

Factors Affecting Prices in an Used Car E-Market

Kullanılmış araba elektronik pazarında fiyatları etkileyen faktörler

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This study has been conducted in order to determine factors which affect price of the used cars. The data for a specific brand were collected from an used car e-market in Turkey. The main effects and two way interaction effects of factors on the price of the used car was determined. The results revealed that such factors as engine type, feature type, gear type, damage condition, and so on have been statistically significant factors. On the other, ad location was found to be insignificant. Although color and the kilometer of the car did not have main effects, they have two way interaction effects with the other factors. The results indicate that such analysis can be valuable not only for the buyers but also for the sellers. Therefore, it is recommended that such analysis can be provided in the e-markets for used cars.

Bu çalışma kullanılmış arabaların fiyatlarını etkileyen faktörleri belirlemek için yapılmıştır. Belli bir marka için Türkiye'deki bir kullanılmış elektronik araba pazarından veriler toplanmıştır. Kullanılmış araba fiyatına etki eden etkenlerin ana etki ve iki yönlü etkileşimli etkileri belirlenmiştir. Motor türü, donanım türü, vites türü, hasar durumu ve diğer etkenlerin istatistiksel olarak önemli etkenler olduğu bulunmuştur. Diğer yandan ilanın verildiği konumun kullanılmış arama fiyatı üzerinde önemsiz bir etki olduğu bulunmuştur. Her ne kadar kullanılmış arabanın rengi ve kilometresi fiyat üzerinde ana etkiye sahip olmasa bile bu iki etken diğer etkenlerle beraber iki yönlü etkileşim etkisine sahiptir. Burada elde edilen sonuçlar, böyle analizlerin sadece kullanılmış araba alıcıları için değil aynı zamanda satıcıları için de önemli olduğunu göstermektedir. Bu nedenle, bu tür analizlerin kullanılmış araba ticaretinin yapılabildiği elektronik pazarlarda sunulması önerilmektedir.

Keywords: *Electronic market, Analysis of variance, Internet, Statistics*

Anahtar Kelimeler: *Elektronik pazar, Varyans analizi, İnternet, İstatistik*

Jel Codes: *C13, C40, D40, L86.*

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1. INTRODUCTION

Ownership of a car is a significant contribution to the economy of a country. The taxes charged for buying and selling new or used cars and fuel price are very special examples for the contribution to the economy of Turkey. People having a car are ready to go anywhere they want and hence have more potential for shopping than the people who don't have a car. This may be regarded as another potential contribution to the economy of a country of the ownership of a car. Görener and Görener (2008) have studied the automobile industry for its contribution to the Turkish Economy.

It can be said that the demand for the new or used car in Turkey has increased rapidly while at the same time, the number, length and quality of highways between cities in Turkey have also increased. Moreover, the credit opportunities provided by the financial institutions are the other factors which excite the people for having a car. Therefore, car trade has become an important economic and social event in Turkey.

Sales of the cars are categorized to two types as the new and used. Both sales strategies are different from each other.

The new cars are sold by the authorized dealers that use the manufacturer names as trading name and the general dealers that sell different brand cars. Both may have shops and showrooms in which sales representatives work. The representatives try to sell the cars by giving information to the costumers and using other sales strategies. Most of the dealers also use Internet websites for their sales activities. The Internet websites of companies are so important tools in digitalized world both for themselves and their stakeholders.

The used cars can be sold by the dealers and the owner of the car. The dealers sell two types of cars in terms of the ownership; the cars which are registered to them and the cars which the dealers are supposed to obtain the authorization to sell the cars by their actual owners. The owner of the car can also sell his car by several ways; giving the authorization to any dealer, trying to sell in the car markets setting up in almost every city of Turkey in a specific day of every week, giving an ad to the specific internet websites which is called used car e-markets in this study and placing an ad on the newspaper that its popularity has decreasing.

As for buyers, they always need information for decision making. They can reach the information about the car of interest by the dealer's showrooms and the Internet websites. The buyers for new car are legal protections such as consumer's rights in law and the warranty provided by manufacturers or distributors in Turkey. In the case of the used car, the buyers don't have much legal right or warranty like in the case of new car. They buy the car as it is. Therefore the information about the used cars is a very critical issue for the buyers. The buyers of used cars need information about not only for their interests but also its alternatives in order to compare the cars in the market. At this point, it can be said that used car e-markets and internet provide a lot of opportunities for reaching any kind of information both for the buyers and sellers.

The car markets in Turkey have been very popular for the people who want to sell their used cars or buy a used car. These car markets have been settled down on an open field every Sunday of the week. A person can find almost all kinds of cars in these used car markets.

However, it is not easy to find a specific model of a brand and is not also trivial job to collect information about alternatives for a searched car in a car market.

As a result of rapidly developing internet technology, the Internet websites like used car e-markets in which used cars can be traded are becoming popular. In used car e-markets, people who want to sell or buy a used car have had more comfortable environments and opportunities for collecting information about used cars of interest.

The most important role of e-markets is to intercede between buyers and sellers (Sarkar et al., 1996). Sellers try to reach the buyers by presenting their cars' information within the borders of used car e-markets. They can explain the specifications of their cars for catching potential buyers' attention. In the buyer side, the buyers try to find the cars of interest and make best decision making on purchasing the car by searching and collecting information through used car e-market. Some of the used car e-markets may charge some fees to the sellers for their services and have some offers for safe trade.

There are a lot of advantages of used car e-markets allowing trade the used cars such as:

- No negative weather conditions
- Accessing 7/24
- No location restriction
- Chance to reach alternative used car's ads
- Communication convenience between buyers and sellers
- Collecting and analyzing the data about the cars of interest and optimizing to the used car's purchasing.

Only one thing about the disadvantage of the e-markets can be that the buyers can only have a chance to view the car virtually.

The seller wants to sell his car in a short time and in a best price and therefore explains all specifications and situations about the car in his ad. The buyer searches all the ads of the car of interest in terms of his need and budget. The contact between seller and buyer is initiated by the buyer.

The buyers want to purchase a car with a low price as possible as while the sellers want to sell a car with a high price as possible as. For both, in order to determine the best price, they need to information about the cars' current market situation. The general question for both is what the best price of the car that is wanted to sell or buy. More specific question can be what the factors affect to the price of a used car. Therefore, the information offered in used car e-markets affects the buyer's decision about whether contacting to the seller.

This paper seeks answers to above questions, emphasizes the importance of the data offered in used car e-markets and proposes that the results of statistical analysis conducted here and other relevant analysis should be in used car e-markets for their customers.

2. LITERATURE REVIEW

The review of literature revealed several research attempts for this purpose. Uygur (2010) has researched in detail about e-trade or e-market with bibliography and the development in Turkey in his thesis.

Gavazzsa et al. (2014) have worked on volume of the market of used cars by examining its change from the goods to goods and from country to country. Their work is very good example for quantitate analysis in economics. They do not investigate the factors affecting the price of used cars.

Andrews and Benzing (2007) studied on used cars' price in internet auctions. They have used the regression analysis with the price as a dependent variable and the specifications of the used cars as independent variables.

Erdem and Şentürk (2009) studied the prices of used cars in Turkey using hedonic regression analysis. They found that diesel engine, black and grey colors, automatic gear, sunroof, year and place of manufacture and number of cylinders have affected to the price of the car positively and number of services visited and place of the car in Istanbul have affected negatively. The effect of feature types, kilometers, seller type and engine type to the price of the cars are not studied in this paper.

Asilkan (2011) collected the data using data mining techniques from several internet websites allowing trade of used cars in Europe. The variability of price of used cars was investigated by regression analysis and artificial neural network. The main aim of his study was to compare these two methods. Forty eight properties of cars were included in both methods and the artificial neural network has given the best results according to Asilkan's analysis. In his study, the sample size is very high because of software technology. Detailed information about the data of the used cars such as number of ads related to the country, the brand and the features of the used cars were not given.

In this study, the sahibinden.com, the one of big and known internet marketing website in Turkey, was selected as used car e-market. The brand and model category of the used car were limited to Volkswagen, Jetta for the convenience of the data collection. The main aim of this paper is to determine the factors affecting the price of the used car by the statistical design and analysis of the experiment. The proper design for this aim is the multifactorial experimental design with one covariate since there a lot of factors and one covariate affecting the price of used car.

3. RESERACH METHODOLOGY

In this study, in order to determine the main and two way interaction effects of factors affecting used Jettas' price the multifactorial design and analysis of experiment with a covarite has been used.

3.1. Design and Analysis of Experiments

The term experiment is defined as the systematic procedure carried out under controlled conditions in order to discover an unknown effect, to test or establish a hypothesis, or to illustrate a known effect. Experiments are often used to evaluate which factors have a significant impact on dependent variable.

There are three components in an experimental design; the dependent variable, the factors and the levels of the factors. The dependent variable (response) is an output of the experiment. Dependent variable in an experiment are measured and analyzed to determine the factors and their settings that will provide the best overall outcome for the critical

characteristics - both measurable variables and assessable attributes. The factors are the variables that may affect the dependent variable under investigation. Generally, the factors are categorical variables. Finally, the last component is levels of each factor in the study. All these components should be clearly identified and defined for the problem under the study.

There are several statistical experimental designs and analysis methods (Montgomery, 2013) which give solutions to the different real problems from several scientific disciplines. In this study, it is not seen the need giving detailed information about methods of designs and analyses of experiments. The interested readers can have a look at Montgomery's book or other related books in literature.

4. APPLICATION

In this study, the aim is to research the reasons of the variability on the price of used Jetta. The dependent variable, factors and levels of factors are described as follows.

4.1. Model for Used Car Price

There are used cars on sale which have several characteristics such as price, engine type, fuel type, gear type, color, feature types, extras, seller type, actual kilometers, damaged conditions etc. These characteristics are called as factors because they may affect to the used car price that is dependent variable. These and other information supplied by seller are available on used car e-market. Buyers first do their research over the used cars' ads on a used car e-market and then contact to seller if decided to get future information and/or to negotiate. There are a lot of used car ads on each used car e-markets so that analyzing all of them are not easy for a regular buyer. Therefore, the buyers need the information about relationship between price and factors of used cars for their purchasing decision.

In this study, it is assumed that a buyer is looking for used Volkswagen Jetta and needs to understand how used Jetta's prices are affected by the information on ads at sahibinden.com's which is called as used car e-market here. For the purpose of the study following model has been described.

$$Y_{ijklmnoprs} = \mu + ET_i + FT_j + MY_k + GT_l + S_m + AA_n + C_o + DC_p + E_r + \beta KM_s + ET * FT_{ij} + \dots + E * KM_{rs} + \epsilon_{ijklmnoprs} \quad (1)$$

$$i = 1, 2, 3; j = 1, 2, 3; k = 2012, 2013, 2014, 2015; l = 1, 2; m = 1, 2; n = 1, 2; o = 1, 2; p = 1, 2, 3; r = 1, 2, 3; s = 1, 2, \dots, 406$$

The dependent variable, factors, their levels of the model in this study are defined in the Table 1.

In model (1) β represents the simple linear regression coefficient between the $Y_{ijklmnoprs}$ and KM variables.

TSI and TDI engines are operated by gasoline and diesel respectively. Therefore, fuel type was not considered as a factor in this study.

The Feature Type is an ordinal variable. The order of feature types is trendline, comfortline and highline. Also, each car could have some extra features so that it is defined as "extra" factor in the model.

Table 1. Dependent Variable, Factors, Two Way Interactions of Factors and Levels

Dependent Variable:	$Y_{ijklmnoprs}$	Price of used car				
	μ	Overall mean (Intercept)				
			Levels			
Factors	ET _i	Engine Type	TSI 1.2 (1)	TSI 1.4 (2)	TDI 1.6 (3)	
	FT _j	Feature Type	Trendline (1)	Comfortline (2)	Highline (3)	
	MY _k	Manufactured Year	2012	2013	2014	2015
	GT _l	Gear Type	Stick (1)	Automatic (2)		
	S _m	Seller	Individual (1)	Dealer (2)		
	AA _n	Ad Area	Metropolitan (1)	Others (2)		
	C _o	Color	Light (1)	Dark (2)		
	DC _p	Damaged conditions	Bad (1)	Medium (2)	Good (3)	
	E _r	Extras	Little (1)	Medium (2)	A Lot (3)	
Covariate	KM _s	Kilometer				
Two Way Interactions	ET*FT _{ij} , ET*MY _{ik} , ET*GT _{il} , ET*S _{im} , ET*AA _{in} , ET*C _{io} , ET*DC _{ip} , ET*E _{ir} , ET*KM _{is} , FT*MY _{jk} , FT*GT _{jl} , FT*S _{jm} , FT*AA _{jn} , FT*C _{jo} , FT*DC _{jp} , FT*E _{jr} , FT*KM _{js} , MY*GT _{kl} , MY*S _{km} , MY*AA _{kn} , MY*C _{ko} , MY*DC _{kp} , MY*E _{kr} , MY*KM _{ks} , GT*S _{lm} , GT*AA _{ln} , GT*C _{lo} , GT*DC _{lp} , GT*E _{lr} , GT*KM _{ls} , S*AA _{mn} , S*C _{mo} , S*DC _{mp} , S*E _{mr} , S*KM _{ms} , AA*C _{no} , AA*DC _{np} , AA*E _{nr} , AA*KM _{ns} , C*DC _{op} , C*E _{or} , C*KM _{os} , DC*E _{pr} , DC*KM _{ps} , E*KM _{rs}					
Error	$\varepsilon_{ijklmnoprs}$					

Manufactured years are limited between years of 2012 and 2015 because the number of ads for Engine Types before 2012 and after 2015 is not enough on used car e-market.

Ad area is divided into two region; big town (İstanbul, Ankara and İzmir) and small town (other towns) because the numbers of Jetta ads are less in the small towns. Ad area has thought to be a factor which may measure heavy traffic effects.

Since there are a lot of color choices and exploring the effect of each color to the price is not the aim of this study, car's colors were grouped as light and dark color. Light colors are taken as white, grey and grey kind colors and dark colors are taken as the other colors such as black, brown, blue and red.

Some of sellers have stated the damaged conditions of the car on their ads. While collecting data, the damaged conditions were coded as low, middle and high subjectively without any expert investigation.

As stated above some cars can have some extras added by first or latter owners such as sunroof, xenon headlights, metallic paints, led lights etc. These were also coded as little, medium and a lot depending on information entered by seller into ad.

Actual kilometer on the cars is the most important factor which one may think that there is negative linear correlation between the price and the kilometers of the car. This is uncontrollable factor due its nature so that it is taken as a covariate variable in the design.

The factors of engine type, feature type, manufactured year, gear type, seller, ad area, color, damaged condition and extras are the fixed effect factors and the factor of the kilometer is as a covariate. Using model (1), the effects of each factor together with all two way interactions between factors will be investigated statistically:

Using the model (1), the following hypotheses will be tested:

H₀: Model (1) on the used car price is not a meaningful model (The all or some of factors and their two way interactions do not affect the mean of the used car price).

H_A: Model (1) on the used car price is a meaningful model (The all or some of factors and their two way interactions affect the mean of the used car price).

Whether the effect of each factor in the model (1) to the used car price is statistically significant will be investigated by following hypotheses:

H₀: The means of the used car price for the levels of each factor are the same.

H_A: The means of the used car price for the levels of each factor are not the same.

Two way interaction terms for the factors will be used to test following hypotheses:

H₀: There is no an interaction effect of two factors on the used car price.

H_A: There is an interaction effect of two factors on the used car price.

In order to test statistically for all of the above hypotheses and for the model (1) adequacy, there are assumptions about error term in the model (1): the errors are assumed to be normally and independently distributed random variables with mean zero and variance σ^2 and the variance σ^2 is assumed to be same for all levels of factors. (Montgomery, 2013) Any violations of these assumptions will be investigated using the residuals after the model is estimated.

4.2. Data Collection and Data Checking

The data were collected from used car e-market for each level combination of factors in the model within 4 days. In the process of data collection, it was regarded to take three ads for each level combination of factors from used car e-market using systematic sampling. Hence sample size is 406 for this problem. The Statistical Package for Social Sciences (SPSS) was used for all statistical analysis in this study.

Before the model (1) is estimated, the data of the used car price was investigated against any anomalies. The graphical analysis of the price data such as box, stem and leaf and Probability Plot (P-P) plots were done, and it was found that there was not so many anomalies. The price variable is normally distributed with some extreme values according to the plots in Figure 1. A Kolmogov-Smirnow test was performed and the hypothesis that the price variable has normal distribution was rejected at 0,05 significant level (Table 2). Even this is statistical evidence about the nonnormality of the data, the model (1) will be estimated. The reason for this step taken is that the assumptions in the model (1) are about the error term and the

reality of that even the observed data is non normally distributed, there is possibility of that errors can be normally distributed. Moreover, graphical analysis has showed that there are some extremes and these extremes can affect the test result of the Kolmogorov Smirnov test.

Table 2. Kolmogorov-Smirnov Normality Test for Used Cars' price

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Price is normal with mean 65.718,153 and standard deviation 10.633,72.	One-Sample Kolmogorov-Smirnov Test	,004 ¹	Reject the null hypothesis.

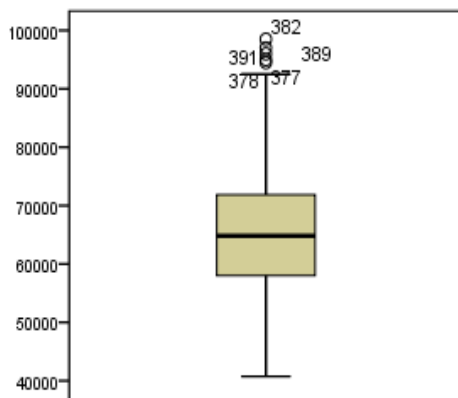
Price Stem-and-Leaf Plot

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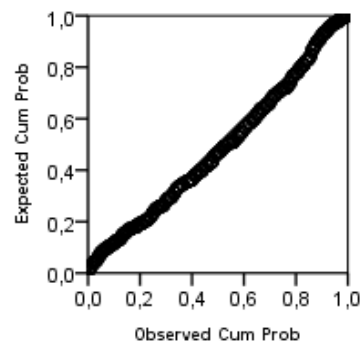
Frequency      Stem & Leaf
  4,00          4 .  0134
 13,00          4 .  5566777788899
 40,00          5 .  0000111111112222222222223333333333334444444
 71,00          5 .  55555555555555666666666666666666777777777788888888888888888899999999999
 77,00          6 .  000000000111111111111111111111222222222222222233333333333333333344444444444
 74,00          6 .  5555555555555555556666666666666666777777777777888888888888888899999999999
 54,00          7 .  000000000111111111111111111111222222222222333333333333444444
 28,00          7 .  5555555555556666667778888889999
 20,00          8 .  00001111122222333444
 13,00          8 .  555666667778
  7,00          9 .  0001112
  5,00 Extremes (>=94500)

Stem width:      10000
Each leaf:       1 case(s)
    
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(a) Stem and Leaf Plot



(b) Box Plot



(c) Probability-Plot (P-P)

Figure 1. Graphical Analysis Of Used Cars' Price

4.3. Analysis of Variance and Checking Model Accuracy

The model (1) was estimated and the residuals have been calculated. As stated before, in order to test any hypothesis related to the model (1) the errors should satisfy the normality and homogeneity assumptions. The residuals obtained from estimated model (1) were used to investigate these assumptions. Graphical Analysis in Figure (2-c) shows there is one outlier which is named with the observation number 314 in the data set. For residuals, a

According to the graphical analysis and hypothesis tests for the assumptions about the error term after the outlier was removed, it is found that the residual has normal distribution with mean zero and constant variance. This finding also shows that the outlier removed has an effect on the distribution of the error in the model and if it was not removed from the data set, there might also be a possibility that the conclusions from the analysis of variance will lead misinterpretations.

After checking and satisfying the assumptions, the analysis of variance was performed and the analysis of variance table is given in Table 5.

Table 5. Analysis of Variance for Used Car Price

Sources of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F	P-Values
Corrected Model	4,295E+10	123	349176673	39,462	0,000*
Intercept	9,877E+09	1	9,877E+09	1116,22	0,000*
ET	891004838	2	445502419	50,348	0,000*
FT	65355953	2	32677977	3,693	0,026*
MY	726143963	3	242047988	27,355	0,000*
GT	80808359	1	80808359	9,133	0,003*
S	54906127	1	54906127	6,205	0,013*
C	4941691	1	4941691	0,558	0,455
AA	3461429	1	3461429	0,391	0,532
DC	147091523	2	73545761	8,312	0,000*
E	156127249	2	78063624	8,822	0,000*
KM	10870824	1	10870824	1,229	0,269
C * AA	353580,65	1	353580,65	0,04	0,842
AA * DC	15654338	2	7827168,9	0,885	0,414
AA * E	28895242	1	28895242	3,266	0,072
ET * AA	36702009	2	18351004	2,074	0,128
FT * AA	49870359	2	24935179	2,818	0,061
GT * AA	7190903,8	1	7190903,8	0,813	0,368
AA * KM	7957330,8	1	7957330,8	0,899	0,344
MY * AA	50068111	3	16689370	1,886	0,132
S * AA	453401,83	1	453401,83	0,051	0,821
C * DC	2394423,1	2	1197211,5	0,135	0,874
C * E	20631316	1	20631316	2,332	0,128

Table 5. Analysis of Variance for Used Car Price (Continued)

Sources of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F	P-Values
ET * C	1874452,4	2	937226,18	0,106	0,9
FT * C	28535033	2	14267516	1,612	0,201
GT * C	6639484,3	1	6639484,3	0,75	0,387
C * KM	72444452	1	72444452	8,187	0,005*
MY * C	76416745	3	25472248	2,879	0,036*
S * C	34163678	1	34163678	3,861	0,050*
DC * E	50209594	2	25104797	2,837	0,06
ET * DC	32909287	3	10969762	1,24	0,296
FT * DC	178212332	4	44553083	5,035	0,001*
GT * DC	9476518	2	4738259	0,535	0,586
DC * KM	42006823	2	21003411	2,374	0,095
MY * DC	49557560	5	9911511,9	1,12	0,35
S * DC	46345256	2	23172628	2,619	0,075
ET * E	66940145	2	33470072	3,783	0,024*
FT * E	58322150	2	29161075	3,296	0,038*
GT * E	415206,52	1	415206,52	0,047	0,829
E * KM	10769919	1	10769919	1,217	0,271
MY * E	212208534	3	70736178	7,994	0,000*
S * E	8824086,4	1	8824086,4	0,997	0,319
ET * FT	129348020	4	32337005	3,655	0,006*
ET * GT	21107495	2	10553748	1,193	0,305
ET * KM	105204909	2	52602455	5,945	0,003*
ET * MY	288169321	6	48028220	5,428	0,000*
ET * S	33672221	2	16836111	1,903	0,151
FT * GT	635357,8	2	317678,9	0,036	0,965
FT * KM	9791702,5	2	4895851,2	0,553	0,576
FT * MY	84604362	6	14100727	1,594	0,149
FT * S	24782483	2	12391241	1,4	0,248
GT * KM	35144446	1	35144446	3,972	0,047*
MY * GT	26733943	3	8911314,4	1,007	0,39
Gear * S	1717545,6	1	1717545,6	0,194	0,66
MY * KM	29019836	3	9673278,6	1,093	0,352
S * KM	16949488	1	16949488	1,916	0,167
MY * S	26406357	3	8802119	0,995	0,396
Error	2,486E+09	281	8848411,4		
Total	1,797E+12	405			
Corrected Total	4,544E+10	404			

*Statistical Significant at $\alpha=0,05$.

It is rejected the hypothesis that Model (1) on the used car price is not a meaningful model according to the F test for the model (1) (F-Value=39,462, P-value=0,000<0,05). It is said that all or some of factors and their two way factor interactions may have significant effects on the used car price. The coefficient of determination (R^2) for the model (1) is 92% so that the variation on the used car prices is explained by the factors and two-way interactions of factors in the model (1).

There are statistical evidences for the hypotheses about factors and two-way interactions as stated above according to F test in Table 5 that the Engine Type (ET), Feature Type (FT) Manufactured Years (MY), Gear Type (GT), Seller (S), Damaged Conditions (DC) and Extras (E) have the main effects on the mean of used Jettas' price. According to analysis of variance in Table 5, there are two way factor interaction effects on the price. These are Color * Kilometer (C * KM), Color * Manufactured Year (C * MY), Color * Seller (C * S), Feature Type * Damaged Condition (FT * DC), Feature Type * Engine Type (FT * ET), Extras * Engine Type (E * ET), Extras * Feature Type (E * FT), Extras * Manufactured Year (E * MY), Engine Type * Kilometer (ET * KM), Engine Type * Manufactured Year (ET * MY) and Gear Type * Kilometer (GT * KM).

Even though Color and Kilometer don't have the main effect on model (1), they have interaction effects with other factors on the used Jetta price.

Ad area does not affect to the mean price of the used car in any way. It can be said that used cars' mean prices of ad locations in used car e-market are the same. The reason for this conclusion might be the used car e-market because the information in the e-market can be reached from all over the places where Internet is available. This result shows the usefulness of used car e-market to the used car buyers and sellers.

Least Square Difference tests have been performed for each main factor and the differences between the means in the levels of each factor are found statistically significant at significant level 0,05. Descriptive statistics for each level of factors are given in Table 6. One can see the difference between the level means of the factors from the table and notice that there is almost no difference the level means of factor Color and Ad areas which are the same to the results of the relevant hypothesis tests above.

The Table 6 is a summary of a big story on the price of used Jetta. It was found that the engine type was an important factor for used Jettas' price. As seen from the table, while the engine type changes from the TSI 1.2 to TSI 1.4, and TSI to TDI, the price increases. The Ad Area was a factor that had been thought that it would be significant factor on used Jettas' price. There was a belief that the cars driven in the cities that have heavy traffic are not in good conditions and therefore their used cars' sale prices were lower than the cars' prices in other cities. However, in this study it was found that the location of the used car is not an important factor on the price. The one reason for this might be that sellers of the used cars can reach the other used car's prices in other cities and information on sale at used car e-markets and determine own car's price according to that information. This conclusion supports the idea of usefulness of used car e-markets for both sellers and buyers.

Table 6. Descriptive Statistics for each level of Factors

Factors	Levels	n	Mean	Std. Error of Mean	Min	Max	95% Confidence Intervals For Mean	
							Lower	Upper
Engine Type	TSI 1.2	121	59071,82	601,474	44700	75000	57880,94	60262,70
	TSI 1.4	141	64161,99	762,356	40750	87500	62654,77	65669,20
	TDI 1.6	143	73009,02	871,498	51750	98500	71286,23	74731,81
Feature Type	Trendline	141	60114,89	647,669	40750	80000	58834,42	61395,37
	Comfortline	144	66009,17	807,460	44700	97000	64413,07	67605,27
	Highline	120	72110,83	1003,729	41950	98500	70123,35	74098,32
Manufactured Year	2012	102	57867,55	720,4868	40750	80000	56438,30	59296,80
	2013	101	62741,09	803,3086	45000	86900	61147,35	64334,83
	2014	101	68715,64	886,5473	47500	91750	66956,76	70474,53
	2015	101	73813,86	1039,979	56000	98500	71750,57	75877,15
Gear Type	Stick	211	64049,62	676,8524	43400	91750	62715,33	65383,92
	Automatic	194	67630,67	797,9345	40750	98500	66056,88	69204,46
Seller	Individual	205	66541,17	749,1744	43400	98500	65064,05	68018,29
	Dealer	200	64969,4	738,6163	40750	97000	63512,88	66425,92
Color	Light	324	65948,58	580,433	41950	98500	64806,67	67090,49
	Dark	81	65030,62	1249,875	40750	94500	62543,29	67517,95
Ad Area	Metropolitan	174	65860,34	841,591	40750	92500	64199,24	67521,45
	Others	231	65693,16	673,667	45000	98500	64365,81	67020,51
Damaged Condition	Bad	14	49489,29	1742,576	40750	65500	45724,32	53253,89
	Medium	71	60363,94	857,6139	48000	90000	58653,49	62074,40
	Good	320	67675,41	579,4904	43400	98500	66535,3	68815,51
Extras	Little	337	64828,1	542,786	40750	98500	63760,41	65895,79
	Medium	57	70600	1704,046	49250	97000	67186,39	74013,61
	Lot	11	69413,64	3062,264	56000	87000	62590,49	76236,78
Total		405	65764,99	526,9601	40750	98500	64729,06	66800,91

In the Table 6, there are 95% confidence intervals for the means of used Jetta in terms of each factor. Each interval has lower and upper bounds. This information is as important as minimum (min) and maximum (max) values statistics for used Jettas' price. It is not logical to use maximum value statistics of the price for the criteria of decision making about determining the price to sell a car because the maximum value is at the disposal of the other sellers. It is more logical for that seller can try to sell his car with a price that is close to the upper bound of the confidence interval with an appropriate confidence level. For buyers, the most appropriate price strategy may be trying to start the negotiation from the lower bound of the confidence interval. It may not be a logical strategy to decide to purchase a car more

than its mean price. Of course, the seller never should consider selling his car less than its mean price.

As seen in the above discussion, every statistics calculated from data of used cars are useful for decision making. The information of the ads in used car e-markets is open to everyone. However, there is no any calculated statistics offered in these used car markets for their users. The user should collect and analyze the data about the car of interest. However, it is not easy task even for a statistician or special analyst.

5. RESULT AND RECOMMENDATIONS

In this study, the factors which affect used car prices have been studied. As collecting data about used cars from open car markets is hard to realize, the use car e-market provides more available information or data for this purpose. That is, the websites in which used cars can be traded give their users opportunity to compare cars using results of statistical analysis for a car of interested for both buyers and sellers. To show usefulness of the information obtained from the analysis, the data about used Jetta were collected from one of used car e-markets and analyzed statistically.

The main and two-way interaction effects of the factors on the used car price were analyzed by the analysis of variance according to multifactorial experimental design with one covariate that was kilometer. The significant main and two way interactions effects on used Jettas' price are found to be as Engine Type, Feature Type, Manufactured Year, Gear Type, Seller, Damaged Condition and Extras and the two way interaction effects of factors are Color * Kilometer, Color * Manufactured Year, Color * Seller, Feature Type * Damaged Condition, Feature Type * Engine Type, Extras * Engine Type, Extras * Feature Type, Extras * Manufactured Year, Engine Type * Kilometer, Engine Type * Manufactured Year and Gear Type * Kilometer, respectively.

One of the important results is that Color and Kilometer factors don't have the main effect, but they have interaction effects with other factors on used Jetta price. It means that Color and Kilometer don't have significant contributions to used Jetta price but their two*way interactions do.

Another important result is that Ad area does not affect to the mean price of used Jetta in any way. In other words, there is no main and any interaction effects of advertisement location of used Jetta. It can be concluded that the internet websites like used car e-markets are so useful that the user can reach all possible information or data and analyze them. In this study, the seller of used Jetta can reach information of other Jetta Ads from all over Turkey and determine the price of his own car accordingly to his profit. This may be the reason why the ad location has no effect on model (1).

This kind of analysis conducted in this study or other statistical analysis are very useful for consumers for their purchasing decision making process. In order to analyze any problem of decision making, the relevant data and information are required. In open used car market, it is not easy to collect information or data about interested cars. However, the used car e-markets give opportunities for collecting and analyzing of data to both the seller and buyers.

The internet websites like the used car e-markets give chance to members to enter information or data for their goods that they want to sell, but it is not common that the

analysis of data for a good in the site is not provided. It is suggested here that Internet websites like the used car e-markets can give some results of data analysis related to a good for its users.

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