Predicting NASDAQ Closing Prices based on Financial Variables

STA 9890 SPRING 2021

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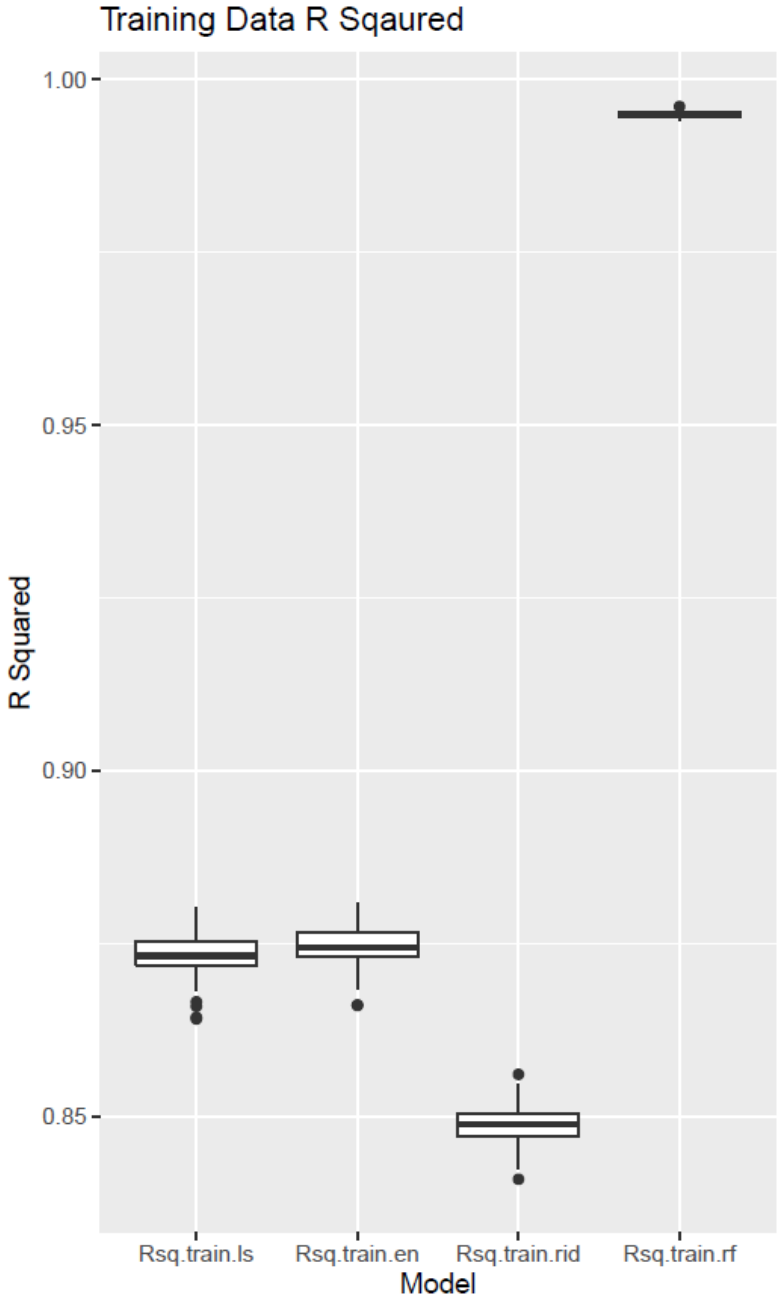
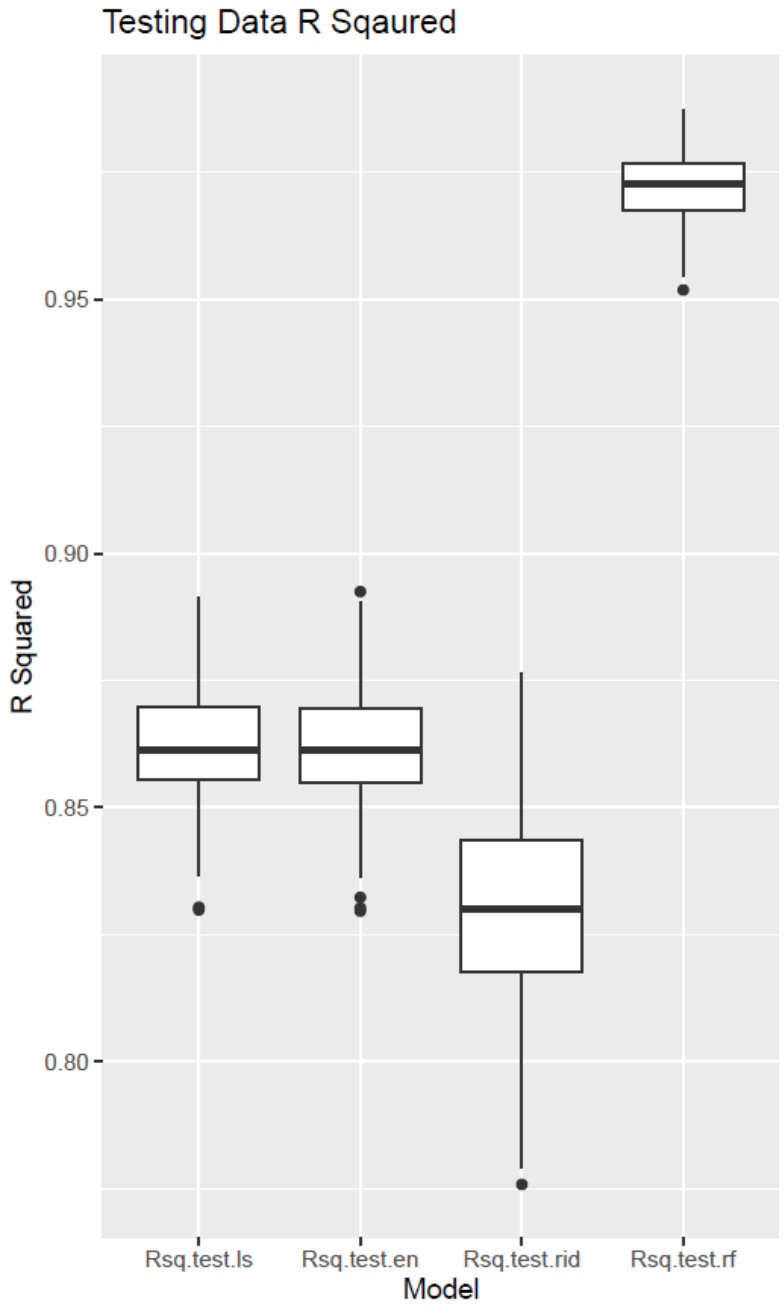
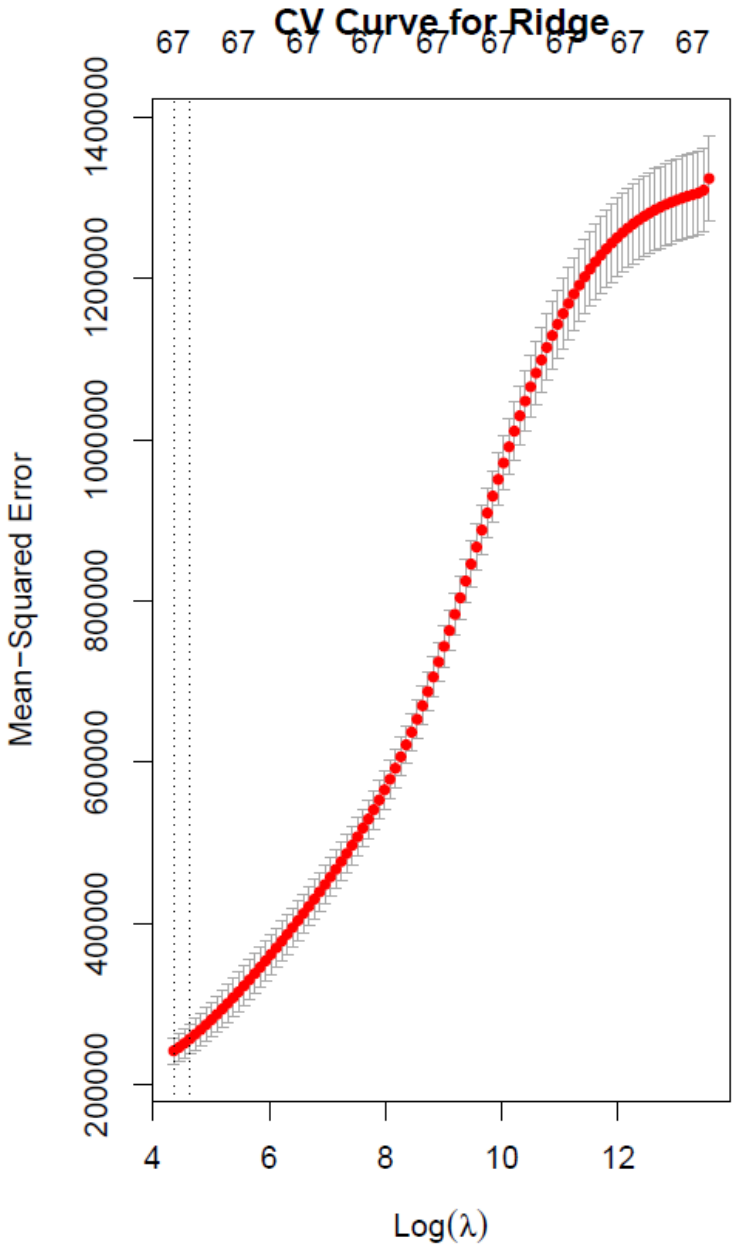
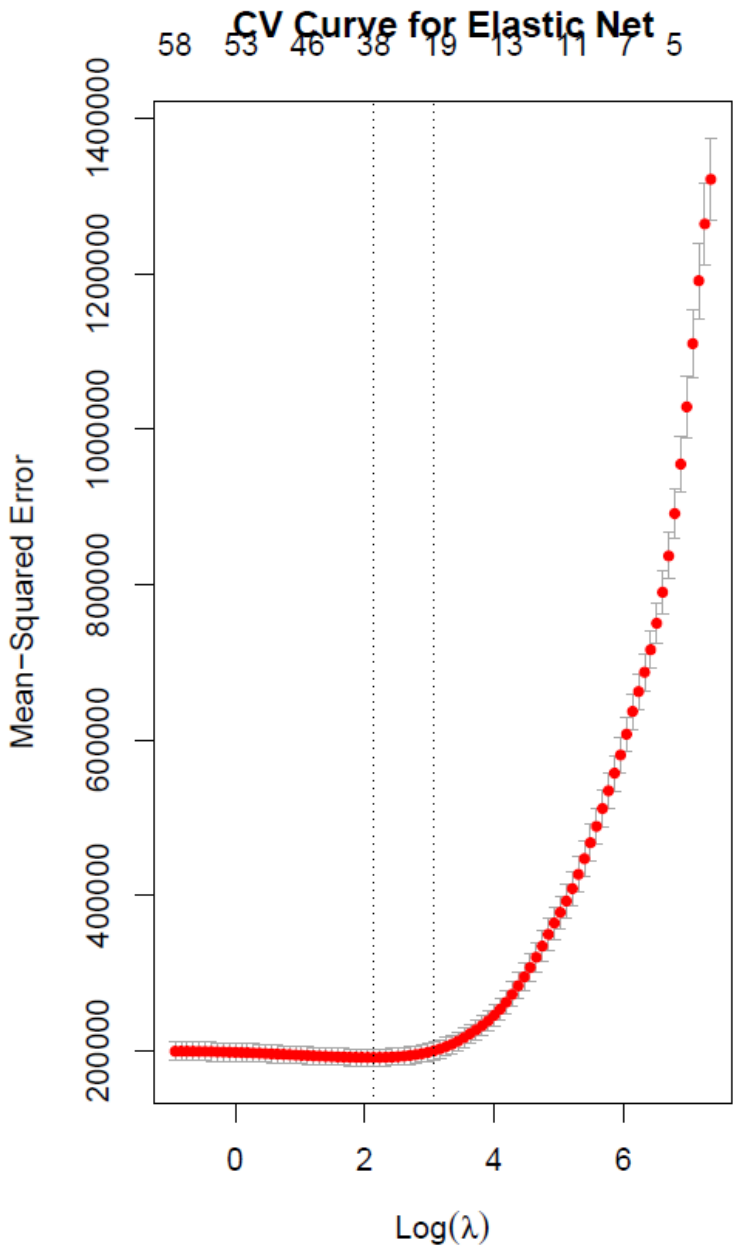
Dataset

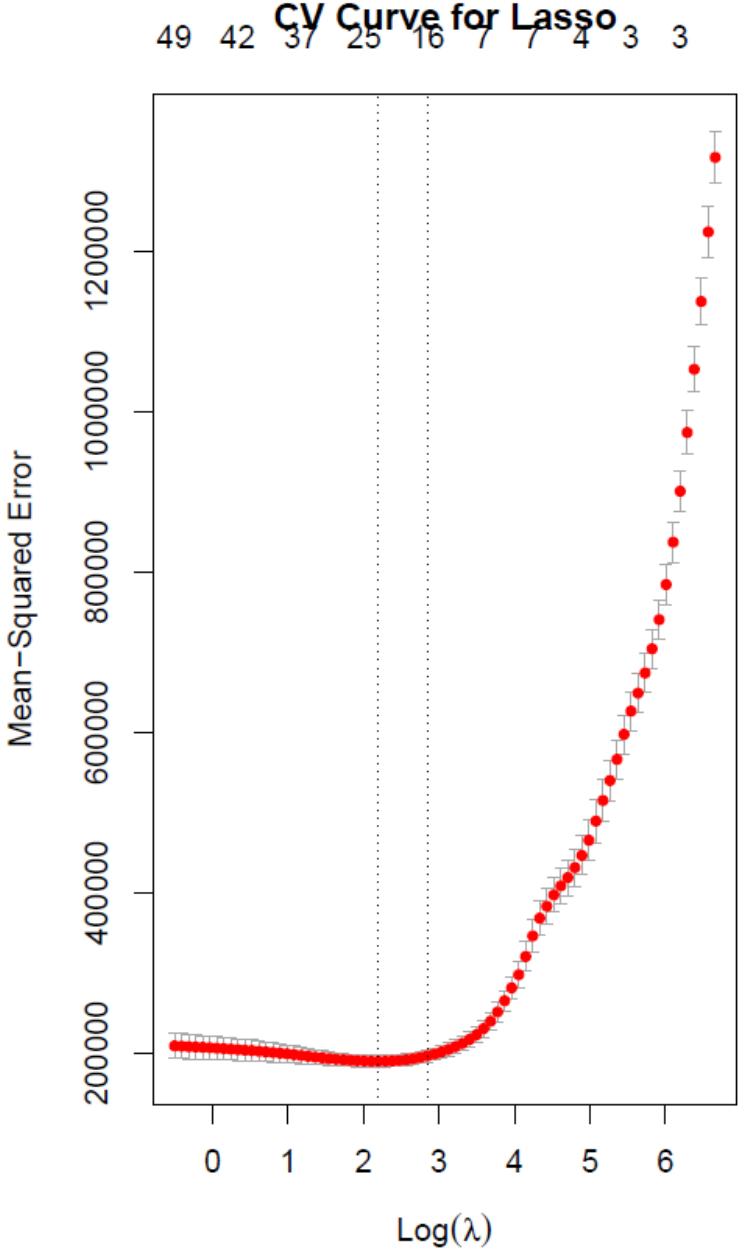
- Response Variable: Daily Close Price of NASDAQ
- Predictor Variables
  - World Stock Markets
    - China, Japan, South Korea
  - Exchange Rate of the USD
    - Canadian Dollar, European Euro
  - Commodities
    - Gold, Silver, Oil, Wheat
  - Big U.S Companies
    - Amazon, Apple
  - Future contracts
  - Treasury Bill Rates


Training Data R Sqaured
1.00
0.95
0.90
0.85
R Squared
Rsq.train.ls
Rsq.train.en
Rsq.train.rid
Rsq.train.rf
Model

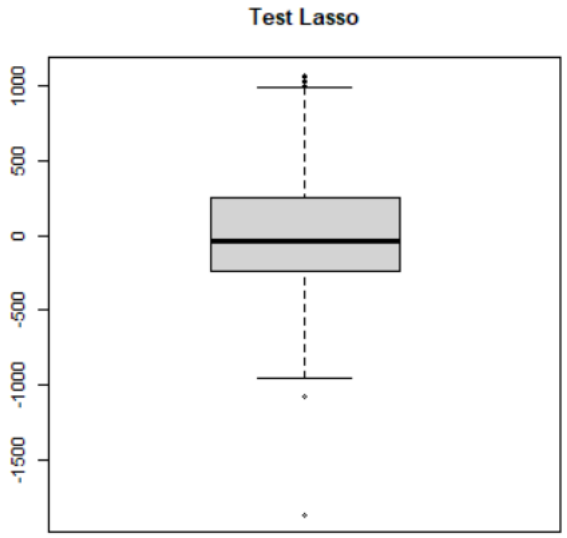

Testing Data R Sqaured
0.95
0.90
0.85
0.80
R Squared
Rsq.test.ls
Rsq.test.en
Rsq.test.rid
Rsq.test.rf
Model

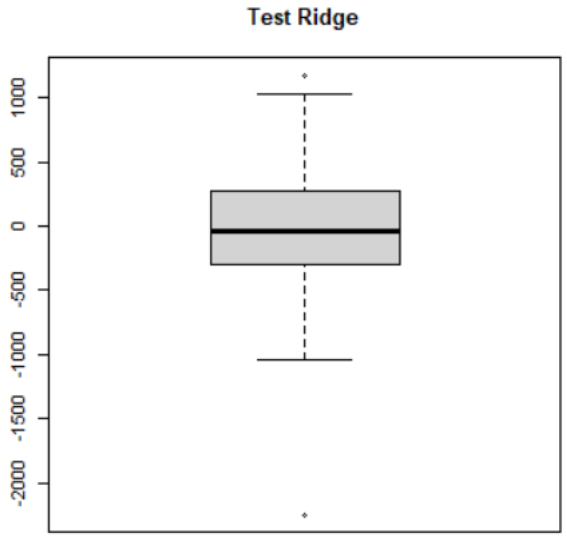

CV Curve for Ridge
67 67 67 67 67 67 67 67 67
Mean−Squared Error
200000
400000
600000
800000
1000000
1200000
1400000
4
6
8
10
12
Log(λ)

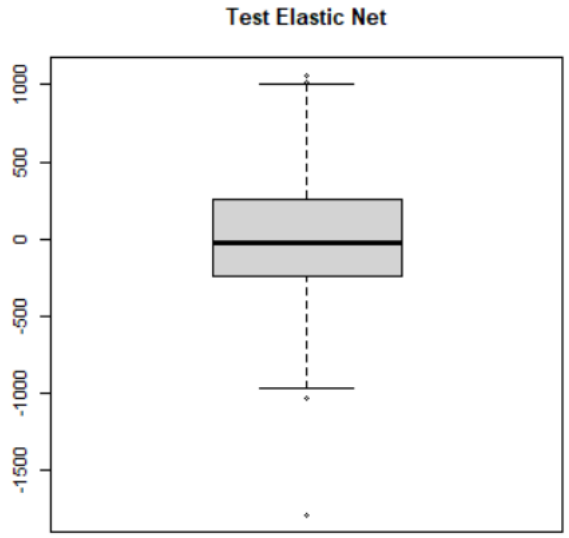

CV Curve for Elastic Net
58 53 46 38 19 13 11 7 5
Mean−Squared Error
200000
400000
600000
800000
1000000
1200000
1400000
0
2
4
6
Log(λ)

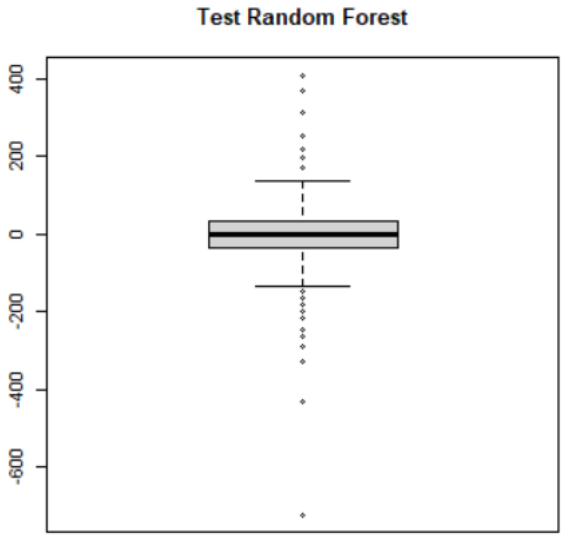

CV Curve for Lasso
49 42 37 25 16 7 7 4 3 3
Mean−Squared Error
200000
400000
600000
800000
1000000
1200000
0
1
2
3
4
5
6
Log(λ)

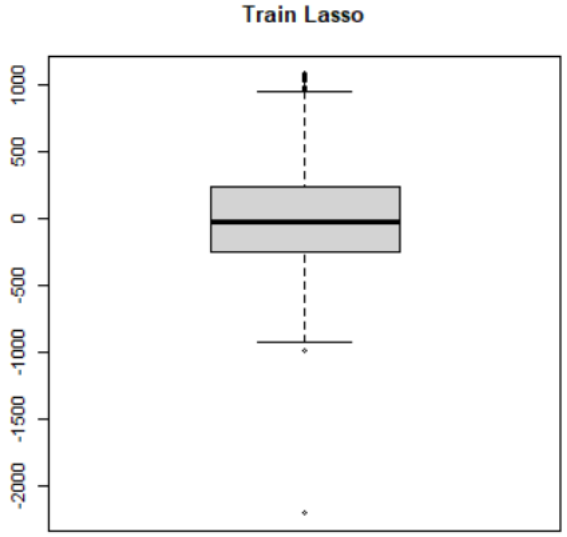
	90% Test R^2 CI	Time (s)
Lasso	0.8568047 - 0.8628603	0.13
Elastic Net	0.8565430 - 0.8625992	0.13
Ridge	0.8241692 - 0.8326184	0.14
Random Forest	0.9698257 - 0.9726702	5.28

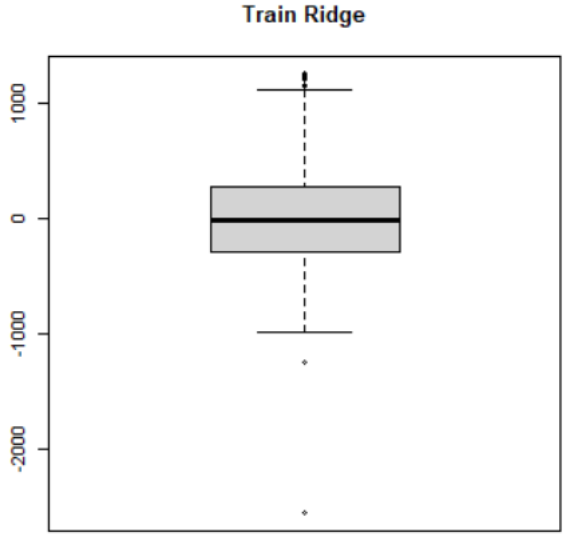

Test Lasso
1000
500
0
-500
-1000
-1500

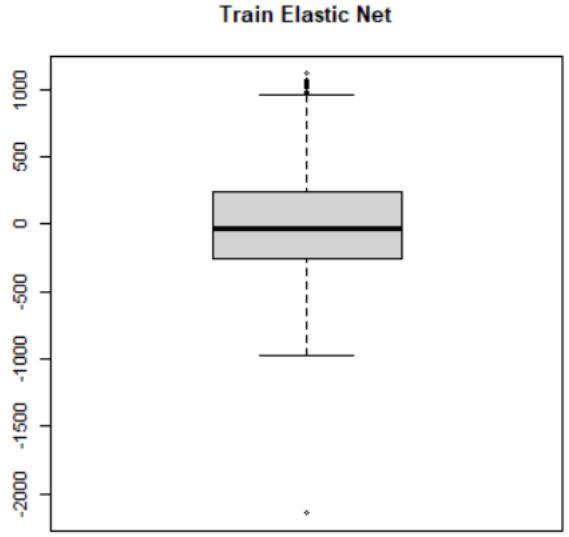

Test Ridge
1000
500
0
-500
-1000
-1500
-2000

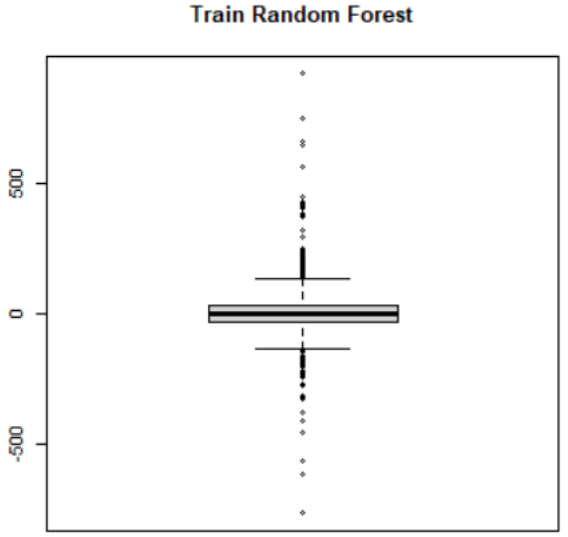

Test Elastic Net
1000
500
0
-500
-1000
-1500

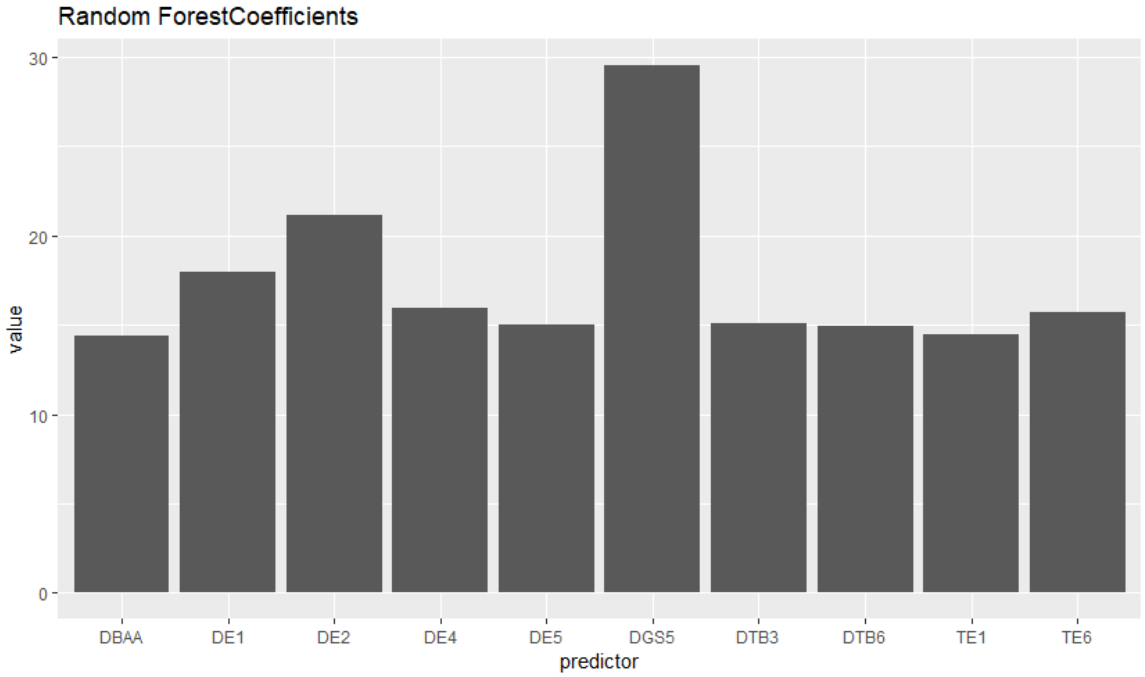

Test Random Forest
400
200
0
-200
-400
-600

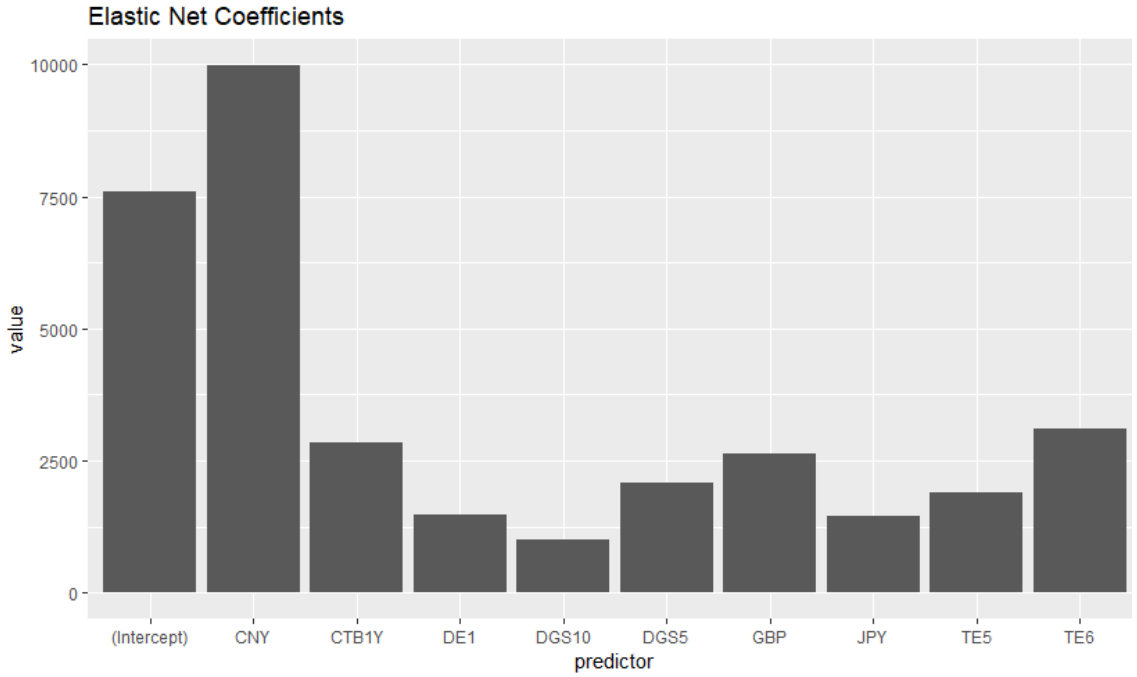

Train Lasso
1000
500
0
-500
-1000
-1500
-2000

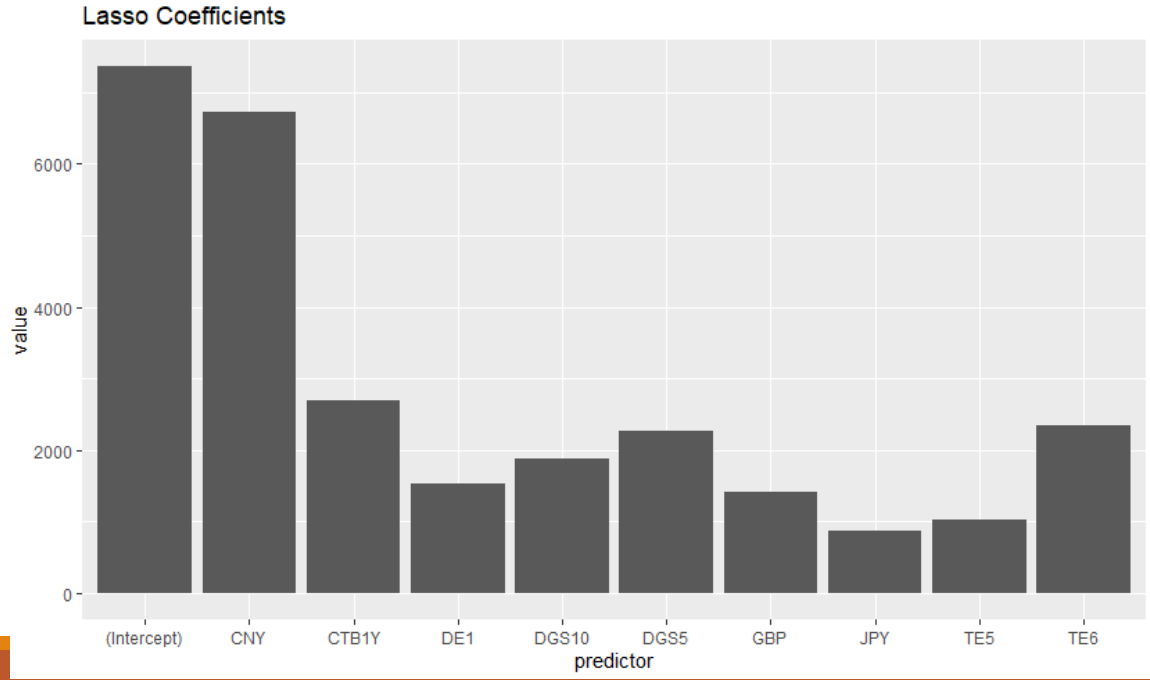

Train Ridge
1000
0
-1000
-2000

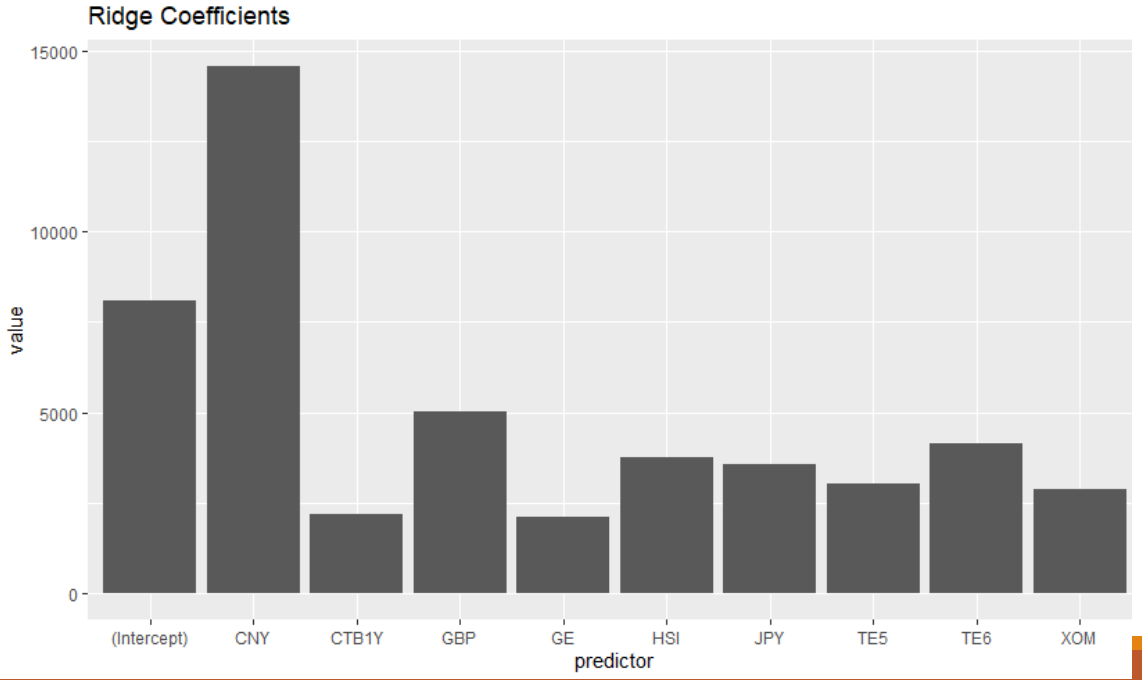

Train Elastic Net
1000
500
0
-500
-1000
-1500
-2000


Train Random Forest
500
0
-500


Random ForestCoefficients
30
20
10
0
value
DBAA
DE1
DE2
DE4
DE5
DGS5
DTB3
DTB6
TE1
TE6
predictor


Elastic Net Coefficients
10000
7500
5000
2500
0
value
(Intercept)
CNY
CTB1Y
DE1
DGS10
DGS5
GBP
JPY
TE5
TE6
predictor


Lasso Coefficients
6000
4000
2000
0
value
(Intercept)
CNY
CTB1Y
DE1
DGS10
DGS5
GBP
JPY
TE5
TE6
predictor


Ridge Coefficients
15000
10000
5000
0
value
(Intercept)
CNY
CTB1Y
GBP
GE
HSI
JPY
TE5
TE6
XOM
predictor

Conclusions

- The USD Exchange Rate relative to Foreign Currencies Chinese Yuan (CNY), British Pound (GBP), and Japanese Yen (JPY) are some of the best predictors of NASDAQ across the different models
- Other strong predictors are 3 (TE5) and 6 (TE6) month treasury bills, market yield on U.S Treasury securities (CTB1Y), 5 year (DGS5) and 10 year(DGS10) Treasury Constant Maturity Rate
- Lasso, Elasic Net, and Ridge regression all had similar R^2 and completion times
- Random Forest took significantly longer to compute than the regressions