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PRICE DETERMINANTS ON USED CAR AUCTION IN TAIWAN

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ABSTRACT

This research examines price determinants of used car using the example on Taiwan used car auctions. The used cars which were produced in Taiwan and whose final price does not exceed one million New Taiwan Dollars. Research data from used cars auction website which included 504 successful transactions in Taiwan used car auction marketing. The log-linear multiple regression model is applied to evaluate this data. According to the results, polynomial log-linear multiple regression models is more suitable for this research and produces better results. As the result shows that the chosen variables can explain changes in price determinants of used cars in Taiwan auctions marketing and Toyota has very strong brand reputation in Taiwan. All chosen variables are statistically significant at 1% confidence interval (p-value<0.01) and all coefficient signs are as expected. Only one variable MILEAGE is not statistically significant. ENGINE is a second variable in decreased marginal effect of engine size on price determinants. This research conclusion is useful for local traffic authority and used car traders to control driver's price determinants choice on used car displacement.

Contribution/ Originality: This study explores price determinants of used car in Taiwan auctions marketing. It contributes first logical analysis on log-linear multiple regression model. This research conclusion is useful for local traffic authority and used car traders to control driver's price determinants choice on used car displacement.

1. INTRODUCTION

Purchasing a used car is very tedious, tiring in psychological determinants if people find a good used car they like, it is hard to guarantee that the car they bought will be running for a long time and keep good conditional serving for many years. In addition, there are also unobservable intangible used car price determinants factors, such as brand strength of certain manufacturer in some countries, fashion, brand reputation, personal preferences (Nolan, 2010). In used car marketing, the trading volume between supply and demand is also important determinant of final price during the auction. Another factor which is important to be considered is the perceived profit of car dealers; their judgment is hard to overestimate, thus if the perceived profit for a certain car is high that conclude this car is more likely to be purchased and the possibility that it would be purchased at a higher price is also higher. This research examines price determinants of used car using the example of Taiwan auctions web-sited. In Taiwan, used car transaction places where the most accurate information about used cars real price could be

collected, the sellers of cars can set the minimum acceptable price. The research focuses on used car which were produced in Taiwan and whose final price does not exceed one million New Taiwan Dollars. Trucks, imported cars and luxury vehicles were excluded from the research. Information about the vendors and the models of cars that are produced locally in Taiwan was collected from the Taiwan Transportation Vehicle Manufacturers Association website. Auctions are important business or products source for buyers. Buyers should rely on their experience and professionalism to purchase a vehicle that could be resold in the future to receive a profit (Genesove, 1993). The auction provides very limited information about car conditions to the buyers; this information includes: vehicle characteristics from the registration documents, such as year of manufacturing, engine displacement, vehicle type, type of the body, and other legal information. Auction also provides information about mileage, accessories in the car and evaluation of body and interior conditions by the auction's mechanics. Available information also includes the guarantee or non-guarantee by the auction the authenticity of the vehicle mileage, equipment, gadgets and other parts that malfunctioned and recommended or needed to be replaced. Buyer cannot have test-drive before purchasing vehicle, only visual inspection is allowed. This research focuses on auctions data to examine price determinants for two reasons: first, car dealers have many years of experience in this business and during the auction they use very limited data to choose the car; since dealers need to add their markup to receive a profit and choice of the right car will affect their business in the future, they tend to choose the right car and pay the real market price for it Genesove (1993); Grether and Plott (2009) secondly, the auction provides detailed information on its successful deals for the duration of the auctions, and the data can be easily extracted for further analysis (Grether and Plott, 2009).

2. LITERATURE REVIEW

Purchasing a used car is often an event that requires significant amount of time, trust and money. Purchasing a car that might have some major defects or does not worth the price paid for is common mistake of many inexperienced buyers. It is important to examine and test-drive the car before purchasing. Most of the major problems could be detected during preliminary examination and test-drive, so a buyer should not neglect these two procedures. Examination of the car starts from the exterior, the future owner should pay attention on the body and evenness of the paint (Buskens and Weesie, 2000). The next step is the interior, it should not have strong smell of cigarettes or mold, otherwise it would be very hard to get rid of the smell, however this is very good negotiation point (Genesove, 1993). The third step is to turn on the ignition to check if all control lamps are on and they go off in different time. The fourth and the final step is to start the engine and test-drive, during which a future owner is suggested to pay attention to strange undesirable noise in suspension, smoothness of the gear box and engine. Average annual growth varies considerably from 1.2% for vehicles in the US (and 1.6% for vehicles) to about 18% for cars (16% for vehicles) in South Korea and Taiwan. There are many components that affect price of used vehicle. Mileage and car's conditions are important determinants of decision to purchase a car (Genesove, 1993). In economically developed countries, the average mileage of cars is much lower than in countries with weak economies. The reason is because one family could have more than one car. The cost of the vehicle is formed by a variety of factors: model of car, year of manufacturing and type of engine, mileage, engine power, a tax on the vehicles, conditions of the engine – those are important elements in predicting the value of the car used in Taiwan (Wu *et al.*, 2009). Brand of the automobile manufacturer and its reputation in the market affect price of the car (Berry *et al.*, 1995). Some cars are proved to hold its value for many years, loosing just a small percentage of its original price every year, while some brands lose fifty percent of its value just in the first few years of operation. On the other hand, the cost of operating a car increases with its age because of its increased physical depreciation (De Jong *et al.*, 2009) thus the owner may want to use it more intensively in the short period to return on its investment faster. Car usage and second hand car price depend also on fuel prices. The rising cost of gasoline affects people decision to start to use a car less and less, and even to contribute to the fact, that people would not like to buy a car

at all, affecting equilibrium in the market at dragging the price of used vehicles down (Goldberg and Verboven, 2005; Ritter and Vance, 2013).

Size of the engine and its type significantly affect price of the used vehicles (Gilmore and Lave, 2013). The size of the engine is generally measured in litters or cubic centimeters, while its types could be inline or straight engine, diesel engine, turbine engine, V engine, rotor engine and others. Depending on the country the car operates in vehicle tax is calculated based on the displacement or power of engine in horse power or kilowatts. If with increased engine size or performance the tax also increases significantly to affect the car price (Chen and Yun, 2015). Mileage of the car and its age affects a decision of car owner to sell a car, thus influencing the price of the car (Lapparent and Cernicchiaro, 2012). There are also certain external elements that influence car price, and those elements could be economic situation, household income that affects demand and thus influences supply, cost of fuel and other factors (Gil-Pareja, 2003; Matas and Raymond, 2008; Grether and Plott, 2009).

3. METHODOLOGY

3.1. Variables

To conduct this study, the data provided by automobile auction website "www.sinjang.com.tw" will be used in this research. Data sample included 504 successful transactions of trading in Taiwan used car auction marketing.

1. Dependent variable is LOG (Price). It is a logarithmic form of final price a buyer needs to pay to purchase a vehicle. The PRICE includes the cost of the vehicle itself and any other penalties or legal charges determined by the authorities (traffic violations and other penalties.) Since the logarithmic form of final PRICE is used in this study, thus for one unit change in the independent variable will change $100 * \beta\%$ in the dependent variable.

2. Qualitative (dummy) variable CONFISC, indicates if the vehicle was confiscated by the authorities (1 – confiscated, 0 – not confiscated). Confiscation of the vehicle is made by court order. The most common reason for the confiscation of the vehicle is the debt to the bank, or multiple violations of the rules of driving.

3. Independent variable **ENGINE** specifies engine displacement in 1,000 cubic centimeters. The engine capacity is most important characteristic of a vehicle. It has a strong influence on most of the parameters and price of the automobile. Taxation system in Taiwan determines yearly automobile tax by the engine displacement. The bigger engine size the higher annual tax. At the same time, according to the information about new vehicles price in Taiwan, cars with bigger engines have higher price. This contradictory situation puts cars with bigger engine into the situation, where value decrease faster over time, than the cars with smaller engine. The study will test this assumption by introducing another variable – **ENGINE^2** – a quadratic form of the variable ENGINE, calculate the marginal effect of the variable ENGINE on the price of car and compare two models.

4. Independent variable **YEARS** specifies vehicle's age in years. This variable disregards the precise age of the vehicle in month, rather this variable depicts the age in years, since generally second hand car buyers look at the age of car as the current year less the year of manufacturing (González et al., 2015).

5. Independent variable **LOG (MILEAGE)** logarithmic form of vehicle's mileage in 1,000 kilometers. If we know year of production and mileage of the car, we could possibly make an assumption about the general physical condition of the car. Thus, this variable is important determinant of car general condition and its price.

6. Independent variable **BODY** shows vehicle's body conditions evaluated by the auction's experts and mechanics. Values are from 1 to 7, with 1 indicating poor body conditions and 7 indicating good body conditions. Negative factors affecting this evaluation may include: scratches, dents, deformation of the body

and others. Also need to consider if it is necessary to place the headlights, fenders, bumpers, hoods, and suggestion for replacement is also indicated in the auction checklist.

7. Qualitative (dummy) variable **INTERIOR** shows vehicle's interior conditions evaluated by the auction's experts and mechanics, with 0 indicating poor interior conditions and 1 indicating good interior conditions. Negative factors affecting this evaluation may include: scratches, stains, damaged plating, smells inside the cabin and others. Positive factors may include: good condition of the control panel and seats, good condition of leather parts and steering wheel and others.

8. Qualitative (dummy) variable **WAGON** indicates if the vehicle is wagon. This category includes Multi-Purpose Vehicle (MPVs) and Sport Utility Vehicle (SUVs) (1 – wagon, 0 – other types). Since this study excluded trucks and concentrated only on passenger vehicles, thus if this variable is equal to 0, it indicated that the car is sedan.

9. Qualitative (dummy) variable **FRIDAY** indicates if the transaction was completed on Friday. This variable was added to depict any changes in price depending on the day of the week the transaction was completed (1 – transaction was on Friday, 0 – not Friday). According to the auction's rules there are only 2 days of trading in one week – on Wednesdays and on Fridays. If seller couldn't sell a car on Wednesday, he would have another chance to sell it on the same week's Friday auction and this will be only 1 day between two auctions. However, if seller couldn't sell his car on Friday – he would have to wait 4 days until the next auction on Wednesday in the following week. This delay could be associated with idling cost - parking fee in the auction's company garage. Combined with willingness of seller to get rid of his car as soon as possible and unwillingness of seller to pay repeated auction fees, these three factors may influence overall selling price of car on Friday, because seller is the one who set the lower threshold for the vehicle price in the auction, thus the dummy variable FRIDAY is expected to have negative sign.

10. Qualitative (dummy) variable **TOYOTA** indicates if the vehicle was manufactured by Toyota. This variable was added to depict how a brand reputation of Toyota affects price in Taiwan (1 – manufacturer is Toyota, 0 – other brands). Toyota is the largest seller of passenger vehicles in Taiwan local market. Thus, including variable TOYOTA in the study is reasonable, thus it will let us test the presence of Toyota strong brand reputation in Taiwan.

3.2. Model

This study uses log-linear model and applies ordinary multiple least squares method of estimation. Multiple linear regression formula of the first model looks as following:

$$\ln(PRICE) = \alpha + \beta_1 CONFISC + \beta_2 ENGINE + \beta_3 YEARS + \beta_4 MILEAGE \\ + \beta_5 BODY + \beta_6 INTERIOR + \beta_7 WAGON + \beta_8 FRIDAY \\ + \beta_9 TOYOTA$$

Including quadratic form of the variable ENGINE donates another log-linear model and applies ordinary multiple least squares method of estimation. Polynomial multiple linear regression formula of the second model looks as following:

$$\ln(PRICE) = \alpha + \beta_1 CONFISC + \beta_2 ENGINE + \beta_3 ENGINE^2 + \beta_4 YEARS \\ + \beta_5 MILEAGE + \beta_6 BODY + \beta_7 INTERIOR + \beta_8 WAGON \\ + \beta_9 FRIDAY + \beta_{10} TOYOTA$$

According to the corresponding literature and personal judgments and reasoning, the expected signs of the variables for the second model are the following (for the first model expected signs are the same as for the second model, except the fact that adding one more variable in the regression shifted betas' sequence number by one):

1) β_1 – negative (the fact that the car was forcefully confiscated reduces price of the vehicle)

2) β_2 – positive (cars with bigger engines tend to be more expensive)

3) β_3 – negative (to capture marginal effect of the increased engine size)

4) β_4 – negative (age of the vehicle negatively affects car price. Older cars tend to cost less than its newer counterparts)

5) β_5 – negative (bigger mileage indicates that vehicle was used intensively, and this reduces its price)

6) β_6 - positive (better body conditions are in favor to the price)

7) β_7 – positive (good interior increases car's price)

8) β_8 – positive (wagon type of vehicles is generally more expensive)

9) β_9 – negative (seller wants to get rid of his car on Friday as soon as possible, thus he can set a lower price to sell the car in the current week)

10) β_{10} - positive (Toyota has very good reputation in Taiwan, thus the fact that the car was manufactured by Toyota increases its value)

4. RESULTS

The results of regression estimation are represented below:

$$LOG(PRICE) = 12.665 - 0.214CONFISC + 0.204ENGINE - 0.138YEARS$$
$$- 0.031LOG(MILEAGE) + 0.051BODY + 0.255INTERIOR$$
$$+ 0.226WAGON - 0.067FRIDAY + 0.202TOYOTA$$

The first multiple regression result presented in the Table 1.

Table-1. Regression results of the model 1.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CONSTANT	12.665***	0.172	73.678	**0.0000**
CONFISC	–0.214***	0.044	–4.835	**0.0000**
ENGINE	0.204***	0.052	3.926	**0.0001**
YEARS	–0.138***	0.006	–23.363	**0.0000**
LOG (MILEAGE)	–0.031	0.030	–4.950	0.3169
BODY	0.051***	0.013	3.829	**0.0000**
INTERIOR	0.255***	0.039	6.48	**0.0000**
WAGON	0.226***	0.043	5.182	**0.0000**
FRIDAY	–0.067*	0.039	–1.713	**0.0873**
TOYOTA	0.202***	0.038	5.300	**0.0000**
R-squared	0.748	Akaike info criterion		0.872
Adjusted R	0.743	Schwarz criterion		0.955
F-statistic	162.83	Prob (F-statistic)		0

Note: *, **, *** are significance at 10%, 5%, 1% levels, respectively.

As the result shows, all chosen variables, except LOG(MILEAGE) are statistically significant at 1% confidence interval (p-value<0.01) and all coefficient signs are as expected (FRIDAY significant at 10%). The variable LOG(MILEAGE) is not statistically significant with p-value equal to 0.3169, what means that the mileage is not significant determinant of car price in Taiwan.

According to the Taiwan vehicle registration law, bigger engine displacement increases car's annual tax. For this data set smallest engine's displacement is 0.8 litters and the biggest 3.5 litters, thus annual total tax varies from $8.420NTD to $36.860NTD, what might also have effect on car's price. To test this, the variable ENGINE^2 added to the regression, and the result of second model is the following:

$$LOG(PRICE) = 11.261 - 0.250CONFISC + 1.619ENGINE$$
$$- 0.329ENGINE^2 - 0.147YEARS - 0.031LOG(MILEAGE)$$
$$+ 0.050BODY + 0.229INTERIOR + 0.169WAGON$$
$$- 0.071FRIDAY + 0.193TOYOTA$$

Results of the second polynomial multiple regression model (with new additional variable ENGINE^2) is presented in the Table 2.

Table-2. Regression results of the model 2.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CONSTANT	11.261***	0.345	32.599	**0.0000**
CONFISC	-0.250***	0.044	-5.689	**0.0000**
ENGINE	1.619***	0.308	5.251	**0.0000**
ENGINE^2	-0.329***	0.070	-4.652	**0.0000**
YEARS	-0.147***	0.006	-23.640	**0.0000**
LOG(MILEAGE)	-0.031***	0.030	-1.022	0.3072
BODY	0.050***	0.013	3.826	**0.0001**
INTERIOR	0.229***	0.038	5.923	**0.0000**
WAGON	0.169***	0.044	3.823	**0.0001**
FRIDAY	-0.071*	0.038	-1.877	**0.0610**
TOYOTA	0.193***	0.037	5.180	**0.0000**
R-squared	0.758	Akaike info criterion		0.832
Adjusted R-sq	0.753	Schwarz criterion		0.924
F-statistic	154.846	Prob(F-statistic)		0

Note: *, **, *** are significance at 10%, 5%, 1% levels, respectively.

As the result shows, all chosen variables are statistically significant at 1% confidence interval (p-value<0.01) and all coefficient signs are as expected. Variable FRIDAY is significant at 10% confidence level. The variable LOG (MILEAGE) is not statistically significant with p-value equal to 0.3072. Insignificance of this variable could be explained in the following manner: since main buyer of used vehicles in auctions are car dealers, they might disregard the fact that the mileage of car is too high, since they can adjust the mileage by themselves using computer software (González et al., 2015). This is the only reasonable explanation, since reviewed literature showed, that mileage is important factor that can determine the price of the vehicle, and result of this study contradicts with the past literature (Genesove, 1993; Lapparent and Cernicchiaro, 2012; Mabit, 2014).

If the vehicle is confiscated by the authorities, on average the price of vehicle will be reduced by 25%. Increase in age of car by one year will decrease the price on average by 14.7%. If the interior is in good condition on average it will add 22.9% to the value of the vehicle. Good body conditions on average will increase price of the car by 5%. Vehicles traded on Fridays on average have a lower price by 7.1%. It supports our hypothesis, that seller can accept to sell a car cheaper to avoid additional costs and idle time. As expected, Toyota brand image is very strong in Taiwan, thus the fact that the vehicle is Toyota on average will increase value of the car by 19.3%.

According to the result of the regression variable ENGINE^2 is significant and has negative sign, thus it could be concluded that increase in engine's sign will decrease marginal effect of engine on price, and marginal effect would be expressed as following:

$$\frac{\Delta \log(price)}{\Delta\ engine} = 1.619 - 2 \times 0.329\ ENGINE$$

The value at which the marginal effect of engine size on car price starts to reduce is calculated in the following fashion: 1.691/(2*0.329)=2.460 liters or 2460 cubic centimeters. According to Taiwan passenger car tax regulation when engine displacement gets over 2,400 cubic centimeters, the tax increases by 28.5% (or by 4,970 NTD). In accordance with findings, government vehicle tax policy is an effective way to control car engine displacement choice of citizens, since higher engine displacement means higher tax and thus faster rate of losing value of vehicle.

The second is more favorable for this data set, because it has lower Akaike info criterion (AIC) and Schwarz criterion (SC) values. R-squared of the second model is higher and equal to 75.8%, comparing with 74.8%, what indicated that more variation is explained in the second model. Comparison of these two models are presented in the Table 3.

As the table 3 depicts, the model 2 is better choice, because it has higher explanation power (R-squared is higher) and Akaike info criterion (AIC) and Schwarz criterion (SC) values are lower, what indicates that model 2 is the better choice. Also, model 2 has additional variable ENGINE^2, that shows reduced marginal effect of engine displacement on used vehicle price. For both models signs of the coefficients are as expected and in accordance with previous literature. The only insignificant variable for both models is LOG(MILEAGE), what shows that vehicle mileage is not significant determinant of car price in Taiwan auction.

Table-3. Combined result of two models.

Variable	Model 1 Coefficient	Model 2 Coefficient
CONSTANT	12.665***	11.261***
CONFISC	-0.214***	-0.250***
ENGINE	0.204***	1.619***
ENGINE^2		-0.329***
YEARS	-0.138***	-0.147***
LOG(MILEAGE)	-0.031	-0.031***
BODY	0.051***	0.050***
INTERIOR	0.255***	0.229***
WAGON	0.226***	0.169***
FRIDAY	-0.067*	-0.071*
TOYOTA	0.202***	0.193***
R-squared	0.748	0.758
Adjusted R-squared	0.743	0.753
AIC	0.872	0.832
SC	0.955	0.924

Note: *, **, *** are significance at 10%, 5%, 1% levels, respectively.

5. CONCLUSION

People purchase used car because it is much cheaper than buying a new one. Price of the used car depends on many factors, such as age, conditions of body and interior, mileage, type, manufacturer and many others. The study shows that the chosen variables can explain changes in price of used cars in Taiwan auctions. If the vehicle was confiscated – it approximately reduces price of cars by 25% similarly age of the car and mileage negatively affect the price and change in age by one year affects the price by around 14.7%. Body conditions and interior conditions positively affect price; if car's body increases by one estimation point – on average it will increase car's price by 5% and if interior of the car is in good condition it will approximately increase car's price by 22.9%. If vehicle has

wagon body type – on average it is 16.9% more expensive than sedan. If the trading is conducted on Fridays, on average the cars are traded 7.1% cheaper, than the cars traded on Wednesday.

According to the regression result Toyota has very strong brand reputation in Taiwan; Toyota approximately 21% more expensive than any other car manufacturers. According to the statistical information provided by Taiwan Transportation Vehicle Manufacturers Association, Toyota have high demand in Taiwan market, because its average yearly local sales take almost 40% of all locally manufactured cars sold in Taiwan. However, this finding does not imply that brand Toyota is better than any other brand which depicts the local market preferences. This finding is useful for the perspective car owners in Taiwan. Their choice of future car should not be based on local market preferences and habits, but rather should be based on personal experience and judgment. The model used in this study explained 75.8% of variation in price of used cars in Taiwan auction. Engine also has positive effect on price; increase in engine by one litter will approximately increase price of the car by 20.4% (from the first model); however, adding quadratic form of ENGINE in the second model will result in decreased marginal effect of engine size on price. This finding is useful for local government to understand the way to control citizens' choice of cars' engine displacement.

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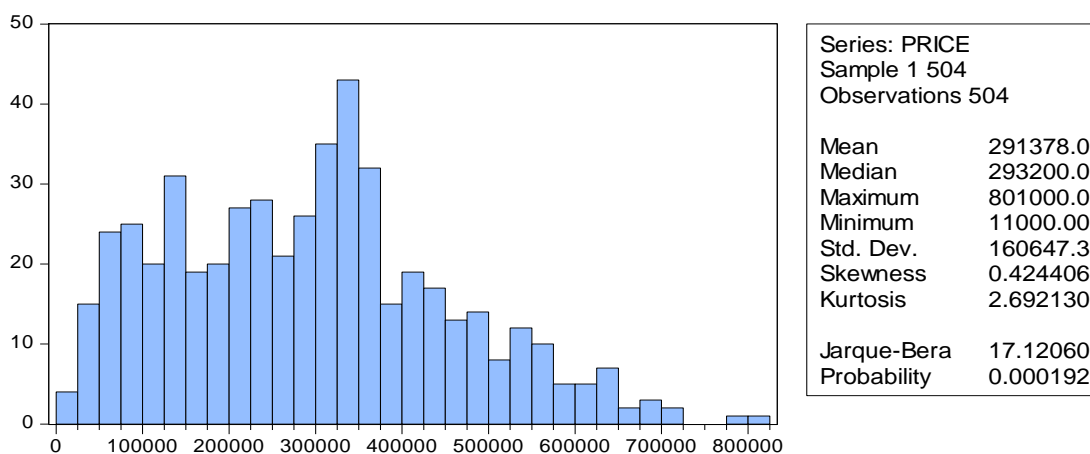
APPENDIX

Figure-1a. Descriptive statistics of the variable PRICE.
Source: this study, sampling provided by auction website "www.sinjang.com.tw" included 504 transactions.
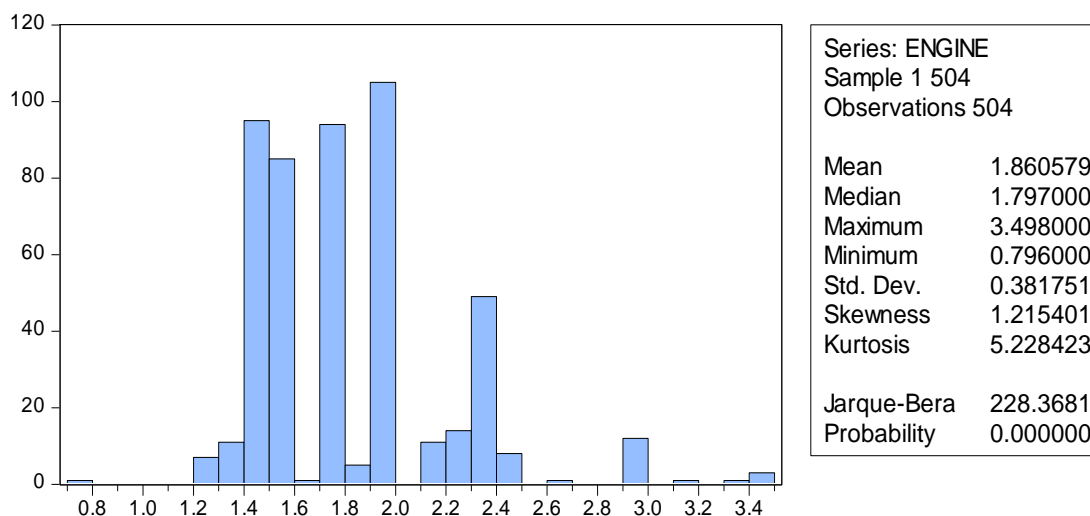

Figure-2a. Descriptive statistics of the variable ENGINE.
Source: this study, sampling provided by auction website "www.sinjang.com.tw" included 504 transactions.
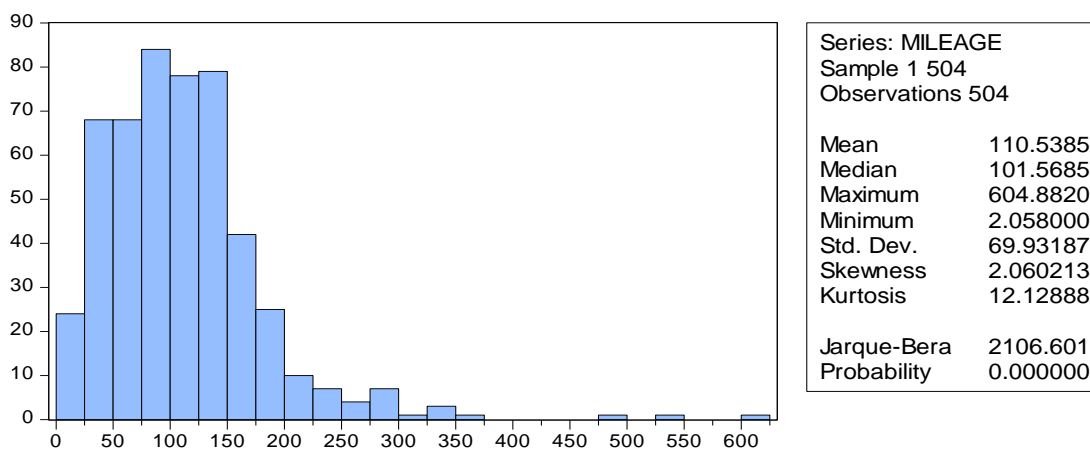
Figure-3a. Descriptive statistics of the variable MILEAGE.

Source: this study, sampling provided by auction website "www.sinjang.com.tw" included 504 transactions.
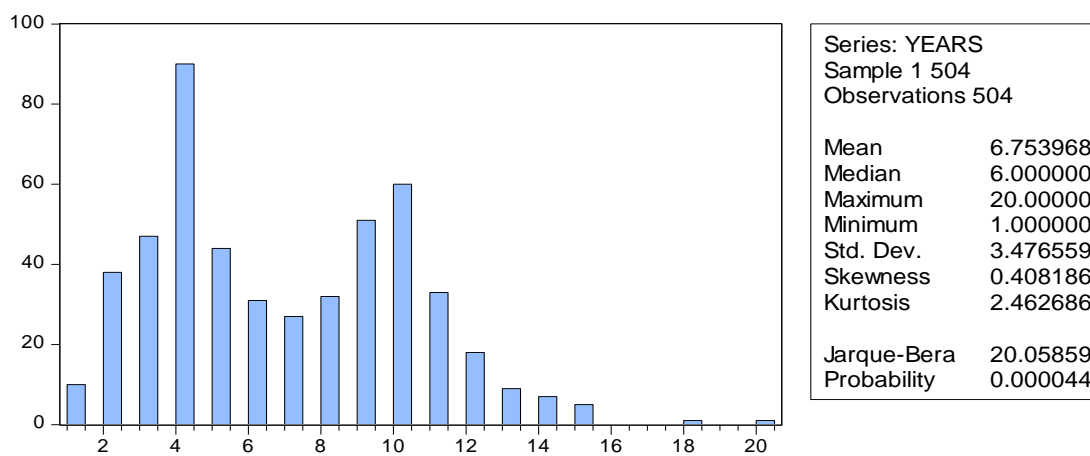

Figure-4a. Descriptive statistics of the variable YEARS.

Source: this study, sampling provided by auction website "www.sinjang.com.tw" included 504 transactions.

Table-1a. Eview output result for model 1.

Dependent Variable: LOG(PRICE)
Method: Least Squares
Sample: 1 504
Included observations: 504

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.66458	0.171890	73.67847	0.0000
CONFISC	–0.214043	0.044271	–4.834849	0.0000
ENGINE	0.204454	0.052070	3.926489	0.0001
YEARS	–0.148421	0.006353	–23.36313	0.0000
LOG(MILEAGE)	–0.031029	0.030970	–1.001918	0.3169
BODY	0.051082	0.013341	3.828885	0.0001
INTERIOR	0.254500	0.039238	6.486029	0.0000
WAGON	0.225629	0.043543	5.181752	0.0000
FRIDAY	–0.066950	0.039075	–1.713376	0.0873
TOYOTA	0.202226	0.038155	5.300114	0.0000
R-squared	0.747902	Mean dependent var		12.37512
Adjusted R-squared	0.743309	S.D. dependent var		0.731323
S.E. of regression	0.370522	Akaike info criterion		0.871835
Sum squared resid	67.81962	Schwarz criterion		0.955616
Log likelihood	–209.7024	Hannan-Quinn criter.		0.904699
F-statistic	162.8397	Durbin-Watson stat		1.930961
Prob(F-statistic)	0.000000			

Source: this study,sampling provided by auction website "www.sinjang.com.tw" included 504 transactions.

Table-1a. Eview output result for model 2.

Dependent Variable: LOG(PRICE)
Method: Least Squares
Sample: 1 504
Included observations: 504

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.26127	0.345439	32.59987	0.0000
CONFISC	-0.250836	0.044089	-5.689346	0.0000
ENGINE	1.619520	0.308384	5.251629	0.0000
ENGINE^2	-0.329254	0.070765	-4.652750	0.0000
YEARS	-0.147257	0.006229	-23.64033	0.0000
LOG(MILEAGE)	-0.031014	0.030342	-1.022138	0.3072
BODY	0.050018	0.013073	3.826105	0.0001
INTERIOR	0.229853	0.038806	5.923082	0.0000
WAGON	0.169519	0.044332	3.823834	0.0001
FRIDAY	-0.071904	0.038298	-1.877500	0.0610
TOYOTA	0.193861	0.037425	5.180009	0.0000
R-squared	0.758506	Mean dependent var		12.37512
Adjusted R-squared	0.753608	S.D. dependent var		0.731323
S.E. of regression	0.363013	Akaike info criterion		0.832829
Sum squared resid	64.96686	Schwarz criterion		0.924988
Log likelihood	-198.8729	Hannan-Quinn criter.		0.868980
F-statistic	154.8462	Durbin-Watson stat		1.897189
Prob(F-statistic)	0.000000			

Source: this study, sampling provided by auction website "www.sinjang.com.tw" included 504 transactions.