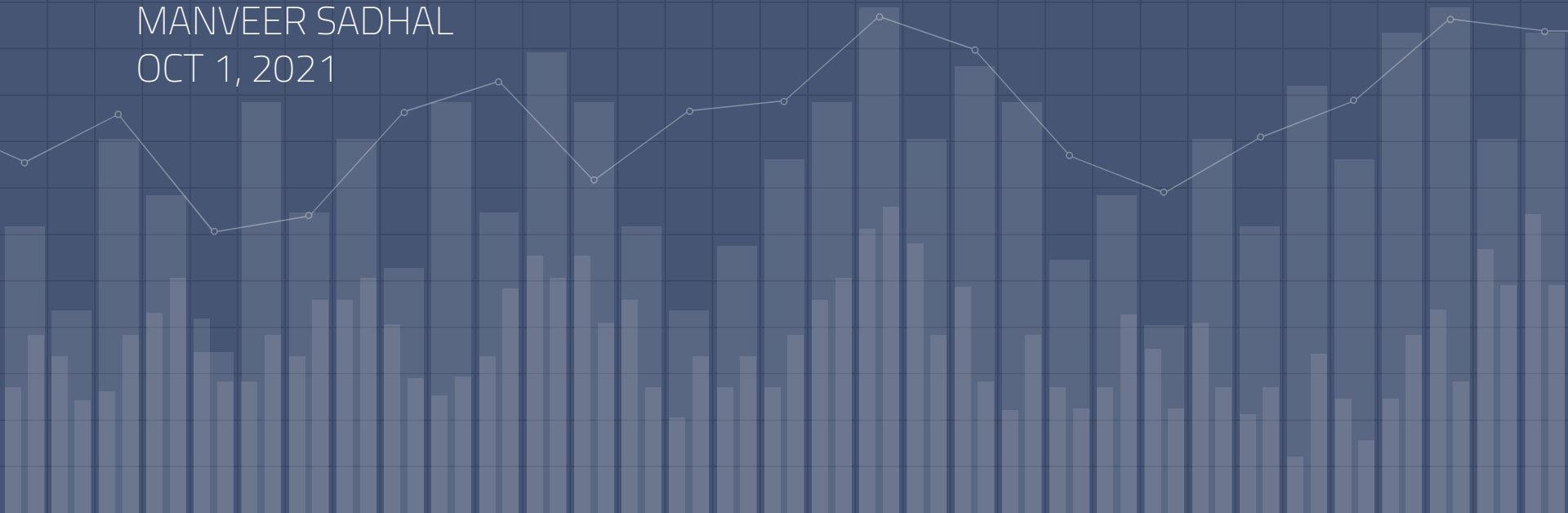


# REGRESSION ANALYSIS OF CAR AUCTION BIDS

MANVEER SADHAL

OCT 1, 2021



# QUESTION

What is the most you should bid to win an online car auction without overpaying?



# DATA AND SCOPE

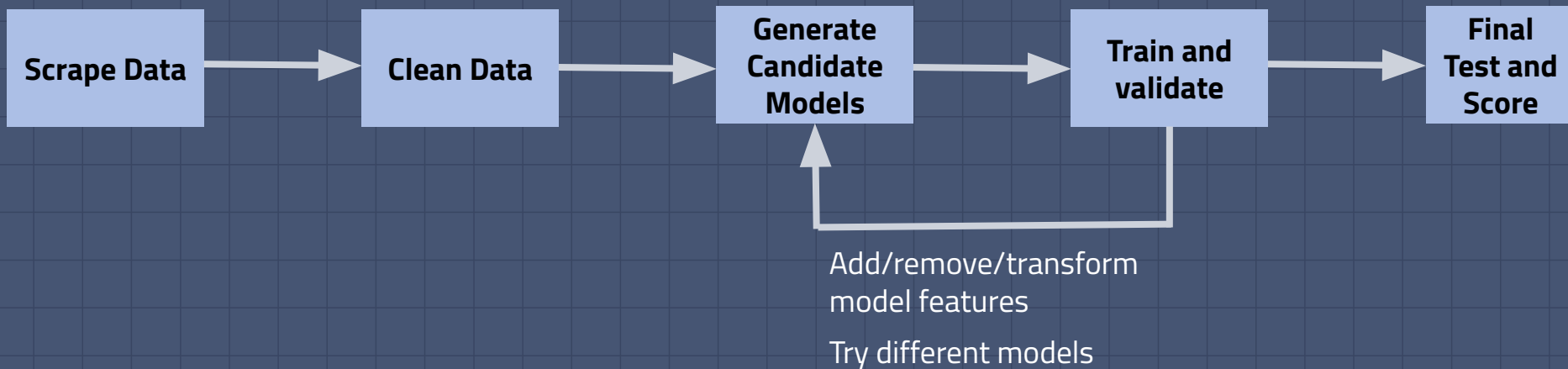
- Data
  - BringATrailer.com completed auctions
- Scope
  - BMW M3 model years 1994-2013
  - 1,121 auctions evaluated from Dec 2016 to present
  - 908 records remained after cleaning



# TOOLS

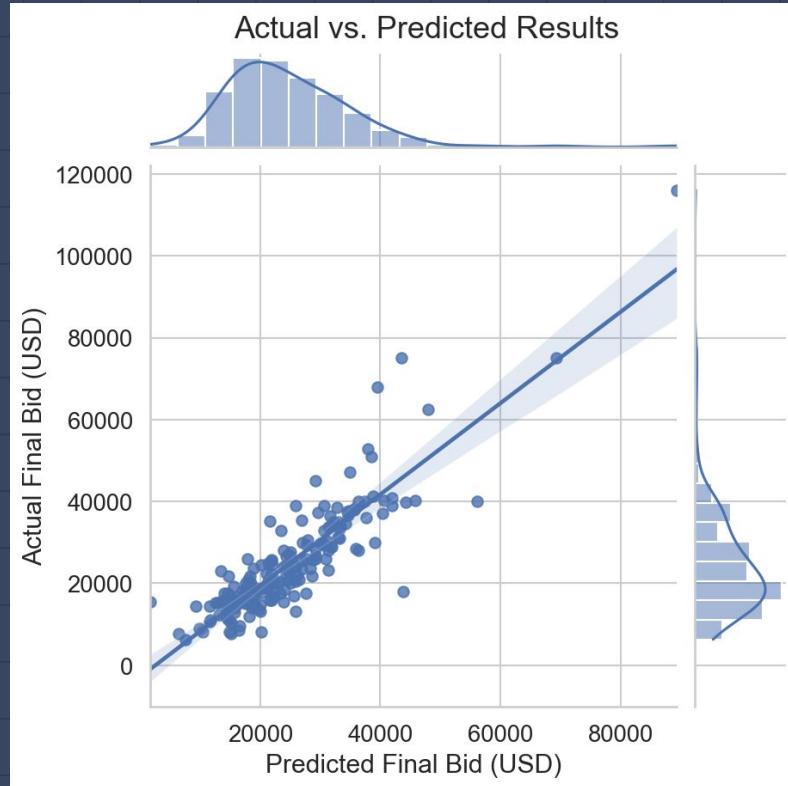
- ▣ Web Scraping
  - Selenium
  - BeautifulSoup
- ▣ Data Cleaning
  - Pandas
  - NumPy
- ▣ Modeling
  - SciKit-Learn
- ▣ Visualization
  - Matplotlib
  - Seaborn

# PROCESS



# RESULTS

- Linear Model Metrics
  - $R^2$ : 0.76
  - Mean Absolute Error: \$4,377
  - Root Mean Squared Error: \$6,585



# RESULTS

Most  
Influential



Least  
Influential

Feature	Standardized Coefficient
log(Mileage)	-6781
Auction Close Date	3028
Model Year	2844
Not a Limited Edition	-2499
Body Style	2421
Auction Reserve Met	2178
Manual Transmission	1991

# CONCLUSIONS

- Current model predicts in the \$15k - \$60k range well. Data are limited outside of this range.
- Mileage is the primary driver of final bid price.
- Limited production cars can carry a significant premium.
- Recent auctions have seen higher bids, reflecting the general used car price trend in 2020-2021.





## FURTHER WORK

- Collect additional data
  - Other auction websites
  - Individual vehicle history (e.g. accidents, number of owners)
- Use alternate models:
  - Time series to predict trends
  - Tree model to adapt to nonlinear relationships

# THANKS!

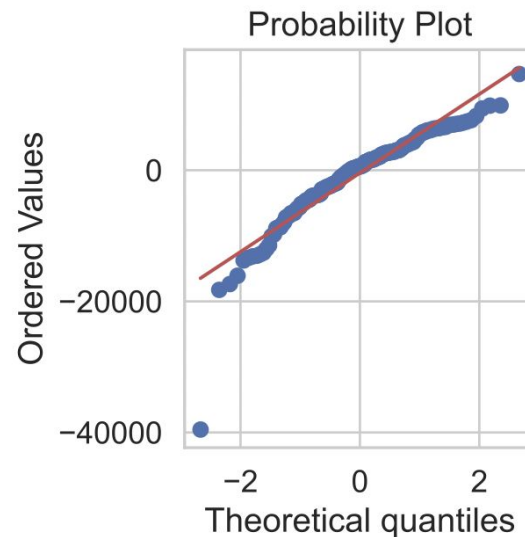
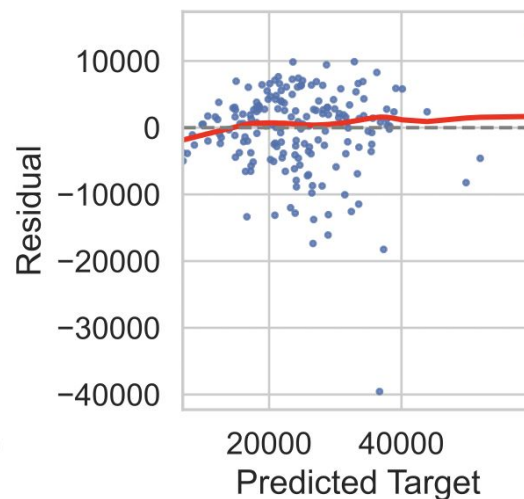
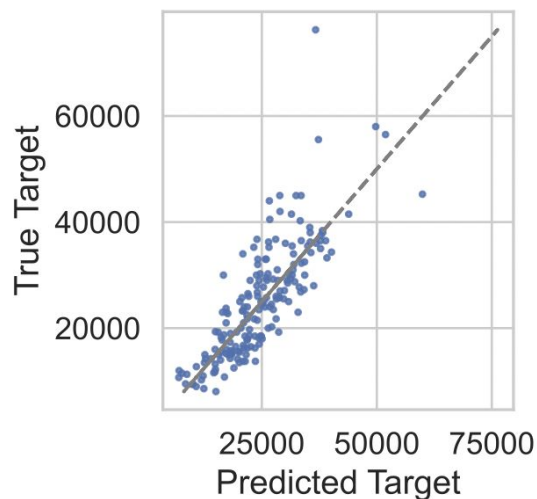
**Any questions?**



# Appendix

## Final validation

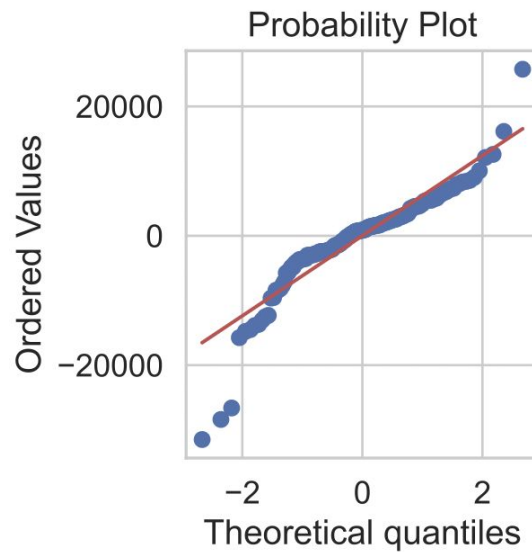
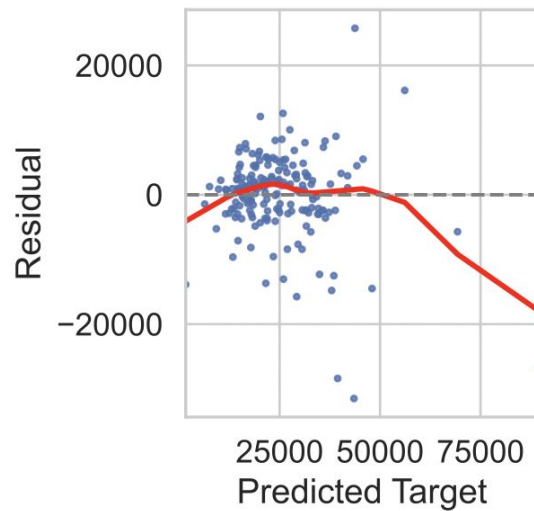
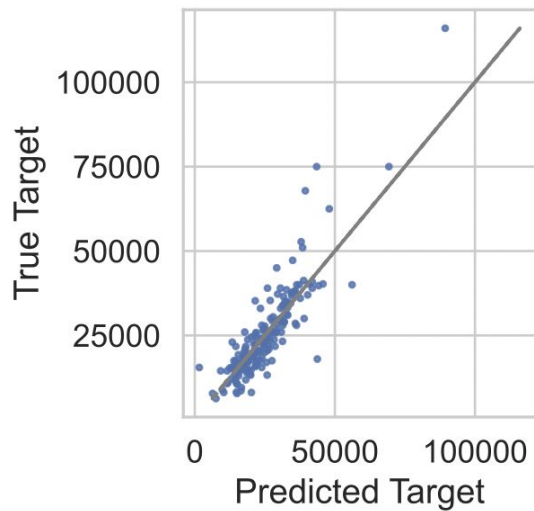
Diagnostic Plots



# Appendix

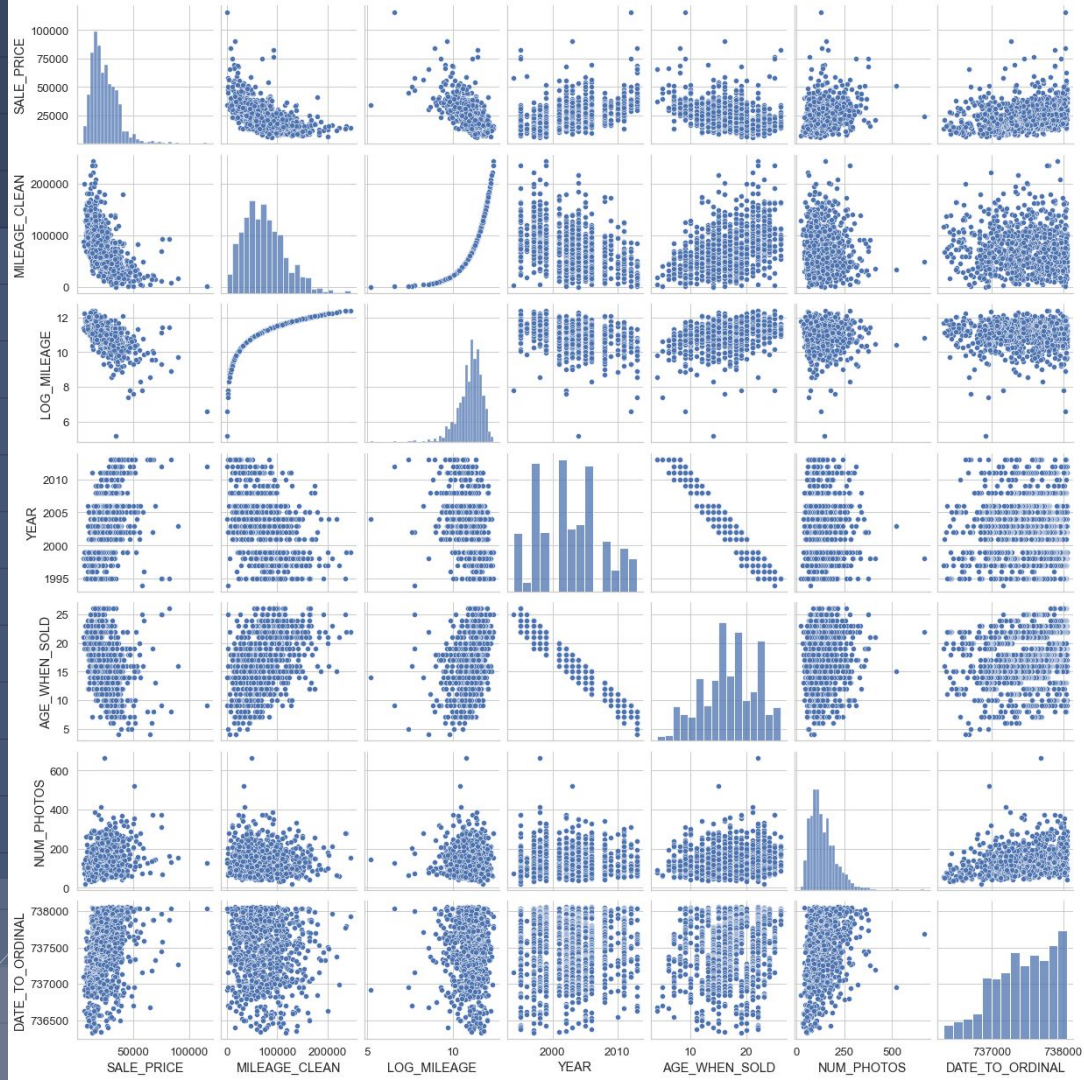
## □ Test

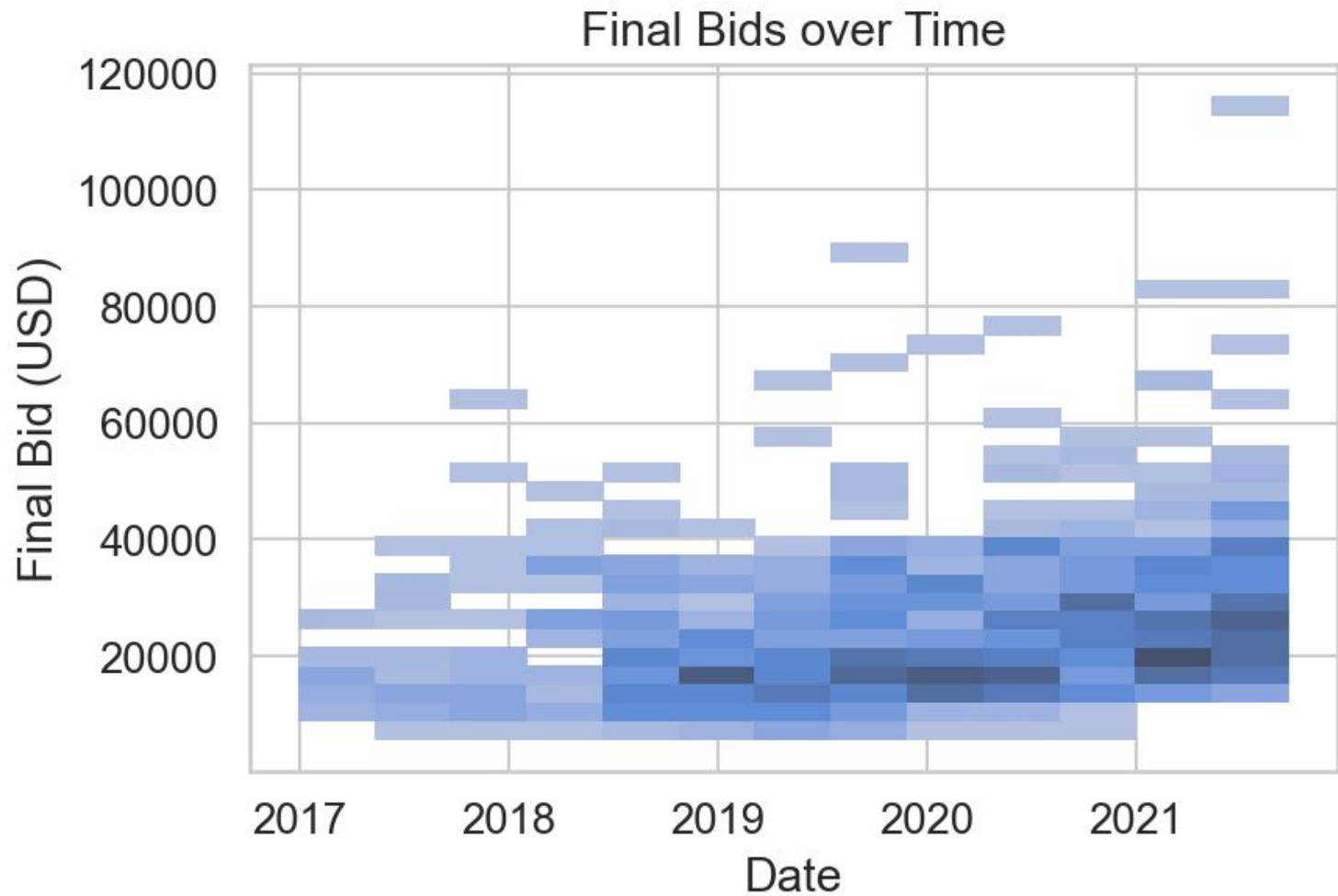
### Diagnostic Plots

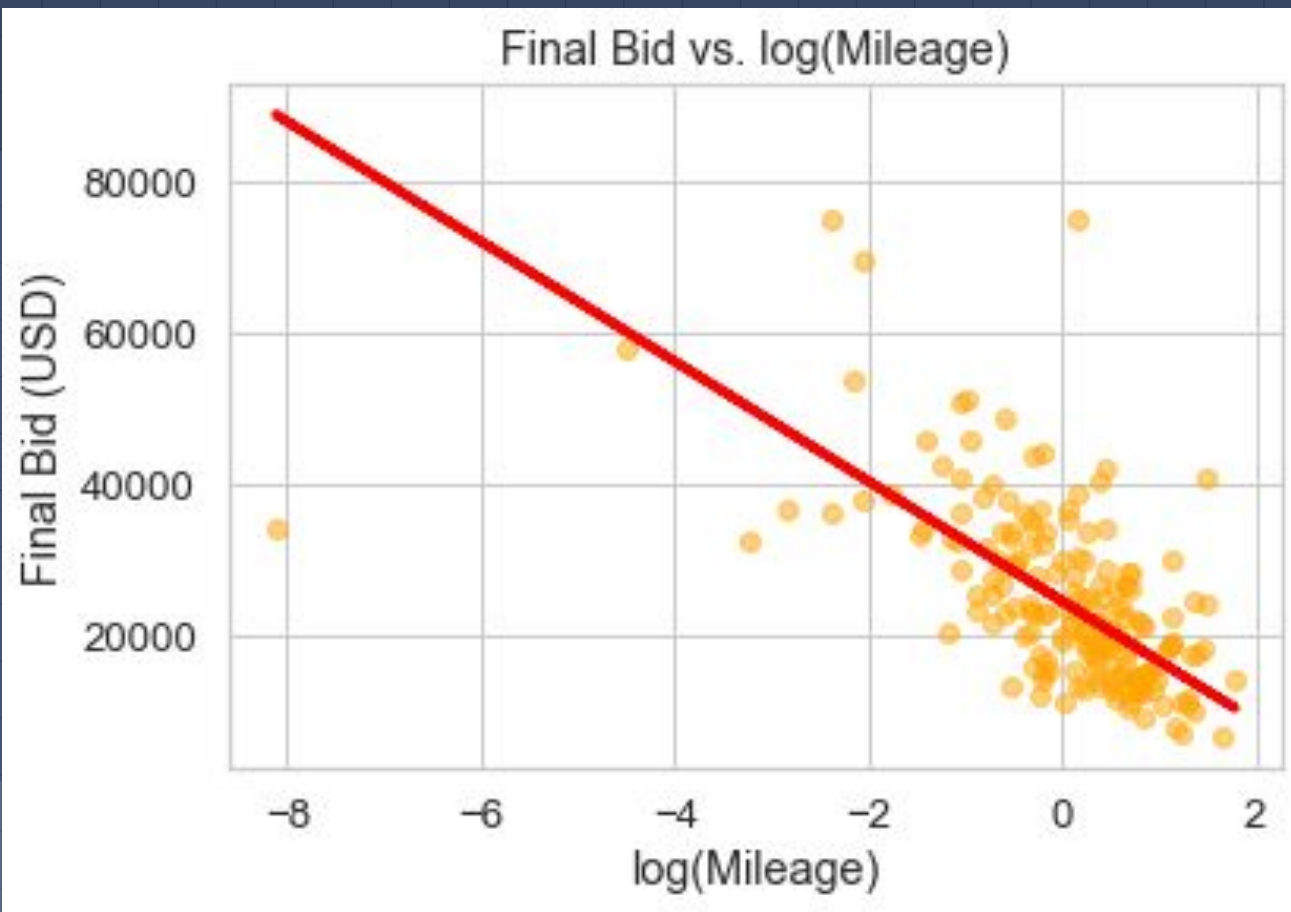


# Appendix

	SALE_PRICE	MILEAGE_CLEAN	LOG_MILEAGE	YEAR	AGE_WHEN_SOLD	NUM_PHOTOS	DATE_TO_ORDINAL
SALE_PRICE	1.000000	-0.583189	-0.615759	0.472826	-0.405725	0.218655	0.278991
MILEAGE_CLEAN	-0.583189	1.000000	0.833499	-0.417688	0.412189	-0.031762	-0.027489
LOG_MILEAGE	-0.615759	0.833499	1.000000	-0.383544	0.385722	-0.031190	0.002676
YEAR	0.472826	-0.417688	-0.383544	1.000000	-0.969747	-0.044772	0.089513
AGE_WHEN_SOLD	-0.405725	0.412189	0.385722	-0.969747	1.000000	0.118754	0.149821
NUM_PHOTOS	0.218655	-0.031762	-0.031190	-0.044772	0.118754	1.000000	0.326935
DATE_TO_ORDINAL	0.278991	-0.027489	0.002676	0.089513	0.149821	0.326935	1.000000









# CREDITS

Special thanks to all the people who made and released these awesome resources for free:

- Presentation template by [SlidesCarnival](#)
- Photographs by [Unsplash](#)