

My good friend Jill is planning to buy a used vehicle. She definitely wants a Mercedes Benz but hasn't decided on the type. She has, however, narrowed her choices down to a SUV or a sports car. I told her that since I'm taking a statistics class that I would do some preliminary market analysis to assist her in her decision. My analysis focuses on price comparisons, mileage versus price, mileage versus age, and color availability for the Mercedes Benz. For this study, I collected data from www.cars.com on used Mercedes Benz SUVs and sports cars that are currently for sale in the San Francisco bay area (within 100 mile radius of 94404). The observational units of this study are Mercedes Benz vehicles (in particular SUVs and Sports cars). The quantitative variables that will be analyzed are age, price, and mileage. The categorical variables are model (SUV or Sports) and color.

Preliminary Analysis:

Combined Car Data			
	Model		Row Summary
	Sports	SUV	
	61	89	150
	36312.672	25347.427	29806.627
Prix	12950	9998	9998
	20988	19888	19888
	27995	22995	24995
	42988	28877	31600
	109988	69988	109988

- S1 =
- S2 =
- S3 =
- S4 =
- S5 =
- S6 =
- S7 =

Of the 150 vehicles observed (sample size), there were more used SUVs (89) for sale than Sports cars (61) during the same time period.

The mean (average) price for the sports cars is higher than for the SUVs – \$36,313 as compared to \$25,347 respectively.

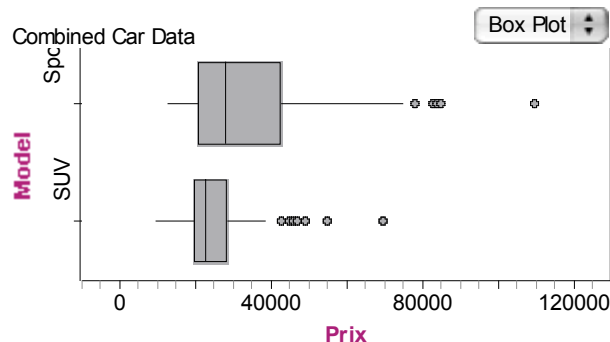
The least expensive SUV (minimum) is a 1998 Mercedes-Benz M-Class for \$9,998 while the least expensive Sport car is a 1986 (12 years older) Mercedes-Benz SL-Class 560SL for \$12,950 (for \$2,952 more).

The most expensive SUV (maximum) is a 2003 Mercedes-Benz G-Class G55 for \$69,988 while the most expensive Sports car is a 2005 Mercedes-Benz SL-Class 55 for \$109,988.

However, the mean (average price) for the SUVs is \$25,347 and for the Sports cars it is \$36,313.

It is clear from the preliminary analysis that the price of the Sports category is much higher than the SUV category.

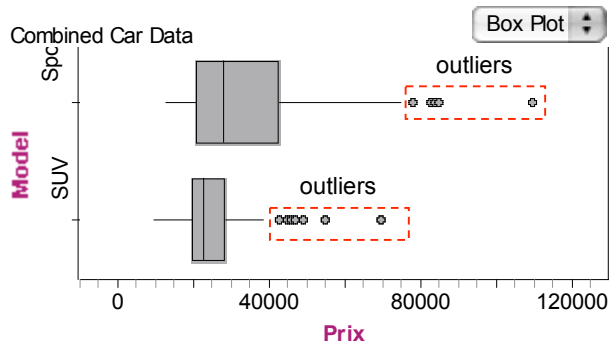
Price Comparison:



There is greater variability in the price of the Sports category than for SUV category.

The box plot indicates that there are outliers for both categories. These are observations that are more than 1.5 times the interquartile range away from the nearer quartile. A test for outliers also proves this fact.

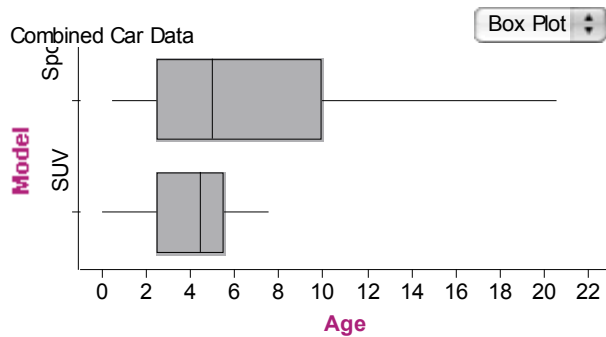
Price Comparison (Continued):



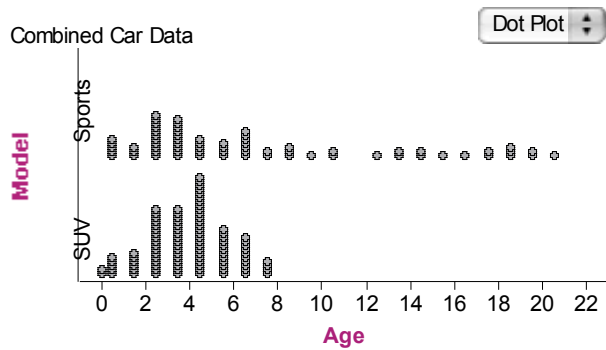
SUVs: IQR: 28,877 - 19,888 = **8,989**
Q1: 19,888 - 1.5(8,989) = **6,405**
Q3: 28,877 + 1.5(8,989) = **42,360**
 There are 7 outliers (observations) that are above \$42,360.

Sports: IQR: 42,988 - 20,988 = **22,000**
Q1: 20,988 - 1.5(22,000) = **-12,012**
Q3: 42,988 + 1.5(20,000) = **75,988**
 There are 5 outliers (observations) that are above \$75,988.

Age Comparison:



There is greater variability (the spread) in the age of the Sports category than there is for the SUV category.



The shape of the distribution for the Sports category is skewed to the right while the shape of the SUV category is more symmetrical.

Combined Car Data		Age
Model	Sports	7.0735294
	SUV	3.9489796
Column Summary		166
		5.2289157
		4.5

S1 =
S2 =
S3 =

The center (median) of the distribution (which is also illustrated on the above graphs) for the Sports category is 5 and 4.5 for the SUV category.

This data suggest that the Mercedes Benz SUVs are resold more frequently than its Sports cars. One reason for this might be because sports cars are more likely to become desired classic cars than SUVs. However, it may also be due to the fact that sports cars, in general, have been around a lot longer than SUVs which also explains the difference in the variability.

Color Comparison:

Combined Car Data		Color						Row Summary
		Black	Blue	Other	Red	Silver	White	
Model	Sports	13 0.19117647	0 0	14 0.20588235	13 0.19117647	18 0.26470588	10 0.14705882	68 1
	SUV	24 0.24489796	6 0.06122449	25 0.25510204	2 0.020408163	32 0.32653061	9 0.091836735	98 1
Column Summary		37 0.22289157	6 0.036144578	39 0.23493976	15 0.090361446	50 0.30120482	19 0.11445783	166 1

S1 =
S2 =

The above data indicates that:

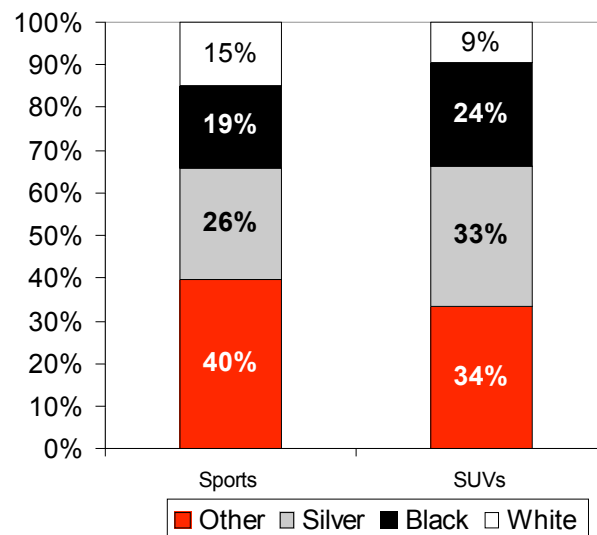
- The proportion of used vehicles for sale that are black is:
Sports: $13/37 = 35\%$ and **SUV:** $24/37 = 65\%$
- The proportion of used vehicles for sale that are silver is,
Sports: $18/50 = 36\%$ and **SUV:** $32/50 = 64\%$ and
- The proportion of used vehicles for sale that are white:
Sports: $10/19 = 53\%$ and **SUV:** $9/19 = 47\%$.

Another way to look at this data is to see what proportion of the model to the color Also the table to the right indicates,

- The proportion of Sports cars that are silver is:
 $18/68 = 26\%$.
- The proportion of SUVs that are silver is:
 $32/98 = 33\%$.

Relative Risk:

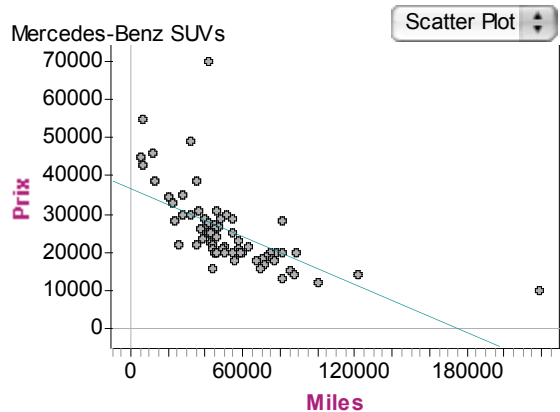
- The proportion of used silver SUVs is **1.27** times greater than used silver Sports cars: $(0.33/0.26 = 1.27)$
(This means that you are 1.27 times more likely to find a used silver SUV and a used silver Sports car.)
- The proportion of used black SUVs is **1.26** times greater than used black Sports cars: $(0.24/0.19 = 1.26)$
- The proportion of used white Sports cars is **1.67** times greater than used white SUVs: $(0.15/0.09 = 1.67)$



Independence:

- The variables color and model are not independent because the distributions of the color variable are not identical for all categories of the model variable.
- For example: of the used black vehicles, 13 are Sports cars and 24 are SUVs. If it were independent, the number of black vehicles would be the same for both categories.

**Price to Miles:
SUVs**



— $Prix = -0.210Miles + 36300; r^2 = 0.38$

- There is a mildly negative association between price and miles. As miles go up the price of the vehicle goes down
- For each additional mile the vehicle decreases in value by \$0.21.
- 38% of the proportion of variability is explained by the least squares line.

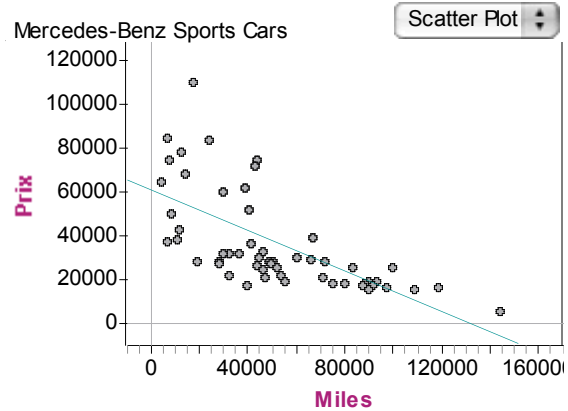
Fitted Value

- Based on the regression line equation, the predicted price for a SUV with 50,890 miles would be:
- $-0.210(50,890) + 36,300 = \mathbf{\$25,613.10}$

Residual Value

- The 2003 Mercedes-Benz M-Class ML500 (SUV) observation has 50,890 and is \$29,988
- The residual value for this vehicle is: $\$29,988 - \$25,613.10 = \$4,374.90$
- The regression line has underestimated the price of this vehicle.

Sports Cars



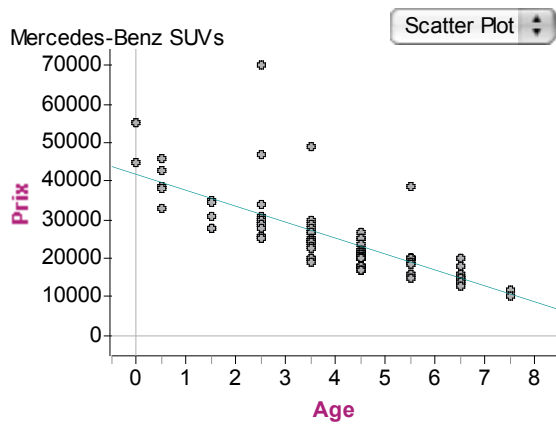
— $Prix = -0.460Miles + 59600; r^2 = 0.43$

- There is a mildly negative association between price and miles. As miles go up the price of the vehicle goes down
- For each additional mile the vehicle decreases in value by \$0.46.
- 43% of the proportion of variability is explained by the least squares line.

- Based on the regression line equation, the predicted price for a Sports car with 50,578 miles would be:
- $-0.460(50,578) + 59,600 = \mathbf{\$36,334.12}$

- The 1997 Mercedes-Benz SL-Class SL500 Roadster (Sports car) observation has 50,578 and is \$28,000
- The residual value for this vehicle is: $\$28,000 - \$36,334.12 = -\$8,334.12$
- The regression line has overestimated the price of this vehicle.

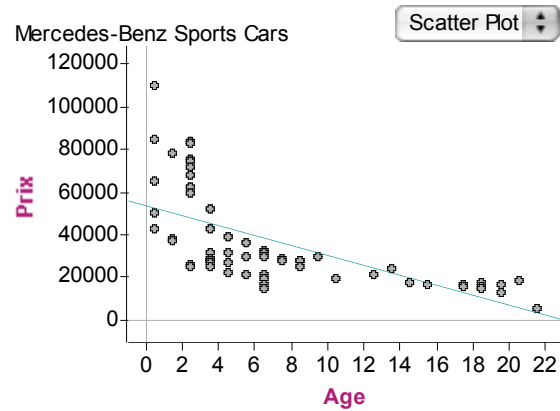
Price to Age (continued):
SUVs



— Prix = -4180Age + 41000; $r^2 = 0.55$

- There is a mildly negative association between price and age. As the vehicle ages, the price goes down.
- For each additional year, the price of the vehicle decreases in value by \$4,180.
- 55% of the proportion of variability is explained by the least squares line.

Sports Cars



— Prix = -2360Age + 53000; $r^2 = 0.42$

- There is a mildly negative association between price and miles. As the vehicle ages, the price goes down.
- For each additional year, the price of the vehicle decreases in value by \$2,360.
- 42% of the proportion of variability is explained by the least squares line.

Conclusion:

Based on these findings, I informed my friend Jill of the following:

- There are slightly more used SUVs on the market than there are Sports cars.
- For both models, there are slightly more silver vehicles available than any other color.
- The SUVs are less expensive than the Sports cars.
 - The price when compared to mileage for SUVs is less than the Sports cars.
- However, SUVs depreciate in value more rapidly than the Sports cars.
 - There is a \$4,180 depreciation for each additional year for the SUVs. While there's only a \$2,360 depreciation for each additional year for the Sports cars.
- In considering the mileage, age, and price of the vehicle, the best value is a SUV, however, if money is not a consideration, she might enjoy driving a pewter (silver) 2005 Mercedes-Benz SL-Class 55 (Sports car). It has only 17,646 miles on it and is priced at only \$109,988.

