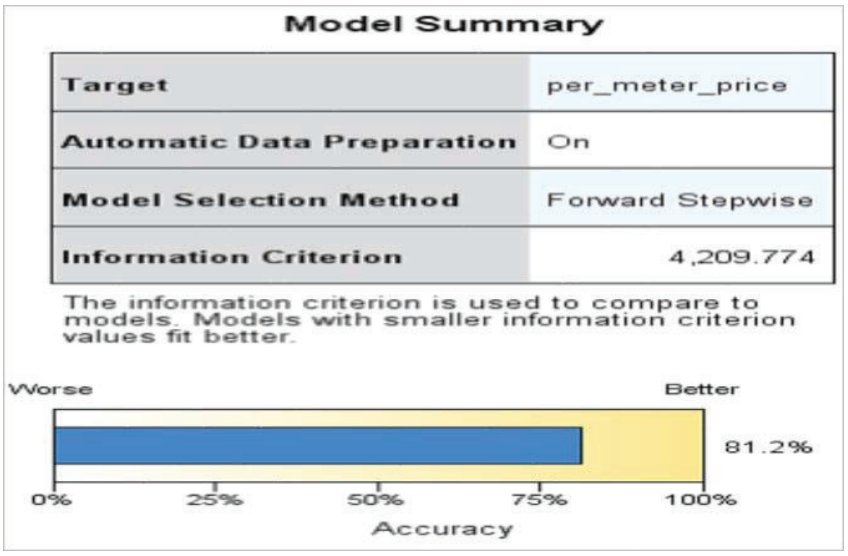


Fig. 4 Summary of Automatic Linear Modeling

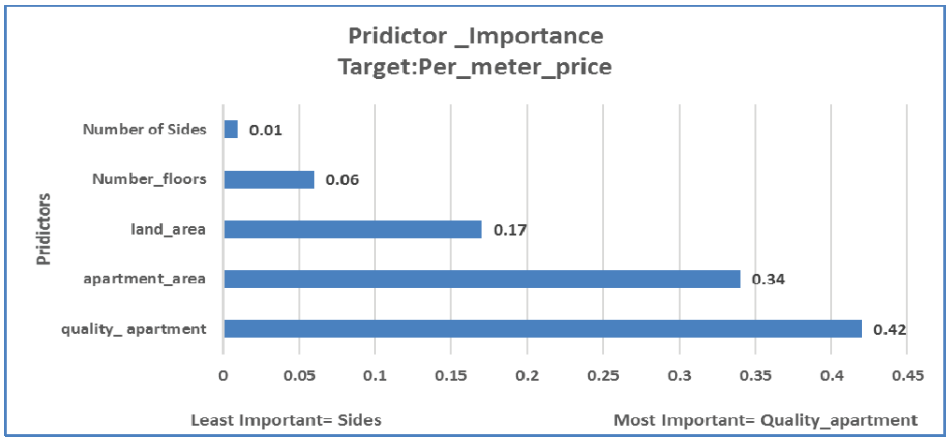


Fig. 5 The significance of predictor variables in the model.

2. The predictor variables' effect on the target variable: in this figures (figure 6 and figure 7), the effect of predictor variables on target variable is shown in two graphs. The sixth figure depicts the severity of variables' effect using line thickness. In this figure, the variable for the quality of construction (ordinary, full and luxury) has the most significant effect which amounts to 0.44. After that, variables of apartment area (0.34), land area (0.17), and number of floors (0.062) are placed. The variable of number of sides has the least effect which is 0.0006.

The seventh graph, in addition to depicting the relationship among target and predictor variables, shows their positive or

negative effect in blue or brown. Brown depicts a negative effect and blue shows a positive one. In this figure, the intercept value is positive and the variable for house quality (ordinary and full) has been divided, due to its being an ordinal variable, and both quality types, namely ordinary and full, have negative effects which are significant with a confidence level of 0.95. The quality of luxury housings, for not being confirmed, has been omitted. The variable for land area, too, has a negative effect on the variable of housing price and has been depicted in brown. Similarly, the variables for apartment area, number of floors, and number of sides (which is a nominal variable, including one-side and two-side buildings) have a positive effect on the price of one side buildings, but their effect on the price of two-side buildings with a confidence level of 0.95 was not confirmed and were, consequently, omitted. Overall, out of the 8 initial variables that were entered into the equation, three variables (width of the street, number of units per floor and number of units) were omitted and among the remaining five variables, 2 had a negative and 3 had a positive effect. It merits a mention that, in addition to the visual method, tables can be used to depict variable characteristics.

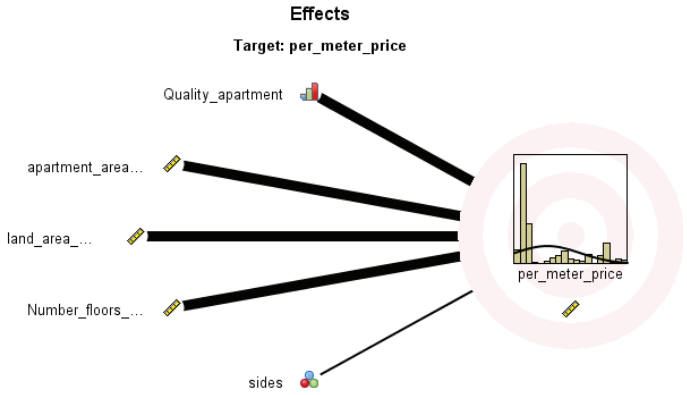


Fig. 6 The effect of predictor variables' linear model on target (dependent) variable.

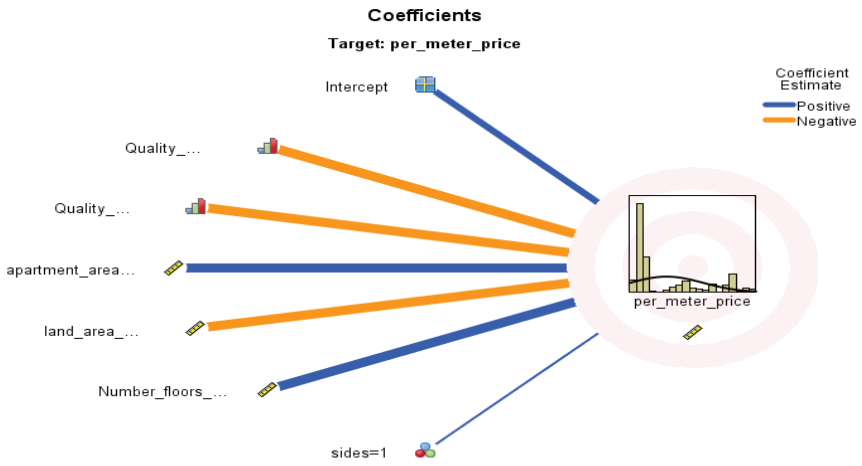


Fig. 7 The positive or negative effect of predictor variables' linear model on target (dependent) variable.

3. Predicted coefficients through observed values:

In figure 8, predicted coefficients on the Y axis have been determined using observed coefficients on the X axis. In the ideal form, the points are located on a line with a 45-degree slope on the diagonal of the chart. Irregular dispersion of the points means that the model has not yielded a satisfactory prediction. In addition, dispersion of the predicted values in the three districts shows the concentration of the data related to middle-income (Elahieh) and low-income (Seyyedi) districts in the lower left section and the data related to high-income (Kosar) district in the upper right section of the chart. Thus the data is divided into two clusters.

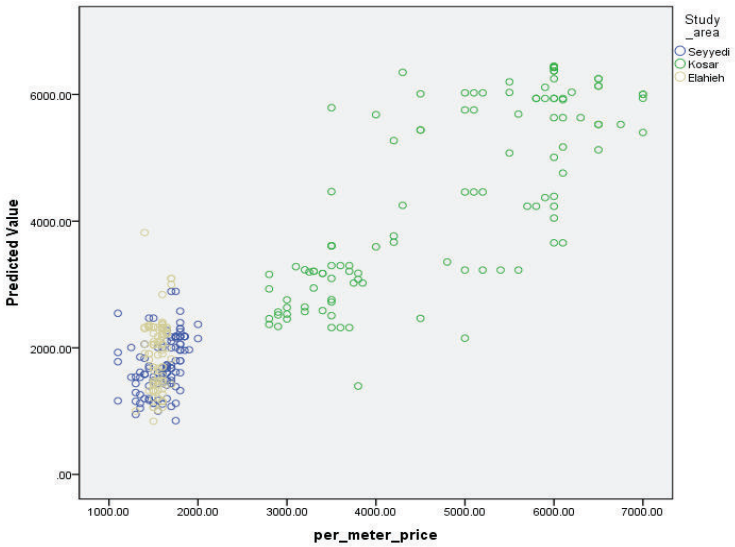


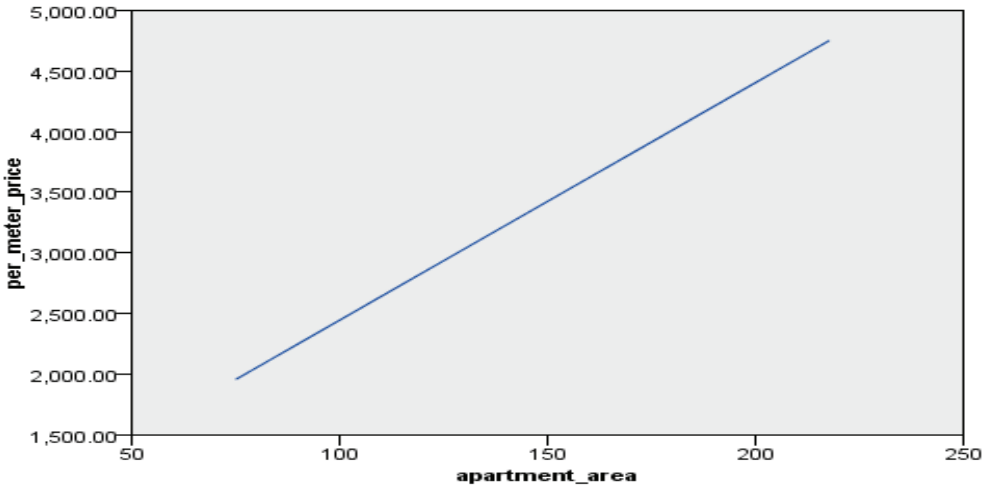
Fig .8. Predicted coefficient using observed values.

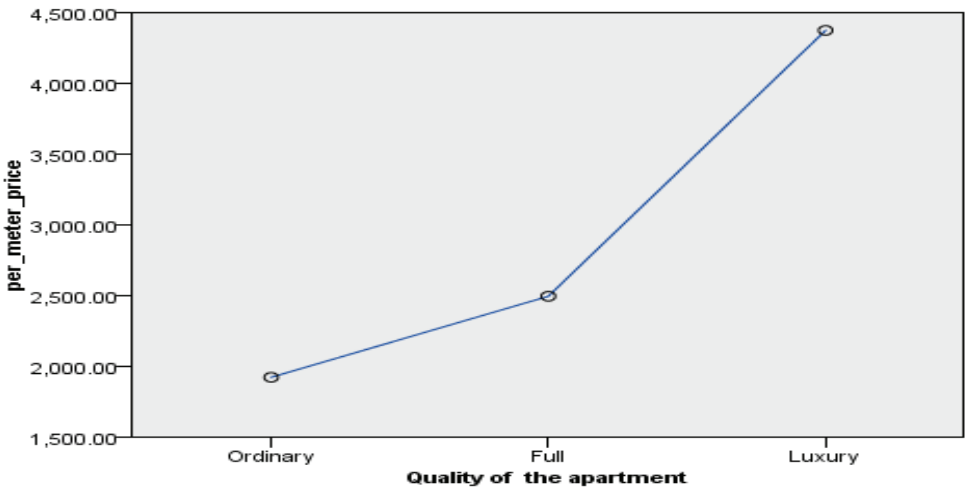
3. Average estimation graph: this graph is noticeable for the purpose of prediction. The graph shows the coefficients for the model's target variable on the vertical axis, for any given value of predictive variable on the horizontal axis, if the other predictive variables remain constant (figure 9). These graphs are useful representations of the effects of each predictive coefficient on the target variable. Graph 9 illustrates the relation among the variables of apartment area, quality of construction (ordinary, full, luxury) and that of number of floors, all of which are positive, and the variable for land area, which is negative.

Estimated Means

Target: per_meter_price

Estimated means charts for the top ten significant effects (p<.05) are displayed.





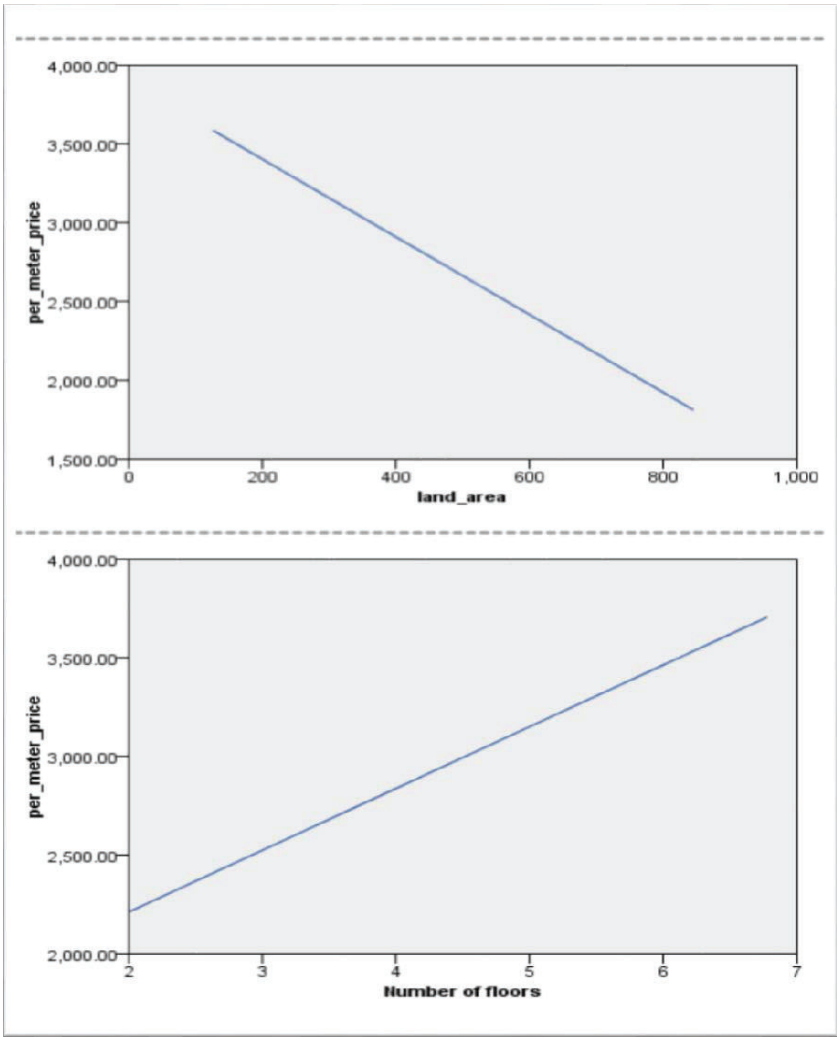


Fig. 9. Average estimation of target variable and predictor variables

3. Model building summary: table 3 shows the operation of model's algorithm, based on forward stepwise regression, up to 10 steps. It also depicts the participation rate for each of predictive variables in each step of the model, the value for determination coefficient in the fifth step, R^2=0.812, and the participation rate of variables in various steps, where the variable of quality of construction (ordinary, full, luxury) are in the model from the first up to the fifth step and the variable for number of sides has entered the model in the fifth step, where the model reaches its maximum fitness.

TABLE III
Summary of predictor participation variables' in the model

Model Building Summary: Target: Per_meter_price						
		Step				
		1	2	3	4	5
Adjusted R Square		.676	0.758	.797	.811	.812
Effect	quality_ apartment	*	*	*	*	*
	apartment_ area_ transformed		*	*	*	*
	land_ area_ transformed			*	*	*
	Number_ floors_ transformed				*	*
	Sides					*
The model building method is Forward Stepwise using the Adjusted R Square criterion. **An asterisk means the effect is in the model at this step.**						

IV. DISCUSSION AND CONCLUSION

One of the major issues for municipalities, as urban management institutions, is to create adequate sources of revenue and to fund urban services to create a healthy city with a desired quality for its citizens. After the Islamic Revolution of 1979, owing to the war imposed by Iraq (1983), the government's financial support of the municipalities was ceased and they were forced to seek out new sources of revenue. Taxes on housing construction licenses, which amounted for nearly 25% of their revenue, was not enough and, consequently, municipalities resorted to selling permits

for higher buildings and collecting fines for construction violations. Estimates show that the revenues collected form construction and violations in construction account for nearly 75% of the municipalities' income, including that of Mashhad municipality. This has led to disobedience of terms and conditions stipulated in urban master plans, land use changes, increase in building density, thus increasing the population, decreasing the offered services per capita and has created serious challenges for urban livability.

Municipalities are becoming increasingly dependent on the income derived from construction, it can be said, they have become addicted to construction violations' revenues and nowadays, they cannot refrain from it easily. So they are, constantly, searching for new ways of making money in this way, which it is becoming less and less viable. Construction revenues are not sustainable and increase during the boom and decrease rapidly in times of recession, impeding urban affairs and frustrating city management. So municipality, through estimation of properties' real market value aims to find a much more realistic basis for determining the fines for construction violation. It also seeks to pinpoint the influencing factors on the properties' market value, preventing personal preferences which it will lack the scientific rigor. To this end, out of 170 suggested blocks for municipality prices (P′) in 2014, three of them were selected from low-income, middle-income and high-income districts and 317 registered plaques were used to pinpoint the real price of one square meter of a newly built apartment, using questionnaires. The results reveal that classifications done by the municipality, in dividing the city to high-income, middle-income and low-income districts, has not been a wise one. Average prices of properties in low-income and middle income districts are not statistically significant (in One Way ANOVA), but the difference between the high-income district and the other two districts is significant. Thus the two districts can be merged, creating one district.

Similarly, the average price gap between the high-income district (1057$) with the other two districts (457$ and 440$ respectively) is significant. The findings show that although middle-income district (Elahieh) is, in comparison with low-income one, physically more orderly, based on urban development principles and has an approved master plan, in terms of dynamism, population concentration, economic value of properties, and their buying and selling ratio, not only isn't in a better condition, but also rather lower and these two districts are not very different from one another. Thus the perception of city management regarding the classification of the city into low-income, middle-income and high-income districts has not been a scientific one and the discounts ratified for decreasing construction violation fees in low-income districts have exacerbated the violations, through increasing violators' income. Thus helping the violators is far from fair and necessitates reconsidering the resolutions and using equal violation coefficients for imposing fines.

The findings obtained from the application of Automatic Linear Modeling for determining the factors influencing housing prices in the metropolis of Mashhad using 8 independent variables (predictor) and one target variable (housing price) via forward stepwise regression showed that out of the 8 initial variables, only 5 (quality of construction, land area, apartment area, number of floor and number of sides) entered the equation and three (number of units per floor, number of units and street width) were omitted. The coefficient of determination was calculated to be R^2=0.81 which means predictive variables account for 81% of the variations in the dependent variable. Out of the 5 variables that entered the Automatic Linear Modeling equation, two (quality construction, be it ordinary, full or luxury and land area) had a negative effect and the other three (apartment area, number of floor and sides) had a positive and influential effect on the target variable (housing price).

Therefore, it is suggested that, first the street-width factor, which constitutes the major factor in determining the market transaction value of properties by both Iranian National Tax Administration and municipality lacks the scientific value and not all the properties situated in wider avenues have higher market value. Second, other factors such as neighborhood location, quality of housing (nondescript, full, luxury) and etc. be considered in determining the market value and third, municipality review its decision concerning classifying the city into low-income, middle-income and high-income districts, a classification which forms the basis for determining the terms of imposed fines on construction violations and has, unjustly, led to a discount for construction violations in low-income districts. The existing mechanism will exacerbate the violations and help violators accrue more interest.

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