

Stock Market Prediction Tesla

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#Group-9

Abbas Ali Code for Linear Regression on the Data

LINEAR REGRESSION

```
#Load the necessary libraries
install.packages('dplyr')

## Installing package into '/cloud/lib/x86_64-pc-linux-gnu-library/4.3'
## (as 'lib' is unspecified)

library(dplyr)

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##   filter, lag

## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union

install.packages('caret')

## Installing package into '/cloud/lib/x86_64-pc-linux-gnu-library/4.3'
## (as 'lib' is unspecified)

library(caret)

## Loading required package: ggplot2

## Loading required package: lattice

#Import the csv file and run the dataset
df <- read.csv('TESLA-PREP.csv')

# Split the data into training and testing sets
set.seed(123) # for reproducibility
train_index <- createDataPartition(df$Close, p = 0.8, list = FALSE)
```

```

train_data <- df[train_index, ]
test_data <- df[-train_index, ]

# Creating the linear regression model
model <- lm(Close ~ Open + High + Low + Adj_Close + Volume, data =
train_data)

# Print the model summary
summary(model)

## Warning in summary.lm(model): essentially perfect fit: summary may be
## unreliable

##
## Call:
## lm(formula = Close ~ Open + High + Low + Adj_Close + Volume,
##     data = train_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.794e-18 -9.820e-20 -5.400e-21  8.980e-20  7.433e-18
##
## Coefficients:
##              Estimate Std. Error  t value Pr(>|t|)
## (Intercept)  0.000e+00  1.744e-20  0.000e+00   1.000
## Open         0.000e+00  1.826e-18  0.000e+00   1.000
## High         0.000e+00  2.334e-18  0.000e+00   1.000
## Low          0.000e+00  2.100e-18  0.000e+00   1.000
## Adj_Close    1.000e+00  1.951e-18  5.126e+17 <2e-16 ***
## Volume       -4.331e-28  6.335e-28 -6.840e-01   0.494
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.748e-19 on 1595 degrees of freedom
## Multiple R-squared:  1, Adjusted R-squared:  1
## F-statistic: 2.104e+38 on 5 and 1595 DF, p-value: < 2.2e-16

# Making predictions on the test data
predictions <- predict(model, newdata = test_data)

# Calculate the Mean Squared Error and R-squared for model evaluation
mse <- mean((test_data$Close - predictions)^2)
r_squared <- cor(test_data$Close, predictions)^2
cat("Mean Squared Error:", mse, "\n")

## Mean Squared Error: 0

cat("R-squared:", r_squared, "\n")

## R-squared: 1

```

```
# Now, let's predict the future 'Close' using the model
future_features <- data.frame(Open = c(200), High = c(220), Low = c(190),
Adj_Close = c(210), Volume = c(150000))
future_close <- predict(model, newdata = future_features)
cat("Predicted Future Close:", future_close, "\n")
```

```
## Predicted Future Close: 210
```

```
output_df <- data.frame(Date = test_data$Date, Actual_Close =
test_data$Close, Predicted_Close = predictions)
print(output_df)
```

##	Date	Actual_Close	Predicted_Close
## 1	2010-06-29	0.021912243	0.021912243
## 15	2010-07-20	0.012188516	0.012188516
## 17	2010-07-22	0.014084507	0.014084507
## 19	2010-07-26	0.013949079	0.013949079
## 28	2010-08-06	0.010265439	0.010265439
## 37	2010-08-19	0.008098592	0.008098592
## 38	2010-08-20	0.008938245	0.008938245
## 44	2010-08-30	0.011023835	0.011023835
## 46	2010-09-01	0.012594800	0.012594800
## 47	2010-09-02	0.014247021	0.014247021
## 49	2010-09-07	0.012838570	0.012838570
## 56	2010-09-16	0.013921993	0.013921993
## 58	2010-09-20	0.014247021	0.014247021
## 60	2010-09-22	0.011023835	0.011023835
## 62	2010-09-24	0.011646804	0.011646804
## 65	2010-09-29	0.016738895	0.016738895
## 68	2010-10-04	0.014057421	0.014057421
## 71	2010-10-07	0.012540628	0.012540628
## 79	2010-10-19	0.011511376	0.011511376
## 88	2010-11-01	0.015195016	0.015195016
## 95	2010-11-10	0.036728061	0.036728061
## 99	2010-11-16	0.037567714	0.037567714
## 101	2010-11-18	0.038163597	0.038163597
## 103	2010-11-22	0.047670639	0.047670639
## 105	2010-11-24	0.053277356	0.053277356
## 124	2010-12-22	0.045585049	0.045585049
## 135	2011-01-07	0.033694475	0.033694475
## 136	2011-01-10	0.034263272	0.034263272
## 138	2011-01-12	0.030227519	0.030227519
## 143	2011-01-20	0.018472373	0.018472373
## 144	2011-01-21	0.019609967	0.019609967
## 145	2011-01-24	0.023537378	0.023537378
## 150	2011-01-31	0.022481040	0.022481040
## 151	2011-02-01	0.021966414	0.021966414
## 154	2011-02-04	0.020747562	0.020747562
## 156	2011-02-08	0.023537378	0.023537378
## 161	2011-02-15	0.019068256	0.019068256

## 162	2011-02-16	0.024187432	0.024187432
## 168	2011-02-25	0.021153846	0.021153846
## 183	2011-03-18	0.019393283	0.019393283
## 193	2011-04-01	0.029414951	0.029414951
## 194	2011-04-04	0.027166847	0.027166847
## 195	2011-04-05	0.029523294	0.029523294
## 200	2011-04-12	0.023970748	0.023970748
## 204	2011-04-18	0.025000000	0.025000000
## 216	2011-05-05	0.028819068	0.028819068
## 219	2011-05-10	0.033938245	0.033938245
## 220	2011-05-11	0.030525460	0.030525460
## 225	2011-05-18	0.028575298	0.028575298
## 240	2011-06-09	0.032015168	0.032015168
## 242	2011-06-13	0.034209101	0.034209101
## 246	2011-06-17	0.028981582	0.028981582
## 249	2011-06-22	0.030904659	0.030904659
## 253	2011-06-28	0.033342362	0.033342362
## 271	2011-07-25	0.034371614	0.034371614
## 283	2011-08-10	0.021722644	0.021722644
## 286	2011-08-15	0.028250271	0.028250271
## 288	2011-08-17	0.027166847	0.027166847
## 297	2011-08-30	0.023916576	0.023916576
## 299	2011-09-01	0.022210184	0.022210184
## 308	2011-09-15	0.024431203	0.024431203
## 310	2011-09-19	0.027004334	0.027004334
## 313	2011-09-22	0.026625135	0.026625135
## 325	2011-10-10	0.032719393	0.032719393
## 326	2011-10-11	0.031988082	0.031988082
## 331	2011-10-18	0.033965330	0.033965330
## 335	2011-10-24	0.034534128	0.034534128
## 344	2011-11-04	0.044718310	0.044718310
## 348	2011-11-10	0.042063922	0.042063922
## 350	2011-11-14	0.047183099	0.047183099
## 359	2011-11-28	0.045395450	0.045395450
## 360	2011-11-29	0.043201517	0.043201517
## 364	2011-12-05	0.050433369	0.050433369
## 366	2011-12-07	0.049810401	0.049810401
## 369	2011-12-12	0.039572048	0.039572048
## 371	2011-12-14	0.034479957	0.034479957
## 379	2011-12-27	0.034588299	0.034588299
## 385	2012-01-05	0.030660888	0.030660888
## 399	2012-01-26	0.035590466	0.035590466
## 409	2012-02-09	0.045449621	0.045449621
## 413	2012-02-15	0.048212351	0.048212351
## 415	2012-02-17	0.051923077	0.051923077
## 420	2012-02-27	0.048266522	0.048266522
## 421	2012-02-28	0.048781148	0.048781148
## 460	2012-04-24	0.043391116	0.043391116
## 474	2012-05-14	0.038624052	0.038624052
## 477	2012-05-17	0.034588299	0.034588299

## 482	2012-05-24	0.039219935	0.039219935
## 487	2012-06-01	0.033450704	0.033450704
## 488	2012-06-04	0.032719393	0.032719393
## 496	2012-06-14	0.036809317	0.036809317
## 498	2012-06-18	0.043445287	0.043445287
## 508	2012-07-02	0.039544962	0.039544962
## 511	2012-07-06	0.041143012	0.041143012
## 512	2012-07-09	0.042497291	0.042497291
## 516	2012-07-13	0.049972914	0.049972914
## 529	2012-08-01	0.028304442	0.028304442
## 533	2012-08-07	0.039138678	0.039138678
## 534	2012-08-08	0.035996750	0.035996750
## 545	2012-08-23	0.040438787	0.040438787
## 559	2012-09-13	0.037053088	0.037053088
## 563	2012-09-19	0.041305525	0.041305525
## 565	2012-09-21	0.038515710	0.038515710
## 567	2012-09-25	0.032123510	0.032123510
## 571	2012-10-01	0.036186349	0.036186349
## 572	2012-10-02	0.037919827	0.037919827
## 574	2012-10-04	0.036836403	0.036836403
## 585	2012-10-19	0.032340195	0.032340195
## 586	2012-10-22	0.032638137	0.032638137
## 587	2012-10-23	0.034100758	0.034100758
## 592	2012-11-01	0.036430119	0.036430119
## 593	2012-11-02	0.035536295	0.035536295
## 601	2012-11-14	0.042199350	0.042199350
## 602	2012-11-15	0.040682557	0.040682557
## 606	2012-11-21	0.045151679	0.045151679
## 615	2012-12-05	0.048510293	0.048510293
## 619	2012-12-11	0.052762730	0.052762730
## 620	2012-12-12	0.052708559	0.052708559
## 627	2012-12-21	0.049295775	0.049295775
## 628	2012-12-24	0.050054171	0.050054171
## 646	2013-01-22	0.052518960	0.052518960
## 648	2013-01-24	0.057394366	0.057394366
## 651	2013-01-29	0.059994583	0.059994583
## 652	2013-01-30	0.058829902	0.058829902
## 653	2013-01-31	0.058802817	0.058802817
## 654	2013-02-01	0.060942579	0.060942579
## 665	2013-02-19	0.063596966	0.063596966
## 678	2013-03-08	0.061403034	0.061403034
## 679	2013-03-11	0.063109426	0.063109426
## 684	2013-03-18	0.052410618	0.052410618
## 696	2013-04-04	0.070991333	0.070991333
## 697	2013-04-05	0.069257855	0.069257855
## 698	2013-04-08	0.070503792	0.070503792
## 707	2013-04-19	0.086755146	0.086755146
## 710	2013-04-24	0.093797400	0.093797400
## 714	2013-04-30	0.103439870	0.103439870
## 718	2013-05-06	0.118364030	0.118364030

## 725	2013-05-15	0.186998917	0.186998917
## 728	2013-05-20	0.200812581	0.200812581
## 736	2013-05-31	0.221993499	0.221993499
## 745	2013-06-13	0.223131094	0.223131094
## 747	2013-06-17	0.234019515	0.234019515
## 749	2013-06-19	0.240736742	0.240736742
## 752	2013-06-24	0.232096425	0.232096425
## 755	2013-06-27	0.253114843	0.253114843
## 761	2013-07-08	0.286592646	0.286592646
## 769	2013-07-18	0.279604550	0.279604550
## 771	2013-07-22	0.288813651	0.288813651
## 774	2013-07-25	0.293255674	0.293255674
## 784	2013-08-08	0.372914396	0.372914396
## 785	2013-08-09	0.371614301	0.371614301
## 788	2013-08-14	0.334669556	0.334669556
## 789	2013-08-15	0.335509209	0.335509209
## 793	2013-08-21	0.357692321	0.357692321
## 798	2013-08-28	0.408044434	0.408044434
## 800	2013-08-30	0.414951232	0.414951232
## 811	2013-09-17	0.407448510	0.407448510
## 812	2013-09-18	0.407421438	0.407421438
## 814	2013-09-20	0.453927424	0.453927424
## 819	2013-09-27	0.474268689	0.474268689
## 823	2013-10-03	0.426625122	0.426625122
## 825	2013-10-07	0.453060645	0.453060645
## 838	2013-10-24	0.426191780	0.426191780
## 857	2013-11-20	0.285238353	0.285238353
## 862	2013-11-27	0.301029252	0.301029252
## 863	2013-11-29	0.301950149	0.301950149
## 864	2013-12-02	0.293526544	0.293526544
## 866	2013-12-04	0.333559060	0.333559060
## 867	2013-12-05	0.337703155	0.337703155
## 868	2013-12-06	0.329252438	0.329252438
## 872	2013-12-12	0.356635956	0.356635956
## 883	2013-12-30	0.370097522	0.370097522
## 886	2014-01-03	0.362296872	0.362296872
## 891	2014-01-10	0.351895978	0.351895978
## 892	2014-01-13	0.334615385	0.334615385
## 898	2014-01-22	0.440845098	0.440845098
## 900	2014-01-24	0.430119150	0.430119150
## 903	2014-01-29	0.431825582	0.431825582
## 905	2014-01-31	0.448564477	0.448564477
## 910	2014-02-07	0.462432286	0.462432286
## 913	2014-02-12	0.486240507	0.486240507
## 921	2014-02-25	0.628927384	0.628927384
## 922	2014-02-26	0.642470179	0.642470179
## 927	2014-03-05	0.641549309	0.641549309
## 928	2014-03-06	0.642307706	0.642307706
## 938	2014-03-20	0.593472346	0.593472346
## 940	2014-03-24	0.553548212	0.553548212

## 950	2014-04-07	0.519284967	0.519284967
## 958	2014-04-17	0.493824499	0.493824499
## 970	2014-05-06	0.518634900	0.518634900
## 973	2014-05-09	0.450866739	0.450866739
## 979	2014-05-19	0.488326097	0.488326097
## 982	2014-05-22	0.512134372	0.512134372
## 986	2014-05-29	0.526652221	0.526652221
## 988	2014-06-02	0.511646790	0.511646790
## 990	2014-06-04	0.509723727	0.509723727
## 991	2014-06-05	0.517605647	0.517605647
## 995	2014-06-11	0.511023849	0.511023849
## 997	2014-06-13	0.516305525	0.516305525
## 1011	2014-07-03	0.578141901	0.578141901
## 1013	2014-07-08	0.550568784	0.550568784
## 1014	2014-07-09	0.561375948	0.561375948
## 1027	2014-07-28	0.566143025	0.566143025
## 1033	2014-08-05	0.603169041	0.603169041
## 1034	2014-08-06	0.631446357	0.631446357
## 1039	2014-08-13	0.662269772	0.662269772
## 1041	2014-08-15	0.666874323	0.666874323
## 1042	2014-08-18	0.661267592	0.661267592
## 1048	2014-08-26	0.666143012	0.666143012
## 1052	2014-09-02	0.726760577	0.726760577
## 1055	2014-09-05	0.708531975	0.708531975
## 1060	2014-09-12	0.713434453	0.713434453
## 1069	2014-09-25	0.626083410	0.626083410
## 1070	2014-09-26	0.625135428	0.625135428
## 1071	2014-09-29	0.621505932	0.621505932
## 1073	2014-10-01	0.607908992	0.607908992
## 1075	2014-10-03	0.648456121	0.648456121
## 1077	2014-10-07	0.660265452	0.660265452
## 1083	2014-10-15	0.579360767	0.579360767
## 1084	2014-10-16	0.570287107	0.570287107
## 1085	2014-10-17	0.573347752	0.573347752
## 1089	2014-10-23	0.594501612	0.594501612
## 1091	2014-10-27	0.557611051	0.557611051
## 1093	2014-10-29	0.602112663	0.602112663
## 1096	2014-11-03	0.614274133	0.614274133
## 1102	2014-11-11	0.637269772	0.637269772
## 1105	2014-11-14	0.657854821	0.657854821
## 1106	2014-11-17	0.645124607	0.645124607
## 1107	2014-11-18	0.655200447	0.655200447
## 1109	2014-11-20	0.630850501	0.630850501
## 1110	2014-11-21	0.614788732	0.614788732
## 1114	2014-11-28	0.619501612	0.619501612
## 1116	2014-12-02	0.584046574	0.584046574
## 1122	2014-12-10	0.525568784	0.525568784
## 1129	2014-12-19	0.551164707	0.551164707
## 1142	2015-01-09	0.516955593	0.516955593
## 1163	2015-02-10	0.543038990	0.543038990

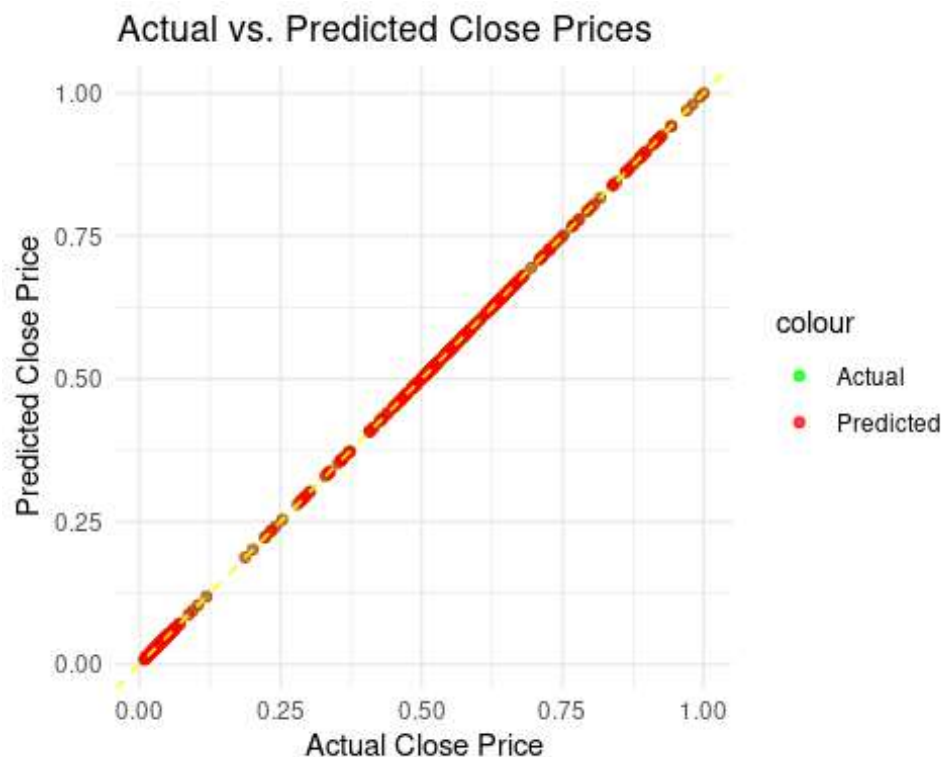
##	1165	2015-02-12	0.506717226	0.506717226
##	1169	2015-02-19	0.530633789	0.530633789
##	1174	2015-02-26	0.518391116	0.518391116
##	1175	2015-02-27	0.507963150	0.507963150
##	1178	2015-03-04	0.505525447	0.505525447
##	1179	2015-03-05	0.500622955	0.500622955
##	1180	2015-03-06	0.482340209	0.482340209
##	1184	2015-03-12	0.474729158	0.474729158
##	1187	2015-03-17	0.484642457	0.484642457
##	1193	2015-03-25	0.483477803	0.483477803
##	1194	2015-03-26	0.472941509	0.472941509
##	1195	2015-03-27	0.458288191	0.458288191
##	1201	2015-04-07	0.507719420	0.507719420
##	1205	2015-04-13	0.525406297	0.525406297
##	1208	2015-04-16	0.517063922	0.517063922
##	1212	2015-04-22	0.551570964	0.551570964
##	1215	2015-04-27	0.584371628	0.584371628
##	1233	2015-05-21	0.622481054	0.622481054
##	1236	2015-05-27	0.627383532	0.627383532
##	1245	2015-06-09	0.650595897	0.650595897
##	1255	2015-06-23	0.682204767	0.682204767
##	1271	2015-07-16	0.679523280	0.679523280
##	1279	2015-07-28	0.674485387	0.674485387
##	1280	2015-07-29	0.671776815	0.671776815
##	1282	2015-07-31	0.678087757	0.678087757
##	1295	2015-08-19	0.648564450	0.648564450
##	1303	2015-08-31	0.631798483	0.631798483
##	1312	2015-09-14	0.642984832	0.642984832
##	1315	2015-09-17	0.667036850	0.667036850
##	1327	2015-10-05	0.623916576	0.623916576
##	1330	2015-10-08	0.571289301	0.571289301
##	1333	2015-10-13	0.551056311	0.551056311
##	1334	2015-10-14	0.544637040	0.544637040
##	1335	2015-10-15	0.556635983	0.556635983
##	1336	2015-10-16	0.572074756	0.572074756
##	1337	2015-10-19	0.575027072	0.575027072
##	1344	2015-10-28	0.534019488	0.534019488
##	1347	2015-11-02	0.536267592	0.536267592
##	1348	2015-11-03	0.521533017	0.521533017
##	1350	2015-11-05	0.584967497	0.584967497
##	1353	2015-11-10	0.543607787	0.543607787
##	1354	2015-11-11	0.550595910	0.550595910
##	1356	2015-11-13	0.518391116	0.518391116
##	1359	2015-11-18	0.555985929	0.555985929
##	1363	2015-11-24	0.548347806	0.548347806
##	1369	2015-12-03	0.587513543	0.587513543
##	1374	2015-12-10	0.572237283	0.572237283
##	1395	2016-01-12	0.525920897	0.525920897
##	1397	2016-01-14	0.515655471	0.515655471
##	1398	2016-01-15	0.512432300	0.512432300

## 1405	2016-01-27	0.466603440	0.466603440
## 1408	2016-02-01	0.490628386	0.490628386
## 1413	2016-02-08	0.358044420	0.358044420
## 1414	2016-02-09	0.358748646	0.358748646
## 1419	2016-02-17	0.414084507	0.414084507
## 1422	2016-02-22	0.438624052	0.438624052
## 1434	2016-03-09	0.522535198	0.522535198
## 1437	2016-03-14	0.539951232	0.539951232
## 1438	2016-03-15	0.548591536	0.548591536
## 1444	2016-03-23	0.560075826	0.560075826
## 1454	2016-04-07	0.653846140	0.653846140
## 1458	2016-04-13	0.646614274	0.646614274
## 1460	2016-04-15	0.646560130	0.646560130
## 1465	2016-04-22	0.644501625	0.644501625
## 1474	2016-05-05	0.530146262	0.530146262
## 1486	2016-05-23	0.542849391	0.542849391
## 1489	2016-05-26	0.566955553	0.566955553
## 1496	2016-06-07	0.586511362	0.586511362
## 1502	2016-06-15	0.546858085	0.546858085
## 1503	2016-06-16	0.547481027	0.547481027
## 1505	2016-06-20	0.552275176	0.552275176
## 1511	2016-06-28	0.503764924	0.503764924
## 1512	2016-06-29	0.526516766	0.526516766
## 1523	2016-07-15	0.554171208	0.554171208
## 1529	2016-07-25	0.580200420	0.580200420
## 1531	2016-07-27	0.576083451	0.576083451
## 1540	2016-08-09	0.577681501	0.577681501
## 1548	2016-08-19	0.566630553	0.566630553
## 1551	2016-08-24	0.560184155	0.560184155
## 1552	2016-08-25	0.555687988	0.555687988
## 1554	2016-08-29	0.540086687	0.540086687
## 1559	2016-09-06	0.506581826	0.506581826
## 1565	2016-09-14	0.489192863	0.489192863
## 1580	2016-10-05	0.521830999	0.521830999
## 1583	2016-10-10	0.501489694	0.501489694
## 1586	2016-10-13	0.499566631	0.499566631
## 1587	2016-10-14	0.489463678	0.489463678
## 1588	2016-10-17	0.482556880	0.482556880
## 1594	2016-10-25	0.505254591	0.505254591
## 1607	2016-11-11	0.467930688	0.467930688
## 1619	2016-11-30	0.470205864	0.470205864
## 1622	2016-12-05	0.463163611	0.463163611
## 1623	2016-12-06	0.460590439	0.460590439
## 1629	2016-12-14	0.495368350	0.495368350
## 1644	2017-01-06	0.577491847	0.577491847
## 1650	2017-01-17	0.595287121	0.595287121
## 1653	2017-01-20	0.620070409	0.620070409
## 1654	2017-01-23	0.631419285	0.631419285
## 1664	2017-02-06	0.655390046	0.655390046
## 1669	2017-02-13	0.717226422	0.717226422

## 1673	2017-02-17	0.694555783	0.694555783
## 1677	2017-02-24	0.653304469	0.653304469
## 1679	2017-02-28	0.634317457	0.634317457
## 1680	2017-03-01	0.634398727	0.634398727
## 1682	2017-03-03	0.638596953	0.638596953
## 1683	2017-03-06	0.637621899	0.637621899
## 1685	2017-03-08	0.625866752	0.625866752
## 1691	2017-03-16	0.666982665	0.666982665
## 1692	2017-03-17	0.665492944	0.665492944
## 1697	2017-03-24	0.669989166	0.669989166
## 1704	2017-04-04	0.779794177	0.779794177
## 1706	2017-04-06	0.766251381	0.766251381
## 1715	2017-04-20	0.776570951	0.776570951
## 1742	2017-05-30	0.864842863	0.864842863
## 1746	2017-06-05	0.897941454	0.897941454
## 1759	2017-06-22	0.993526585	0.993526585
## 1769	2017-07-07	0.805579645	0.805579645
## 1774	2017-07-14	0.845016251	0.845016251
## 1782	2017-07-26	0.888542755	0.888542755
## 1788	2017-08-03	0.897318513	0.897318513
## 1789	2017-08-04	0.923916631	0.923916631
## 1793	2017-08-10	0.919826679	0.919826679
## 1794	2017-08-11	0.926516752	0.926516752
## 1795	2017-08-14	0.942578575	0.942578575
## 1802	2017-08-23	0.912703155	0.912703155
## 1805	2017-08-28	0.893445341	0.893445341
## 1807	2017-08-30	0.913813678	0.913813678
## 1813	2017-09-08	0.887323944	0.887323944
## 1814	2017-09-11	0.942280593	0.942280593
## 1817	2017-09-14	0.980065005	0.980065005
## 1819	2017-09-18	1.000000000	1.000000000
## 1821	2017-09-20	0.969962053	0.969962053
## 1838	2017-10-13	0.920287080	0.920287080
## 1846	2017-10-25	0.839761633	0.839761633
## 1864	2017-11-20	0.793445301	0.793445301
## 1871	2017-11-30	0.793743229	0.793743229
## 1881	2017-12-14	0.872399824	0.872399824
## 1887	2017-12-22	0.838028183	0.838028183
## 1888	2017-12-26	0.816603467	0.816603467
## 1891	2017-12-29	0.800514626	0.800514626
## 1900	2018-01-12	0.867876530	0.867876530
## 1901	2018-01-16	0.878277370	0.878277370
## 1903	2018-01-18	0.890492971	0.890492971
## 1905	2018-01-22	0.909425731	0.909425731
## 1912	2018-01-31	0.916874323	0.916874323
## 1916	2018-02-06	0.861782218	0.861782218
## 1923	2018-02-15	0.862053128	0.862053128
## 1927	2018-02-22	0.894826666	0.894826666
## 1931	2018-02-28	0.886403034	0.886403034
## 1942	2018-03-15	0.839111633	0.839111633

```
## 1952 2018-03-29 0.678033613 0.678033613
## 1955 2018-04-04 0.734398700 0.734398700
## 1957 2018-04-06 0.767876503 0.767876503
## 1958 2018-04-09 0.741765967 0.741765967
## 1965 2018-04-18 0.751760536 0.751760536
## 1969 2018-04-24 0.724972928 0.724972928
## 1974 2018-05-01 0.769555810 0.769555810
## 1976 2018-05-03 0.727654374 0.727654374
## 1990 2018-05-23 0.713082327 0.713082327
## 1991 2018-05-24 0.709777898 0.709777898
## 1993 2018-05-29 0.725785469 0.725785469
## 1996 2018-06-01 0.747616441 0.747616441
```

```
ggplot(output_df, aes(x = Actual_Close, y = Predicted_Close)) +
  geom_point(aes(color = "Actual"), alpha = 0.5) + # Actual points with blue
color and transparency
  geom_point(aes(color = "Predicted"), alpha = 0.5) + # Predicted points with
red color and transparency
  geom_abline(intercept = 0, slope = 1, color = "yellow", linetype =
"dashed") +
  labs(title = "Actual vs. Predicted Close Prices", x = "Actual Close Price",
y = "Predicted Close Price") +
  scale_color_manual(values = c("Actual" = "green", "Predicted" = "red")) +
  theme_minimal()
```



Hardik Jain Code performed for the Random Forest for all data

RANDOM FOREST MODEL

```
#Load the required libraries
install.packages('caret')

## Installing package into '/cloud/lib/x86_64-pc-linux-gnu-library/4.3'
## (as 'lib' is unspecified)

library(caret)
install.packages('randomForest')

## Installing package into '/cloud/lib/x86_64-pc-linux-gnu-library/4.3'
## (as 'lib' is unspecified)

library(randomForest)

## randomForest 4.7-1.1

## Type rfNews() to see new features/changes/bug fixes.

##
## Attaching package: 'randomForest'

## The following object is masked from 'package:ggplot2':
##
##     margin

## The following object is masked from 'package:dplyr':
##
##     combine

#Load the dataset file
df <- read.csv('TESLA-PREP.csv')

# Split the data into training and testing sets for reproducibility
set.seed(123)
train_index <- createDataPartition(df$Close, p = 0.9, list = FALSE)
train_data <- df[train_index, ]
test_data <- df[-train_index, ]

# Create the Random Forest model
model <- randomForest(Close ~ Open + High + Low + Adj_Close + Volume, data =
train_data)

# Make predictions on the test data
predictions <- predict(model, newdata = test_data)

# Calculate the Mean Squared Error and R-squared for model evaluation
mse <- mean((test_data$Close - predictions)^2)
r_squared <- cor(test_data$Close, predictions)^2
```

```

cat("Mean Squared Error:", mse, "\n")

## Mean Squared Error: 1.828369e-05

cat("R-squared:", r_squared, "\n")

## R-squared: 0.9997919

# Now, Let's predict the future 'Close' using the model
future_features <- data.frame(Open = c(200), High = c(220), Low = c(190),
Adj_Close = c(210), Volume = c(150000))
future_close <- predict(model, newdata = future_features)
cat("Predicted Future Close:", future_close, "\n")

## Predicted Future Close: 0.8890798

output_df <- data.frame(Date = test_data$Date, Actual_Close =
test_data$Close, Predicted_Close = predictions)
print(output_df)

##           Date Actual_Close Predicted_Close
## 1    2010-06-29    0.02191224    0.02009106
## 15   2010-07-20    0.01218852    0.01405442
## 17   2010-07-22    0.01408451    0.01362916
## 44   2010-08-30    0.01102384    0.01067788
## 49   2010-09-07    0.01283857    0.01314620
## 58   2010-09-20    0.01424702    0.01331576
## 62   2010-09-24    0.01164680    0.01110203
## 65   2010-09-29    0.01673889    0.01614452
## 71   2010-10-07    0.01254063    0.01259312
## 99   2010-11-16    0.03756771    0.03804723
## 103  2010-11-22    0.04767064    0.04604758
## 105  2010-11-24    0.05327736    0.05221951
## 109  2010-12-01    0.05024377    0.05202615
## 124  2010-12-22    0.04558505    0.04517117
## 136  2011-01-10    0.03426327    0.03402545
## 138  2011-01-12    0.03022752    0.03022624
## 144  2011-01-21    0.01960997    0.01950279
## 145  2011-01-24    0.02353738    0.02290676
## 150  2011-01-31    0.02248104    0.02214267
## 151  2011-02-01    0.02196641    0.02255492
## 154  2011-02-04    0.02074756    0.02092609
## 168  2011-02-25    0.02115385    0.02043885
## 200  2011-04-12    0.02397075    0.02443984
## 216  2011-05-05    0.02881907    0.02979470
## 220  2011-05-11    0.03052546    0.03145861
## 240  2011-06-09    0.03201517    0.03186129
## 246  2011-06-17    0.02898158    0.02985095
## 253  2011-06-28    0.03334236    0.03324844
## 283  2011-08-10    0.02172264    0.02335521
## 288  2011-08-17    0.02716685    0.02759986

```

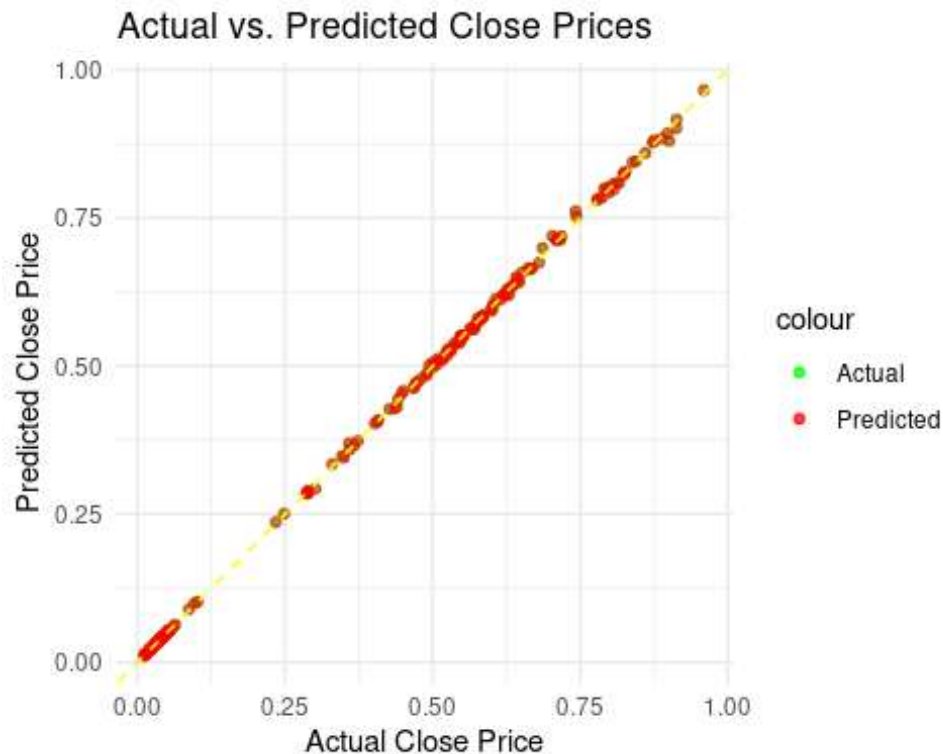
## 297	2011-08-30	0.02391658	0.02233211
## 313	2011-09-22	0.02662514	0.02645621
## 326	2011-10-11	0.03198808	0.03187633
## 331	2011-10-18	0.03396533	0.03299979
## 360	2011-11-29	0.04320152	0.04438281
## 369	2011-12-12	0.03957205	0.03947858
## 413	2012-02-15	0.04821235	0.04825824
## 432	2012-03-14	0.05278982	0.05299608
## 447	2012-04-04	0.05200433	0.05160786
## 451	2012-04-11	0.04683099	0.04612322
## 474	2012-05-14	0.03862405	0.04056107
## 482	2012-05-24	0.03921993	0.03989328
## 487	2012-06-01	0.03345070	0.03372767
## 488	2012-06-04	0.03271939	0.03256525
## 496	2012-06-14	0.03680932	0.03721523
## 498	2012-06-18	0.04344529	0.04189366
## 508	2012-07-02	0.03954496	0.04047554
## 512	2012-07-09	0.04249729	0.04216694
## 517	2012-07-16	0.05460455	0.05262201
## 533	2012-08-07	0.03913868	0.03787439
## 534	2012-08-08	0.03599675	0.03600832
## 563	2012-09-19	0.04130553	0.04167454
## 567	2012-09-25	0.03212351	0.03311297
## 571	2012-10-01	0.03618635	0.03655752
## 572	2012-10-02	0.03791983	0.03759494
## 586	2012-10-22	0.03263814	0.03234369
## 592	2012-11-01	0.03643012	0.03605818
## 593	2012-11-02	0.03553629	0.03571764
## 602	2012-11-15	0.04068256	0.04129003
## 606	2012-11-21	0.04515168	0.04577782
## 620	2012-12-12	0.05270856	0.05306085
## 628	2012-12-24	0.05005417	0.04893816
## 646	2013-01-22	0.05251896	0.05208185
## 656	2013-02-05	0.06048212	0.06043589
## 659	2013-02-08	0.06348862	0.06298841
## 672	2013-02-28	0.05154388	0.05278682
## 685	2013-03-19	0.05222102	0.05244624
## 707	2013-04-19	0.08675515	0.08901767
## 712	2013-04-26	0.09588299	0.09892814
## 715	2013-05-01	0.10151679	0.10166022
## 747	2013-06-17	0.23401952	0.23640323
## 756	2013-06-28	0.24799567	0.25059558
## 761	2013-07-08	0.28659265	0.28577212
## 763	2013-07-10	0.28838028	0.28498952
## 771	2013-07-22	0.28881365	0.28934958
## 781	2013-08-05	0.34907910	0.34537187
## 784	2013-08-08	0.37291440	0.37340912
## 796	2013-08-26	0.40200436	0.40264813
## 809	2013-09-13	0.40557966	0.40520820
## 812	2013-09-18	0.40742144	0.40821813

## 813	2013-09-19	0.43911159	0.43113807
## 822	2013-10-02	0.44731851	0.45340452
## 823	2013-10-03	0.42662512	0.42724173
## 858	2013-11-21	0.28791983	0.28635141
## 859	2013-11-22	0.28596965	0.28424215
## 862	2013-11-27	0.30102925	0.29228424
## 868	2013-12-06	0.32925244	0.33412805
## 879	2013-12-23	0.34601840	0.34773364
## 897	2014-01-21	0.43575297	0.42824318
## 907	2014-02-04	0.44130550	0.44413547
## 920	2014-02-24	0.54672263	0.54180333
## 921	2014-02-25	0.62892738	0.61935007
## 923	2014-02-27	0.64122426	0.64990403
## 955	2014-04-14	0.49374323	0.50122022
## 976	2014-05-14	0.47351031	0.47271235
## 986	2014-05-29	0.52665222	0.52691693
## 995	2014-06-11	0.51102385	0.50835979
## 999	2014-06-17	0.58469664	0.58173174
## 1003	2014-06-23	0.59972914	0.59280959
## 1013	2014-07-08	0.55056878	0.55047729
## 1016	2014-07-11	0.54802274	0.54882908
## 1047	2014-08-25	0.66833692	0.66485822
## 1069	2014-09-25	0.62608341	0.62959173
## 1071	2014-09-29	0.62150593	0.62191294
## 1084	2014-10-16	0.57028711	0.56811647
## 1111	2014-11-24	0.62546048	0.62357076
## 1117	2014-12-03	0.57827737	0.57655061
## 1118	2014-12-04	0.57551460	0.57821924
## 1129	2014-12-19	0.55116471	0.55013247
## 1147	2015-01-16	0.48014624	0.47804589
## 1149	2015-01-21	0.48962621	0.48474559
## 1156	2015-01-30	0.50866740	0.51217466
## 1169	2015-02-19	0.53063379	0.52467218
## 1170	2015-02-20	0.54526004	0.54120980
## 1178	2015-03-04	0.50552545	0.50167198
## 1205	2015-04-13	0.52540630	0.52726553
## 1215	2015-04-27	0.58437163	0.58322402
## 1220	2015-05-04	0.58155473	0.58121286
## 1232	2015-05-20	0.61904116	0.61971384
## 1262	2015-07-02	0.71565550	0.71298881
## 1278	2015-07-27	0.64249730	0.64723098
## 1281	2015-07-30	0.67982126	0.67438583
## 1283	2015-08-03	0.66140305	0.66501496
## 1287	2015-08-07	0.61405741	0.61145674
## 1289	2015-08-11	0.60013541	0.59848645
## 1300	2015-08-26	0.56619717	0.56095596
## 1303	2015-08-31	0.63179848	0.63196007
## 1312	2015-09-14	0.64298483	0.64094523
## 1318	2015-09-22	0.66397616	0.66273573
## 1325	2015-10-01	0.60693394	0.61323583

## 1329	2015-10-07	0.58548210	0.58626665
## 1334	2015-10-14	0.54463704	0.54646174
## 1358	2015-11-17	0.53683639	0.53836006
## 1363	2015-11-24	0.54834781	0.55031992
## 1367	2015-12-01	0.59964789	0.59589473
## 1374	2015-12-10	0.57223728	0.56755466
## 1387	2015-12-30	0.60208559	0.60470638
## 1395	2016-01-12	0.52592090	0.52571408
## 1397	2016-01-14	0.51565547	0.50997565
## 1413	2016-02-08	0.35804442	0.36974843
## 1414	2016-02-09	0.35874865	0.35858477
## 1417	2016-02-12	0.36630553	0.36571366
## 1429	2016-03-02	0.46733476	0.46293548
## 1460	2016-04-15	0.64656013	0.64205131
## 1488	2016-05-25	0.55195016	0.55062530
## 1498	2016-06-09	0.57843990	0.58144935
## 1500	2016-06-13	0.54731854	0.55155541
## 1513	2016-06-30	0.53217770	0.53205008
## 1514	2016-07-01	0.54360779	0.53795195
## 1519	2016-07-11	0.56603468	0.56243034
## 1524	2016-07-18	0.57001625	0.56243940
## 1529	2016-07-25	0.58020042	0.57853826
## 1545	2016-08-16	0.56286566	0.56287167
## 1576	2016-09-29	0.50081255	0.50660337
## 1586	2016-10-13	0.49956663	0.49755458
## 1611	2016-11-17	0.46820149	0.46386628
## 1616	2016-11-25	0.48984293	0.48758927
## 1619	2016-11-30	0.47020586	0.46994937
## 1620	2016-12-01	0.44983747	0.45803395
## 1633	2016-12-20	0.52272480	0.51578432
## 1635	2016-12-22	0.52180389	0.52076015
## 1653	2017-01-20	0.62007041	0.61867811
## 1654	2017-01-23	0.63141928	0.63177953
## 1659	2017-01-30	0.63605091	0.63694948
## 1672	2017-02-16	0.68567174	0.69899319
## 1674	2017-02-21	0.70853197	0.71239517
## 1676	2017-02-23	0.65056882	0.65760514
## 1701	2017-03-30	0.70996750	0.71425209
## 1702	2017-03-31	0.71099675	0.71506151
## 1736	2017-05-19	0.79910618	0.80177916
## 1739	2017-05-24	0.79745394	0.79259419
## 1740	2017-05-25	0.81535754	0.80880235
## 1756	2017-06-19	0.95882989	0.96566586
## 1777	2017-07-19	0.83819071	0.84366477
## 1786	2017-08-01	0.82277900	0.82530491
## 1802	2017-08-23	0.91270316	0.90180329
## 1830	2017-10-03	0.90016249	0.87966380
## 1848	2017-10-27	0.82630016	0.82785615
## 1849	2017-10-30	0.82416033	0.82300575
## 1855	2017-11-07	0.78615925	0.78393748


```
## 1858 2017-11-10    0.77787107    0.78063939
## 1860 2017-11-14    0.79333697    0.79906851
## 1870 2017-11-29    0.79019500    0.79914008
## 1874 2017-12-05    0.77979418    0.78169637
## 1875 2017-12-06    0.80568797    0.79746042
## 1881 2017-12-14    0.87239982    0.87756830
## 1882 2017-12-15    0.88745940    0.88386087
## 1883 2017-12-18    0.87505420    0.88074295
## 1890 2017-12-28    0.81137593    0.80843716
## 1902 2018-01-17    0.89750811    0.89257988
## 1906 2018-01-23    0.91275730    0.91609037
## 1934 2018-03-05    0.86010290    0.85963749
## 1938 2018-03-09    0.84336400    0.84536134
## 1944 2018-03-19    0.80650057    0.80736544
## 1958 2018-04-09    0.74176597    0.76122604
## 1967 2018-04-20    0.74333694    0.75258594
## 1970 2018-04-25    0.71747021    0.71872906
## 1989 2018-05-22    0.70208558    0.71941984
## 1992 2018-05-25    0.71248646    0.71330620
```

```
ggplot(output_df, aes(x = Actual_Close, y = Predicted_Close)) +
  geom_point(aes(color = "Actual"), alpha = 0.5) + # Actual points with blue
color and transparency
  geom_point(aes(color = "Predicted"), alpha = 0.5) + # Predicted points with
red color and transparency
  geom_abline(intercept = 0, slope = 1, color = "yellow", linetype =
"dashed") +
  labs(title = "Actual vs. Predicted Close Prices", x = "Actual Close Price",
y = "Predicted Close Price") +
  scale_color_manual(values = c("Actual" = "green", "Predicted" = "red")) +
  theme_minimal()
```



Sairaj Salvi Code performed for the Long Short-Term Memory (LSTM) for all data

LONG SHORT-TERM MEMORY (LSTM):-

```
install.packages('tidyverse')
library(tidyverse)
install.packages('keras')
library(keras)

# Load and preprocess the data
df <- read.csv('TESLA.csv')

# Remove non-numeric columns
numeric_columns <- sapply(df, is.numeric)
df_numeric <- df[, numeric_columns]

# Check for missing values and replace them
```

```

df_numeric[is.na(df_numeric)] <- 0 # Replace missing values with 0

# Normalize the data
normalize <- function(x) {
  return((x - min(x)) / (max(x) - min(x)))
}

df_normalized <- as.data.frame(lapply(df_numeric, normalize))

# Prepare sequences for LSTM
sequence_length <- 10 # You can adjust this based on your preference
sequences <- matrix(0, nrow = nrow(df_normalized) - sequence_length + 1, ncol
= sequence_length, byrow = TRUE)
for (i in 1:(nrow(df_normalized) - sequence_length + 1)) {
  sequences[i, ] <- df_normalized$Close[i:(i + sequence_length - 1)]
}
targets <- df_normalized$Close[(sequence_length):(nrow(df_normalized))]

# Create LSTM model
model <- keras_model_sequential()
model %>%
  layer_lstm(units = 50, input_shape = c(sequence_length, 1)) %>%
  layer_dense(units = 1)

# Compile the model
model %>% compile(

```

```

    loss = 'mean_squared_error',
    optimizer = optimizer_adam(),
    metrics = c('mean_absolute_error')
)

# Train the model
X <- array_reshape(sequences, c(dim(sequences), 1))
history <- model %>% fit(
  x = X,
  y = targets,
  batch_size = 32,
  epochs = 100,
  validation_split = 0.1
)

# Make predictions on the entire dataset
all_sequences <- matrix(0, nrow = nrow(df_normalized) - sequence_length + 1,
  ncol = sequence_length, byrow = TRUE)
for (i in 1:(nrow(df_normalized) - sequence_length + 1)) {
  all_sequences[i, ] <- df_normalized$Close[i:(i + sequence_length - 1)]
}
all_X <- array_reshape(all_sequences, c(dim(all_sequences), 1))
predictions <- model %>% predict(all_X)

# Inverse normalize predictions
predictions <- predictions * (max(df$Close) - min(df$Close)) + min(df$Close)

# Calculate Mean Squared Error
mse <- mean((df$Close[(sequence_length):(nrow(df))]] - predictions)^2)

```

```

cat("Mean Squared Error:", mse, "\n")
# Calculate R-squared value
actual_values <- df$Close[(sequence_length):(nrow(df))]
r_squared <- (cor(actual_values, predictions))^2
cat("R-squared:", r_squared, "\n")

# Calculate accuracy in percentage
accuracy <- sum(sign(predictions - df$Close[(sequence_length):(nrow(df))]) ==
0) / length(predictions) * 100
cat("Accuracy:", accuracy, "%\n")

# Print the predictions

# Print the predictions
output_df <- data.frame(Date = df$Date[(sequence_length):(nrow(df))],
Actual_Close = df$Close[(sequence_length):(nrow(df))], Predicted_Close =
predictions)
print(output_df)
ggplot(output_df, aes(x = Actual_Close, y = Predicted_Close)) +
  geom_point(aes(color = "Actual"), alpha = 0.5) + # Actual points with blue
color and transparency
  geom_point(aes(color = "Predicted"), alpha = 0.5) + # Predicted points with
red color and transparency
  geom_abline(intercept = 0, slope = 1, color = "yellow", linetype =
"dashed") +
  labs(title = "Actual vs. Predicted Close Prices", x = "Actual Close Price",
y = "Predicted Close Price") +
  scale_color_manual(values = c("Actual" = "green", "Predicted" = "red")) +
  theme_minimal()

Mean Squared Error: 6.115383e-06

R-squared: 0.9999346

```

	Date	Actual_Close	Predicted_Close
1	2010-07-13	0.006338028	0.004441486
2	2010-07-14	0.010942579	0.007512582
3	2010-07-15	0.011078007	0.009306134
4	2010-07-16	0.013109426	0.011193778
5	2010-07-19	0.016549296	0.013827523
6	2010-07-20	0.012188516	0.013085298
7	2010-07-21	0.011971831	0.012390031
8	2010-07-22	0.014084507	0.012966160
9	2010-07-23	0.014869989	0.013700885
10	2010-07-26	0.013949079	0.013674127
11	2010-07-27	0.012865655	0.013098738
12	2010-07-28	0.013326111	0.012975857
13	2010-07-29	0.012323944	0.012426284
14	2010-07-30	0.011213434	0.011578152
15	2010-08-02	0.013867822	0.012416726
16	2010-08-03	0.016657638	0.014321290
17	2010-08-04	0.014788732	0.014498687
18	2010-08-05	0.012594800	0.013443751
19	2010-08-06	0.010265439	0.011633656
20	2010-08-09	0.010292524	0.010615744
21	2010-08-10	0.008748646	0.009349599
22	2010-08-11	0.005687974	0.007204016
23	2010-08-12	0.004875406	0.005655142
24	2010-08-13	0.006825569	0.005830515
25	2010-08-16	0.008071506	0.006656304
26	2010-08-17	0.009073673	0.007672447
27	2010-08-18	0.008044420	0.007744683

28	2010-08-19	0.008098592	0.007760233
29	2010-08-20	0.008938245	0.008143952
30	2010-08-23	0.011728061	0.009712753
31	2010-08-24	0.009209101	0.009374014
32	2010-08-25	0.0111105092	0.010042599
33	2010-08-26	0.010698808	0.010207214
34	2010-08-27	0.010563380	0.010206698
35	2010-08-30	0.011023835	0.010409336
36	2010-08-31	0.009967497	0.009999305
37	2010-09-01	0.012594800	0.011040769
38	2010-09-02	0.014247021	0.012466289
39	2010-09-03	0.014219935	0.013251560
40	2010-09-07	0.012838570	0.012954854
41	2010-09-08	0.013813651	0.013195944
42	2010-09-09	0.013299025	0.013057957
43	2010-09-10	0.011836403	0.012246260
44	2010-09-13	0.013326111	0.012510275
45	2010-09-14	0.014409534	0.013226944
46	2010-09-15	0.016738895	0.014802274
47	2010-09-16	0.013921993	0.014300160
48	2010-09-17	0.011998917	0.012991814
49	2010-09-20	0.014247021	0.013317753
50	2010-09-21	0.013461538	0.013159330
51	2010-09-22	0.011023835	0.011886541
52	2010-09-23	0.010184182	0.010751609
53	2010-09-24	0.011646804	0.010866279
54	2010-09-27	0.012811484	0.011574711
55	2010-09-28	0.015167931	0.013175720

56	2010-09-29	0.016738895	0.014857779
57	2010-09-30	0.012486457	0.013665957
58	2010-10-01	0.013001083	0.013131595
59	2010-10-04	0.014057421	0.013326067
60	2010-10-05	0.014409534	0.013635640
61	2010-10-06	0.012621885	0.012947094
62	2010-10-07	0.012540628	0.012506018
63	2010-10-08	0.012540628	0.012271096
64	2010-10-11	0.012026002	0.011911319
65	2010-10-12	0.012026002	0.011725233
66	2010-10-13	0.012838570	0.012037334
67	2010-10-14	0.013407367	0.012517465
68	2010-10-15	0.012838570	0.012513133
69	2010-10-18	0.011998917	0.012075701
70	2010-10-19	0.011511376	0.011568821
71	2010-10-20	0.013136511	0.012084561
72	2010-10-21	0.013407367	0.012541686
73	2010-10-22	0.013326111	0.012763573
74	2010-10-25	0.013678223	0.013044020
75	2010-10-26	0.015059588	0.013865371
76	2010-10-27	0.014084507	0.013838780
77	2010-10-28	0.014599133	0.014037369
78	2010-10-29	0.016359697	0.014998019
79	2010-11-01	0.015195016	0.014964361
80	2010-11-02	0.014761647	0.014693194
81	2010-11-03	0.016170098	0.015209014
82	2010-11-04	0.024647887	0.019700576
83	2010-11-05	0.023401950	0.021659655

84	2010-11-08	0.024864572	0.023348203
85	2010-11-09	0.023916576	0.023668358
86	2010-11-10	0.036728061	0.030111725
87	2010-11-11	0.033152763	0.031925250
88	2010-11-12	0.038028169	0.035159249
89	2010-11-15	0.040628386	0.038097072
90	2010-11-16	0.037567714	0.037995588
91	2010-11-17	0.037080173	0.037484631
92	2010-11-18	0.038163597	0.037648086
93	2010-11-19	0.041143012	0.039248265
94	2010-11-22	0.047670639	0.043490540
95	2010-11-23	0.050839653	0.047451586
96	2010-11-24	0.053277356	0.050731659
97	2010-11-26	0.052871073	0.052100658
98	2010-11-29	0.050189599	0.051219352
99	2010-11-30	0.052898158	0.051967047
100	2010-12-01	0.050243770	0.050960734
101	2010-12-02	0.044826652	0.047573261
102	2010-12-03	0.042497291	0.044538431
103	2010-12-06	0.039301192	0.041362226
104	2010-12-07	0.042686891	0.041547995
105	2010-12-08	0.044880823	0.042984359
106	2010-12-09	0.044014085	0.043426011
107	2010-12-10	0.042578548	0.042913385
108	2010-12-13	0.039951246	0.041239101
109	2010-12-14	0.034479957	0.037495863
110	2010-12-15	0.037378115	0.036961198
111	2010-12-16	0.040655471	0.038503740

112	2010-12-17	0.042145179	0.040243331
113	2010-12-20	0.043066089	0.041687191
114	2010-12-21	0.044582882	0.043190889
115	2010-12-22	0.045585049	0.044439238
116	2010-12-23	0.038705309	0.041489925
117	2010-12-27	0.026408451	0.033473104
118	2010-12-28	0.028737811	0.030273845
119	2010-12-29	0.032313109	0.030630006
120	2010-12-30	0.028981582	0.029446490
121	2010-12-31	0.029333694	0.029101191
122	2011-01-03	0.029306609	0.028976263
123	2011-01-04	0.029442037	0.029017534
124	2011-01-05	0.029875406	0.029272394
125	2011-01-06	0.032719393	0.030845786
126	2011-01-07	0.033694475	0.032213651
127	2011-01-10	0.034263272	0.033221409
128	2011-01-11	0.030227519	0.031663060
129	2011-01-12	0.030227519	0.030703532
130	2011-01-13	0.028223185	0.029165937
131	2011-01-14	0.026950163	0.027713468
132	2011-01-18	0.026652221	0.026831284
133	2011-01-19	0.022291441	0.024239361
134	2011-01-20	0.018472373	0.020945778
135	2011-01-21	0.019609967	0.019777184
136	2011-01-24	0.023537378	0.021252729
137	2011-01-25	0.024052004	0.022481756
138	2011-01-26	0.024241603	0.023288265
139	2011-01-27	0.024702059	0.023919903

140	2011-01-28	0.022237270	0.022980794
141	2011-01-31	0.022481040	0.022509765
142	2011-02-01	0.021966414	0.021986023
143	2011-02-02	0.022047671	0.021757510
144	2011-02-03	0.021208017	0.021248620
145	2011-02-04	0.020747562	0.020759275
146	2011-02-07	0.019691224	0.019982638
147	2011-02-08	0.023537378	0.021486988
148	2011-02-09	0.020070423	0.020658705
149	2011-02-10	0.020097508	0.020170279
150	2011-02-11	0.020178765	0.019934939
151	2011-02-14	0.019718310	0.019594952
152	2011-02-15	0.019068256	0.019099670
153	2011-02-16	0.024187432	0.021385366
154	2011-02-17	0.021126761	0.021196820
155	2011-02-18	0.019989166	0.020460630
156	2011-02-22	0.016440953	0.018237520
157	2011-02-23	0.016332611	0.016922185
158	2011-02-24	0.018228602	0.017198598
159	2011-02-25	0.021153846	0.018910237
160	2011-02-28	0.021912243	0.020311570
161	2011-03-01	0.022047671	0.021136658
162	2011-03-02	0.022264355	0.021632856
163	2011-03-03	0.023185265	0.022292817
164	2011-03-04	0.024783315	0.023410568
165	2011-03-07	0.024756230	0.023988092
166	2011-03-08	0.023997833	0.023881568
167	2011-03-09	0.024160347	0.023853244

168	2011-03-10	0.022237270	0.022857402
169	2011-03-11	0.022399783	0.022367137
170	2011-03-14	0.020178765	0.021013863
171	2011-03-15	0.019366197	0.019879945
172	2011-03-16	0.019014085	0.019126758
173	2011-03-17	0.018986999	0.018760804
174	2011-03-18	0.019393283	0.018817725
175	2011-03-21	0.018770314	0.018582495
176	2011-03-22	0.017307692	0.017737273
177	2011-03-23	0.017361863	0.017291045
178	2011-03-24	0.017686891	0.017230185
179	2011-03-25	0.018824485	0.017793164
180	2011-03-28	0.020178765	0.018807720
181	2011-03-29	0.021993499	0.020279311
182	2011-03-30	0.021424702	0.020794446
183	2011-03-31	0.032367281	0.026465422
184	2011-04-01	0.029414951	0.028174167
185	2011-04-04	0.027166847	0.027796453
186	2011-04-05	0.029523294	0.028565831
187	2011-04-06	0.028954496	0.028639752
188	2011-04-07	0.030985915	0.029656807
189	2011-04-08	0.028954496	0.029190196
190	2011-04-11	0.025650054	0.027225124
191	2011-04-12	0.023970748	0.025267074
192	2011-04-13	0.024729144	0.024615383
193	2011-04-14	0.025297941	0.024638344
194	2011-04-15	0.026489707	0.025333239
195	2011-04-18	0.025000000	0.025019228

196	2011-04-19	0.025352113	0.025005022
197	2011-04-20	0.026950163	0.025794318
198	2011-04-21	0.029631636	0.027584320
199	2011-04-25	0.028683640	0.028095076
200	2011-04-26	0.030146262	0.029042456
201	2011-04-27	0.030552546	0.029720904
202	2011-04-28	0.032123510	0.030835148
203	2011-04-29	0.031960997	0.031329028
204	2011-05-02	0.031554713	0.031338282
205	2011-05-03	0.029983749	0.030501911
206	2011-05-04	0.029496208	0.029763635
207	2011-05-05	0.028819068	0.029028375
208	2011-05-06	0.030660888	0.029585211
209	2011-05-09	0.032800650	0.031031106
210	2011-05-10	0.033938245	0.032429565
211	2011-05-11	0.030525460	0.031438962
212	2011-05-12	0.032150596	0.031618915
213	2011-05-13	0.031825569	0.031542100
214	2011-05-16	0.029252438	0.030196074
215	2011-05-17	0.027518960	0.028567551
216	2011-05-18	0.028575298	0.028233377
217	2011-05-19	0.033586132	0.030663557
218	2011-05-20	0.032963164	0.031780977
219	2011-05-23	0.029848321	0.030777613
220	2011-05-24	0.029577465	0.029989313
221	2011-05-25	0.035698808	0.032628302
222	2011-05-26	0.037053088	0.034833383
223	2011-05-27	0.037242687	0.036102466

224	2011-05-31	0.038840737	0.037505168
225	2011-06-01	0.034452871	0.035950266
226	2011-06-02	0.035102925	0.035308398
227	2011-06-03	0.038813651	0.036836930
228	2011-06-06	0.034940412	0.035760805
229	2011-06-07	0.034046587	0.034681525
230	2011-06-08	0.030660888	0.032375716
231	2011-06-09	0.032015168	0.031823285
232	2011-06-10	0.032665222	0.031949405
233	2011-06-13	0.034209101	0.032883435
234	2011-06-14	0.034669556	0.033670440
235	2011-06-15	0.031202600	0.032333292
236	2011-06-16	0.028981582	0.030412672
237	2011-06-17	0.028981582	0.029348748
238	2011-06-20	0.027654388	0.028163657
239	2011-06-21	0.031771398	0.029661549
240	2011-06-22	0.030904659	0.030155586
241	2011-06-23	0.032258938	0.031110801
242	2011-06-24	0.031879740	0.031420916
243	2011-06-27	0.031581798	0.031388152
244	2011-06-28	0.033342362	0.032215223
245	2011-06-29	0.033829902	0.032910503
246	2011-06-30	0.036105092	0.034423519
247	2011-07-01	0.035807151	0.035082564
248	2011-07-05	0.036132178	0.035546921
249	2011-07-06	0.035644637	0.035493761
250	2011-07-07	0.037730228	0.036479060
251	2011-07-08	0.035238353	0.035744444

252	2011-07-11	0.033992416	0.034662165
253	2011-07-12	0.033504875	0.033813436
254	2011-07-13	0.034777898	0.034030959
255	2011-07-14	0.031988082	0.032793920
256	2011-07-15	0.031906826	0.032082465
257	2011-07-18	0.030958830	0.031251281
258	2011-07-19	0.032746479	0.031742748
259	2011-07-20	0.034913326	0.033171207
260	2011-07-21	0.034940412	0.033995345
261	2011-07-22	0.036538462	0.035219710
262	2011-07-25	0.034371614	0.034744389
263	2011-07-26	0.033044420	0.033729400
264	2011-07-27	0.032069339	0.032640465
265	2011-07-28	0.033504875	0.032789614
266	2011-07-29	0.033504875	0.032935120
267	2011-08-01	0.035130011	0.033874236
268	2011-08-02	0.031256771	0.032442119
269	2011-08-03	0.030877573	0.031413808
270	2011-08-04	0.024241603	0.027507609
271	2011-08-05	0.022860238	0.024676442
272	2011-08-08	0.021235103	0.022430448
273	2011-08-09	0.025081257	0.023286562
274	2011-08-10	0.021722644	0.022264466
275	2011-08-11	0.025731311	0.023749983
276	2011-08-12	0.028466956	0.026006024
277	2011-08-15	0.028250271	0.027143436
278	2011-08-16	0.027898158	0.027505463
279	2011-08-17	0.027166847	0.027236633

280	2011-08-18	0.022914410	0.024890002
281	2011-08-19	0.017605634	0.020891124
282	2011-08-22	0.016657638	0.018234869
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288	2011-08-30	0.023916576	0.022984661
289	2011-08-31	0.024214518	0.023526128
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291	2011-09-02	0.019691224	0.021010805
292	2011-09-06	0.019339112	0.019845732
293	2011-09-07	0.021776815	0.020465795
294	2011-09-08	0.021153846	0.020593582
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297	2011-09-13	0.022426869	0.020589858
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312	2011-10-04	0.021289274	0.021329973
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647	2013-02-05	0.060482124	0.059919223
648	2013-02-06	0.063299025	0.061606467
649	2013-02-07	0.064138678	0.062950209
650	2013-02-08	0.063488624	0.063268930
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655	2013-02-15	0.057529794	0.058868244
656	2013-02-19	0.063596966	0.061116144
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659	2013-02-22	0.055010834	0.055355102
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1684	2017-03-20	0.666630539	0.665966451
1685	2017-03-21	0.636186376	0.638770521
1686	2017-03-22	0.647914396	0.644064784
1687	2017-03-23	0.647291454	0.647575617
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1689	2017-03-27	0.689111579	0.689107895
1690	2017-03-28	0.708694502	0.708489835
1691	2017-03-29	0.708504902	0.709632397
1692	2017-03-30	0.709967497	0.708946943
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1695	2017-04-04	0.779794177	0.781885266
1696	2017-04-05	0.756229686	0.758764148
1697	2017-04-06	0.766251381	0.761855781
1698	2017-04-07	0.776652207	0.774821758
1699	2017-04-10	0.803331541	0.801737964
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1704	2017-04-18	0.770449607	0.771404028
1705	2017-04-19	0.784723727	0.784024119
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1714	2017-05-02	0.820937161	0.823715210
1715	2017-05-03	0.799620788	0.799927294
1716	2017-05-04	0.757475609	0.758206189
1717	2017-05-05	0.792388922	0.787587583
1718	2017-05-08	0.789247021	0.793744981
1719	2017-05-09	0.827356433	0.826863647
1720	2017-05-10	0.838082327	0.840861499
1721	2017-05-11	0.832340236	0.833584666
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1732	2017-05-26	0.837865655	0.838845909
1733	2017-05-30	0.864842863	0.864983439
1734	2017-05-31	0.880850528	0.881166577
1735	2017-06-01	0.879116969	0.878980398

1736	2017-06-02	0.877708573	0.875880480
1737	2017-06-05	0.897941454	0.895462394
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1739	2017-06-07	0.931338028	0.931317508
1740	2017-06-08	0.959371614	0.958784640
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1742	2017-06-12	0.929604577	0.925935030
1743	2017-06-13	0.975487568	0.973885834
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1765	2017-07-14	0.845016251	0.843312740
1766	2017-07-17	0.822778995	0.825118423
1767	2017-07-18	0.846262229	0.843848288
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1775	2017-07-28	0.864761647	0.862773180
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1791	2017-08-21	0.872318513	0.874925137

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1795	2017-08-25	0.899918757	0.901847720
1796	2017-08-28	0.893445341	0.893235385
1797	2017-08-29	0.898049837	0.898423493
1798	2017-08-30	0.913813678	0.914982140
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1802	2017-09-06	0.890384588	0.890591741
1803	2017-09-07	0.906852681	0.906562507
1804	2017-09-08	0.887323944	0.891435206
1805	2017-09-11	0.942280593	0.940200388
1806	2017-09-12	0.939734602	0.945172250
1807	2017-09-13	0.949160374	0.949179590
1808	2017-09-14	0.980065005	0.978878975
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1810	2017-09-18	1.000000000	0.999174416
1811	2017-09-19	0.973185225	0.974146426
1812	2017-09-20	0.969962053	0.967901409
1813	2017-09-21	0.949837459	0.951379597
1814	2017-09-22	0.908152790	0.910669148
1815	2017-09-25	0.891630566	0.892448783
1816	2017-09-26	0.892334819	0.895523727
1817	2017-09-27	0.880742145	0.886191785
1818	2017-09-28	0.877031392	0.880416393
1819	2017-09-29	0.881094271	0.883897364

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1829	2017-10-13	0.920287080	0.921168923
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1844	2017-11-03	0.786267592	0.781645894
1845	2017-11-06	0.777302275	0.781529665
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1849	2017-11-10	0.777871073	0.778587937
1850	2017-11-13	0.811484317	0.810109377
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1857	2017-11-22	0.803900325	0.806859612
1858	2017-11-24	0.811890588	0.811012983
1859	2017-11-27	0.815303359	0.815847039
1860	2017-11-28	0.817307665	0.817968309
1861	2017-11-29	0.790195003	0.792425513
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1863	2017-12-01	0.787459372	0.788913250
1864	2017-12-04	0.783857002	0.785150051
1865	2017-12-05	0.779794177	0.781094611
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1870	2017-12-12	0.880904672	0.881558180
1871	2017-12-13	0.875487541	0.877482653
1872	2017-12-14	0.872399824	0.870248735
1873	2017-12-15	0.887459399	0.884490252
1874	2017-12-18	0.875054198	0.876091063
1875	2017-12-19	0.854008681	0.854085028

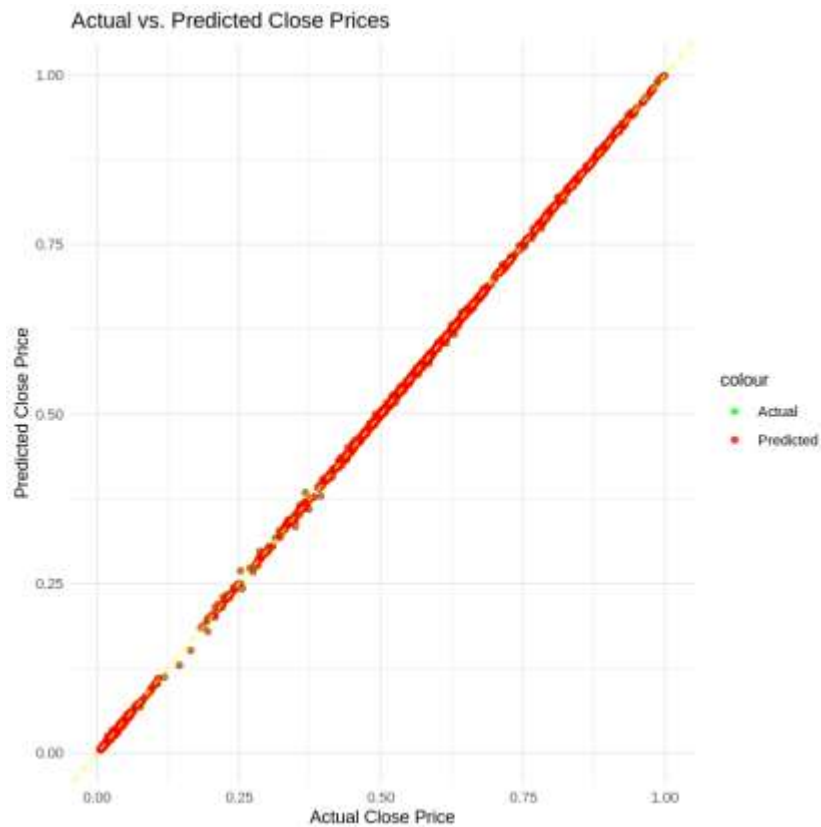
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1887	2018-01-08	0.868391089	0.866110206
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1890	2018-01-11	0.872562243	0.870876729
1891	2018-01-12	0.867876530	0.868171275
1892	2018-01-16	0.878277370	0.877243578
1893	2018-01-17	0.897508112	0.897300243
1894	2018-01-18	0.890492971	0.892500281
1895	2018-01-19	0.905254577	0.904009640
1896	2018-01-22	0.909425731	0.910319448
1897	2018-01-23	0.912757300	0.913186550
1898	2018-01-24	0.894068269	0.895300448
1899	2018-01-25	0.871722644	0.871855497
1900	2018-01-26	0.885834236	0.884774208
1901	2018-01-29	0.903927384	0.906334281
1902	2018-01-30	0.893878670	0.897779942
1903	2018-01-31	0.916874323	0.916108549

1904	2018-02-01	0.903168987	0.906153440
1905	2018-02-02	0.888271939	0.888696849
1906	2018-02-05	0.859507029	0.860457420
1907	2018-02-06	0.861782218	0.861250997
1908	2018-02-07	0.891657638	0.892862618
1909	2018-02-08	0.811023849	0.819768012
1910	2018-02-09	0.797995666	0.794707596
1911	2018-02-12	0.812378115	0.812916040
1912	2018-02-13	0.833857015	0.837852120
1913	2018-02-14	0.830200406	0.835066378
1914	2018-02-15	0.862053128	0.861322463
1915	2018-02-16	0.865899242	0.868368983
1916	2018-02-20	0.863949106	0.864373386
1917	2018-02-21	0.859967551	0.859328091
1918	2018-02-22	0.894826666	0.892175019
1919	2018-02-23	0.910753034	0.912568569
1920	2018-02-26	0.925297955	0.925613701
1921	2018-02-27	0.907881880	0.908669412
1922	2018-02-28	0.886403034	0.885166943
1923	2018-03-01	0.853548172	0.853619039
1924	2018-03-02	0.864897102	0.863618016
1925	2018-03-05	0.860102898	0.863958180
1926	2018-03-06	0.846153833	0.849433899
1927	2018-03-07	0.857258925	0.857861698
1928	2018-03-08	0.848591549	0.851971626
1929	2018-03-09	0.843364003	0.844953120
1930	2018-03-12	0.893038963	0.891346753
1931	2018-03-13	0.883098537	0.888448060

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1934	2018-03-16	0.827600176	0.829090238
1935	2018-03-19	0.806500569	0.809232712
1936	2018-03-20	0.798347793	0.799564958
1937	2018-03-21	0.814544962	0.815369129
1938	2018-03-22	0.794420368	0.799363732
1939	2018-03-23	0.773943648	0.775823832
1940	2018-03-26	0.781094244	0.780479133
1941	2018-03-27	0.713380268	0.720270157
1942	2018-03-28	0.655417118	0.657175958
1943	2018-03-29	0.678033613	0.674133599
1944	2018-04-02	0.641061728	0.649433494
1945	2018-04-03	0.681825582	0.679820418
1946	2018-04-04	0.734398700	0.734714866
1947	2018-04-05	0.785265452	0.787014842
1948	2018-04-06	0.767876503	0.773508489
1949	2018-04-09	0.741765967	0.740871787
1950	2018-04-10	0.782502695	0.774006426
1951	2018-04-11	0.772291454	0.774229944
1952	2018-04-12	0.753737839	0.754248500
1953	2018-04-13	0.770693405	0.767081678
1954	2018-04-16	0.745964261	0.748977840
1955	2018-04-17	0.736430092	0.736227393
1956	2018-04-18	0.751760536	0.750417233
1957	2018-04-19	0.769989152	0.770805061
1958	2018-04-20	0.743336945	0.747804761
1959	2018-04-23	0.724729144	0.724689245

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1962	2018-04-26	0.730444217	0.730235696
1963	2018-04-27	0.753737839	0.753793955
1964	2018-04-30	0.753250257	0.755885959
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1966	2018-05-02	0.772887324	0.773234010
1967	2018-05-03	0.727654374	0.730828762
1968	2018-05-04	0.753764911	0.747737706
1969	2018-05-07	0.777275203	0.777033865
1970	2018-05-08	0.775108356	0.778167784
1971	2018-05-09	0.788326097	0.787442505
1972	2018-05-10	0.783369475	0.784139574
1973	2018-05-11	0.772643581	0.772721469
1974	2018-05-14	0.748022765	0.748691678
1975	2018-05-15	0.726923063	0.726923764
1976	2018-05-16	0.733152776	0.732008278
1977	2018-05-17	0.727898172	0.730472744
1978	2018-05-18	0.706988055	0.710308254
1979	2018-05-21	0.727762717	0.725956738
1980	2018-05-22	0.702085577	0.706858456
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1982	2018-05-24	0.709777898	0.711315751
1983	2018-05-25	0.712486457	0.712977529
1984	2018-05-29	0.725785469	0.725287676
1985	2018-05-30	0.747345639	0.746822298
1986	2018-05-31	0.728412771	0.731734633
1987	2018-06-01	0.747616441	0.744377792

1988	2018-06-04	0.760942579	0.760402143
1989	2018-06-05	0.745747589	0.747848749
1990	2018-06-06	0.822589410	0.814972401
1991	2018-06-07	0.813353183	0.818907797



This Code for XGBOOST on the Data is performed by every group member.

XGBOOST:-

```
install.packages('tidyverse')
library(tidyverse)
install.packages('plotly')
library(plotly)
install.packages('xgboost')
```

```
library(xgboost)

# Load and preprocess the data
df <- read.csv('TESLA-PREP.csv')

# ... (Rest of your preprocessing code)

# Prepare data for XGBoost
X <- sequences
y <- targets

# Create the XGBoost model
xgb_model <- xgboost(data = X, label = y, nrounds = 100, verbose = 0)

# Make predictions using the XGBoost model
xgb_predictions <- predict(xgb_model, data.matrix(all_sequences))

# Inverse normalize predictions
xgb_predictions <- xgb_predictions * (max(df$Close) - min(df$Close)) +
min(df$Close)

# Calculate Mean Squared Error for XGBoost
xgb_mse <- mean((df$Close[(sequence_length):(nrow(df))]] - xgb_predictions)^2)
cat("XGBoost Mean Squared Error:", xgb_mse, "\n")

# Calculate R-squared value for XGBoost
xgb_r_squared <- (cor(actual_values, xgb_predictions))^2
cat("XGBoost R-squared:", xgb_r_squared, "\n")

# Calculate accuracy in percentage for XGBoost
```

```
xgb_accuracy <- sum(sign(xgb_predictions -
df$Close[(sequence_length):(nrow(df))]) == 0) / length(xgb_predictions) * 100
cat("XGBoost Accuracy:", xgb_accuracy, "%\n")
```

```
# Print the XGBoost predictions
```

```
xgb_output_df <- data.frame(Date = df$Date[(sequence_length):(nrow(df))],
Actual_Close = df$Close[(sequence_length):(nrow(df))],
XGBoost_Predicted_Close = xgb_predictions)
```

```
print(xgb_output_df)
```

```
# Create a scatter plot for XGBoost predictions
```

```
# Create a scatter plot for XGBoost predictions
```

```
ggplot(xgb_output_df, aes(x = Actual_Close, y = XGBoost_Predicted_Close)) +
```

```
  geom_point(aes(color = "Actual"), alpha = 0.5) +
```

```
  geom_point(aes(y = Actual_Close, color = "XGBoost Predicted"), data =
xgb_output_df, alpha = 0.5) +
```

```
  geom_abline(intercept = 0, slope = 1, color = "yellow", linetype =
"dashed") +
```

```
  labs(title = "XGBoost Predicted Close Prices", x = "Actual Close Price", y
= "XGBoost Predicted Close Price") +
```

```
  scale_color_manual(values = c("Actual" = "blue", "XGBoost Predicted" =
"red")) +
```

```
  theme_minimal()
```

```
XGBoost Mean Squared Error: 7.99464e-07
```

```
XGBoost R-squared: 0.9999912
```

```
XGBoost Accuracy: 0 %
```

	Date	Actual_Close	XGBoost_Predicted_Close
1	2010-07-13	0.006338028	0.006558403
2	2010-07-14	0.010942579	0.011019240
3	2010-07-15	0.011078007	0.011019240
4	2010-07-16	0.013109426	0.013189428

5	2010-07-19	0.016549296	0.016532963
6	2010-07-20	0.012188516	0.012267429
7	2010-07-21	0.011971831	0.012152978
8	2010-07-22	0.014084507	0.014374668
9	2010-07-23	0.014869989	0.014864992
10	2010-07-26	0.013949079	0.014374668
11	2010-07-27	0.012865655	0.013288850
12	2010-07-28	0.013326111	0.013288850
13	2010-07-29	0.012323944	0.012267429
14	2010-07-30	0.011213434	0.011213313
15	2010-08-02	0.013867822	0.014275246
16	2010-08-03	0.016657638	0.016728168
17	2010-08-04	0.014788732	0.014864992
18	2010-08-05	0.012594800	0.012267429
19	2010-08-06	0.010265439	0.010517291
20	2010-08-09	0.010292524	0.010417869
21	2010-08-10	0.008748646	0.008794948
22	2010-08-11	0.005687974	0.006080808
23	2010-08-12	0.004875406	0.006080808
24	2010-08-13	0.006825569	0.007086295
25	2010-08-16	0.008071506	0.008175030
26	2010-08-17	0.009073673	0.009063280
27	2010-08-18	0.008044420	0.008175030
28	2010-08-19	0.008098592	0.008175030
29	2010-08-20	0.008938245	0.009063280
30	2010-08-23	0.011728061	0.011958905
31	2010-08-24	0.009209101	0.009162702
32	2010-08-25	0.011105092	0.011113891
33	2010-08-26	0.010698808	0.011019240
34	2010-08-27	0.010563380	0.010417869

35	2010-08-30	0.011023835	0.011113891
36	2010-08-31	0.009967497	0.010001348
37	2010-09-01	0.012594800	0.012168008
38	2010-09-02	0.014247021	0.014280017
39	2010-09-03	0.014219935	0.014374668
40	2010-09-07	0.012838570	0.013288850
41	2010-09-08	0.013813651	0.013288850
42	2010-09-09	0.013299025	0.013288850
43	2010-09-10	0.011836403	0.012152978
44	2010-09-13	0.013326111	0.013288850
45	2010-09-14	0.014409534	0.014374668
46	2010-09-15	0.016738895	0.016728168
47	2010-09-16	0.013921993	0.014374668
48	2010-09-17	0.011998917	0.012152978
49	2010-09-20	0.014247021	0.014374668
50	2010-09-21	0.013461538	0.013288850
51	2010-09-22	0.011023835	0.011213313
52	2010-09-23	0.010184182	0.010417869
53	2010-09-24	0.011646804	0.012053557
54	2010-09-27	0.012811484	0.013094777
55	2010-09-28	0.015167931	0.014864992
56	2010-09-29	0.016738895	0.016728168
57	2010-09-30	0.012486457	0.012267429
58	2010-10-01	0.013001083	0.013288850
59	2010-10-04	0.014057421	0.014374668
60	2010-10-05	0.014409534	0.014374668
61	2010-10-06	0.012621885	0.012267429
62	2010-10-07	0.012540628	0.012267429
63	2010-10-08	0.012540628	0.012267429
64	2010-10-11	0.012026002	0.012152978

65	2010-10-12	0.012026002	0.012152978
66	2010-10-13	0.012838570	0.013288850
67	2010-10-14	0.013407367	0.013288850
68	2010-10-15	0.012838570	0.013288850
69	2010-10-18	0.011998917	0.012152978
70	2010-10-19	0.011511376	0.011213313
71	2010-10-20	0.013136511	0.013189428
72	2010-10-21	0.013407367	0.013288850
73	2010-10-22	0.013326111	0.013288850
74	2010-10-25	0.013678223	0.013288850
75	2010-10-26	0.015059588	0.014864992
76	2010-10-27	0.014084507	0.014374668
77	2010-10-28	0.014599133	0.014573276
78	2010-10-29	0.016359697	0.016532963
79	2010-11-01	0.015195016	0.014864992
80	2010-11-02	0.014761647	0.014864992
81	2010-11-03	0.016170098	0.016532963
82	2010-11-04	0.024647887	0.024291044
83	2010-11-05	0.023401950	0.023460476
84	2010-11-08	0.024864572	0.024291044
85	2010-11-09	0.023916576	0.023877857
86	2010-11-10	0.036728061	0.036906864
87	2010-11-11	0.033152763	0.033168133
88	2010-11-12	0.038028169	0.038152672
89	2010-11-15	0.040628386	0.040550616
90	2010-11-16	0.037567714	0.037224080
91	2010-11-17	0.037080173	0.037224080
92	2010-11-18	0.038163597	0.038152672
93	2010-11-19	0.041143012	0.041256081
94	2010-11-22	0.047670639	0.047658358

95	2010-11-23	0.050839653	0.050327867
96	2010-11-24	0.053277356	0.052627742
97	2010-11-26	0.052871073	0.052627742
98	2010-11-29	0.050189599	0.050327867
99	2010-11-30	0.052898158	0.052627742
100	2010-12-01	0.050243770	0.050327867
101	2010-12-02	0.044826652	0.044909429
102	2010-12-03	0.042497291	0.042027947
103	2010-12-06	0.039301192	0.039230466
104	2010-12-07	0.042686891	0.043621648
105	2010-12-08	0.044880823	0.044909429
106	2010-12-09	0.044014085	0.044174068
107	2010-12-10	0.042578548	0.042027947
108	2010-12-13	0.039951246	0.040054642
109	2010-12-14	0.034479957	0.034261737
110	2010-12-15	0.037378115	0.037224080
111	2010-12-16	0.040655471	0.040550616
112	2010-12-17	0.042145179	0.041916039
113	2010-12-20	0.043066089	0.043621648
114	2010-12-21	0.044582882	0.044909429
115	2010-12-22	0.045585049	0.045597121
116	2010-12-23	0.038705309	0.038780533
117	2010-12-27	0.026408451	0.026984949
118	2010-12-28	0.028737811	0.028694941
119	2010-12-29	0.032313109	0.032240238
120	2010-12-30	0.028981582	0.028694941
121	2010-12-31	0.029333694	0.029223150
122	2011-01-03	0.029306609	0.029223150
123	2011-01-04	0.029442037	0.029223150
124	2011-01-05	0.029875406	0.029470544

125	2011-01-06	0.032719393	0.032875750
126	2011-01-07	0.033694475	0.033787057
127	2011-01-10	0.034263272	0.034261737
128	2011-01-11	0.030227519	0.029650263
129	2011-01-12	0.030227519	0.029650263
130	2011-01-13	0.028223185	0.027992133
131	2011-01-14	0.026950163	0.027270013
132	2011-01-18	0.026652221	0.026984949
133	2011-01-19	0.022291441	0.022213005
134	2011-01-20	0.018472373	0.019241596
135	2011-01-21	0.019609967	0.019475948
136	2011-01-24	0.023537378	0.023703691
137	2011-01-25	0.024052004	0.023877857
138	2011-01-26	0.024241603	0.023877857
139	2011-01-27	0.024702059	0.024291044
140	2011-01-28	0.022237270	0.022213005
141	2011-01-31	0.022481040	0.022213005
142	2011-02-01	0.021966414	0.022111671
143	2011-02-02	0.022047671	0.022111671
144	2011-02-03	0.021208017	0.021902015
145	2011-02-04	0.020747562	0.021902015
146	2011-02-07	0.019691224	0.019475948
147	2011-02-08	0.023537378	0.023703691
148	2011-02-09	0.020070423	0.019475948
149	2011-02-10	0.020097508	0.019475948
150	2011-02-11	0.020178765	0.019475948
151	2011-02-14	0.019718310	0.019475948
152	2011-02-15	0.019068256	0.019241596
153	2011-02-16	0.024187432	0.023877857
154	2011-02-17	0.021126761	0.021902015

155	2011-02-18	0.019989166	0.019475948
156	2011-02-22	0.016440953	0.016532963
157	2011-02-23	0.016332611	0.016532963
158	2011-02-24	0.018228602	0.019241596
159	2011-02-25	0.021153846	0.021902015
160	2011-02-28	0.021912243	0.022111671
161	2011-03-01	0.022047671	0.022111671
162	2011-03-02	0.022264355	0.022213005
163	2011-03-03	0.023185265	0.023245096
164	2011-03-04	0.024783315	0.024291044
165	2011-03-07	0.024756230	0.024291044
166	2011-03-08	0.023997833	0.023877857
167	2011-03-09	0.024160347	0.023877857
168	2011-03-10	0.022237270	0.022213005
169	2011-03-11	0.022399783	0.022213005
170	2011-03-14	0.020178765	0.019475948
171	2011-03-15	0.019366197	0.019241596
172	2011-03-16	0.019014085	0.019241596
173	2011-03-17	0.018986999	0.019241596
174	2011-03-18	0.019393283	0.019241596
175	2011-03-21	0.018770314	0.019241596
176	2011-03-22	0.017307692	0.016728168
177	2011-03-23	0.017361863	0.016728168
178	2011-03-24	0.017686891	0.016728168
179	2011-03-25	0.018824485	0.019241596
180	2011-03-28	0.020178765	0.019475948
181	2011-03-29	0.021993499	0.022111671
182	2011-03-30	0.021424702	0.021902015
183	2011-03-31	0.032367281	0.032577224
184	2011-04-01	0.029414951	0.029223150

185	2011-04-04	0.027166847	0.027270013
186	2011-04-05	0.029523294	0.029223150
187	2011-04-06	0.028954496	0.028694941
188	2011-04-07	0.030985915	0.032013774
189	2011-04-08	0.028954496	0.028694941
190	2011-04-11	0.025650054	0.026984949
191	2011-04-12	0.023970748	0.023877857
192	2011-04-13	0.024729144	0.024291044
193	2011-04-14	0.025297941	0.024291044
194	2011-04-15	0.026489707	0.026984949
195	2011-04-18	0.025000000	0.024291044
196	2011-04-19	0.025352113	0.024291044
197	2011-04-20	0.026950163	0.027270013
198	2011-04-21	0.029631636	0.029223150
199	2011-04-25	0.028683640	0.028694941
200	2011-04-26	0.030146262	0.029650263
201	2011-04-27	0.030552546	0.029650263
202	2011-04-28	0.032123510	0.032240238
203	2011-04-29	0.031960997	0.032240238
204	2011-05-02	0.031554713	0.032013774
205	2011-05-03	0.029983749	0.029470544
206	2011-05-04	0.029496208	0.029223150
207	2011-05-05	0.028819068	0.028694941
208	2011-05-06	0.030660888	0.029650263
209	2011-05-09	0.032800650	0.032875750
210	2011-05-10	0.033938245	0.033787057
211	2011-05-11	0.030525460	0.029650263
212	2011-05-12	0.032150596	0.032240238
213	2011-05-13	0.031825569	0.032240238
214	2011-05-16	0.029252438	0.029223150

215	2011-05-17	0.027518960	0.027697692
216	2011-05-18	0.028575298	0.027992133
217	2011-05-19	0.033586132	0.033168133
218	2011-05-20	0.032963164	0.032875750
219	2011-05-23	0.029848321	0.029470544
220	2011-05-24	0.029577465	0.029223150
221	2011-05-25	0.035698808	0.036713000
222	2011-05-26	0.037053088	0.037224080
223	2011-05-27	0.037242687	0.037224080
224	2011-05-31	0.038840737	0.038780533
225	2011-06-01	0.034452871	0.034261737
226	2011-06-02	0.035102925	0.034739088
227	2011-06-03	0.038813651	0.038780533
228	2011-06-06	0.034940412	0.034739088
229	2011-06-07	0.034046587	0.033787057
230	2011-06-08	0.030660888	0.029650263
231	2011-06-09	0.032015168	0.032240238
232	2011-06-10	0.032665222	0.032875750
233	2011-06-13	0.034209101	0.034261737
234	2011-06-14	0.034669556	0.034500636
235	2011-06-15	0.031202600	0.032013774
236	2011-06-16	0.028981582	0.028694941
237	2011-06-17	0.028981582	0.028694941
238	2011-06-20	0.027654388	0.027697692
239	2011-06-21	0.031771398	0.032240238
240	2011-06-22	0.030904659	0.032013774
241	2011-06-23	0.032258938	0.032240238
242	2011-06-24	0.031879740	0.032240238
243	2011-06-27	0.031581798	0.032013774
244	2011-06-28	0.033342362	0.033168133

245	2011-06-29	0.033829902	0.033787057
246	2011-06-30	0.036105092	0.036713000
247	2011-07-01	0.035807151	0.036713000
248	2011-07-05	0.036132178	0.036713000
249	2011-07-06	0.035644637	0.034739088
250	2011-07-07	0.037730228	0.037224080
251	2011-07-08	0.035238353	0.034739088
252	2011-07-11	0.033992416	0.033787057
253	2011-07-12	0.033504875	0.033168133
254	2011-07-13	0.034777898	0.034500636
255	2011-07-14	0.031988082	0.032240238
256	2011-07-15	0.031906826	0.032240238
257	2011-07-18	0.030958830	0.032013774
258	2011-07-19	0.032746479	0.032875750
259	2011-07-20	0.034913326	0.034739088
260	2011-07-21	0.034940412	0.034739088
261	2011-07-22	0.036538462	0.036906864
262	2011-07-25	0.034371614	0.034261737
263	2011-07-26	0.033044420	0.033008516
264	2011-07-27	0.032069339	0.032240238
265	2011-07-28	0.033504875	0.033168133
266	2011-07-29	0.033504875	0.033168133
267	2011-08-01	0.035130011	0.034739088
268	2011-08-02	0.031256771	0.032013774
269	2011-08-03	0.030877573	0.032013774
270	2011-08-04	0.024241603	0.023877857
271	2011-08-05	0.022860238	0.023245096
272	2011-08-08	0.021235103	0.021902015
273	2011-08-09	0.025081257	0.024291044
274	2011-08-10	0.021722644	0.021902015

275	2011-08-11	0.025731311	0.026984949
276	2011-08-12	0.028466956	0.027992133
277	2011-08-15	0.028250271	0.027992133
278	2011-08-16	0.027898158	0.027697692
279	2011-08-17	0.027166847	0.027270013
280	2011-08-18	0.022914410	0.023245096
281	2011-08-19	0.017605634	0.016728168
282	2011-08-22	0.016657638	0.016728168
283	2011-08-23	0.019393283	0.019241596
284	2011-08-24	0.021858072	0.022111671
285	2011-08-25	0.019799567	0.019475948
286	2011-08-26	0.021478873	0.021902015
287	2011-08-29	0.024133261	0.023877857
288	2011-08-30	0.023916576	0.023877857
289	2011-08-31	0.024214518	0.023877857
290	2011-09-01	0.022210184	0.022213005
291	2011-09-02	0.019691224	0.019475948
292	2011-09-06	0.019339112	0.019241596
293	2011-09-07	0.021776815	0.022111671
294	2011-09-08	0.021153846	0.021902015
295	2011-09-09	0.019420368	0.019241596
296	2011-09-12	0.019176598	0.019241596
297	2011-09-13	0.022426869	0.022213005
298	2011-09-14	0.023131094	0.023245096
299	2011-09-15	0.024431203	0.024131786
300	2011-09-16	0.027085590	0.027270013
301	2011-09-19	0.027004334	0.027270013
302	2011-09-20	0.027654388	0.027697692
303	2011-09-21	0.027221018	0.027270013
304	2011-09-22	0.026625135	0.026984949

305	2011-09-23	0.028656555	0.028694941
306	2011-09-26	0.026327194	0.026984949
307	2011-09-27	0.028141928	0.027992133
308	2011-09-28	0.023808234	0.023877857
309	2011-09-29	0.022535211	0.022213005
310	2011-09-30	0.023266522	0.023245096
311	2011-10-03	0.021478873	0.021902015
312	2011-10-04	0.021289274	0.021902015
313	2011-10-05	0.025920910	0.026984949
314	2011-10-06	0.030227519	0.029650263
315	2011-10-07	0.030308776	0.029650263
316	2011-10-10	0.032719393	0.032875750
317	2011-10-11	0.031988082	0.032240238
318	2011-10-12	0.032502709	0.032577224
319	2011-10-13	0.032881907	0.032875750
320	2011-10-14	0.033179848	0.033168133
321	2011-10-17	0.031473456	0.032013774
322	2011-10-18	0.033965330	0.033787057
323	2011-10-19	0.031879740	0.032240238
324	2011-10-20	0.031256771	0.032013774
325	2011-10-21	0.033125677	0.033008516
326	2011-10-24	0.034534128	0.034261737
327	2011-10-25	0.033721560	0.033787057
328	2011-10-26	0.032990249	0.033008516
329	2011-10-27	0.035102925	0.034739088
330	2011-10-28	0.038109426	0.038152672
331	2011-10-31	0.036755146	0.036906864
332	2011-11-01	0.035427952	0.034739088
333	2011-11-02	0.034967497	0.034739088
334	2011-11-03	0.045124594	0.045480076

335	2011-11-04	0.044718310	0.044909429
336	2011-11-07	0.041901408	0.041711424
337	2011-11-08	0.043445287	0.043763697
338	2011-11-09	0.040845070	0.040550616
339	2011-11-10	0.042063922	0.041916039
340	2011-11-11	0.048320693	0.048174627
341	2011-11-14	0.047183099	0.046998136
342	2011-11-15	0.049106176	0.048570704
343	2011-11-16	0.051841820	0.052209325
344	2011-11-17	0.048429036	0.048174627
345	2011-11-18	0.045503792	0.045480076
346	2011-11-21	0.043228602	0.043621648
347	2011-11-22	0.044068256	0.044174068
348	2011-11-23	0.042388949	0.042027947
349	2011-11-25	0.042957746	0.043621648
350	2011-11-28	0.045395450	0.045480076
351	2011-11-29	0.043201517	0.043621648
352	2011-11-30	0.045882990	0.045597121
353	2011-12-01	0.045503792	0.045480076
354	2011-12-02	0.047399783	0.047658358
355	2011-12-05	0.050433369	0.050327867
356	2011-12-06	0.051652221	0.052209325
357	2011-12-07	0.049810401	0.050327867
358	2011-12-08	0.040872156	0.040550616
359	2011-12-09	0.041278440	0.041256081
360	2011-12-12	0.039572048	0.039329864
361	2011-12-13	0.036971831	0.037224080
362	2011-12-14	0.034479957	0.034261737
363	2011-12-15	0.034723727	0.034500636
364	2011-12-16	0.033044420	0.033008516

365	2011-12-19	0.032367281	0.032577224
366	2011-12-20	0.032773564	0.032875750
367	2011-12-21	0.031879740	0.032240238
368	2011-12-22	0.032421452	0.032577224
369	2011-12-23	0.032773564	0.032875750
370	2011-12-27	0.034588299	0.034500636
371	2011-12-28	0.034425785	0.034261737
372	2011-12-29	0.035021668	0.034739088
373	2011-12-30	0.034561213	0.034261737
374	2012-01-03	0.033261105	0.033168133
375	2012-01-04	0.032258938	0.032240238
376	2012-01-05	0.030660888	0.029650263
377	2012-01-06	0.030092091	0.029650263
378	2012-01-09	0.031013001	0.032013774
379	2012-01-10	0.032015168	0.032240238
380	2012-01-11	0.033667389	0.033787057
381	2012-01-12	0.033721560	0.033787057
382	2012-01-13	0.018932828	0.019241596
383	2012-01-17	0.029252438	0.029223150
384	2012-01-18	0.029821235	0.029470544
385	2012-01-19	0.029685807	0.029223150
386	2012-01-20	0.029252438	0.029223150
387	2012-01-23	0.029712893	0.029223150
388	2012-01-24	0.031473456	0.032013774
389	2012-01-25	0.032963164	0.032875750
390	2012-01-26	0.035590466	0.034739088
391	2012-01-27	0.036646804	0.036906864
392	2012-01-30	0.037296858	0.037224080
393	2012-01-31	0.035942579	0.036713000
394	2012-02-01	0.037323944	0.037224080

395	2012-02-02	0.039138678	0.039012790
396	2012-02-03	0.041576381	0.041455213
397	2012-02-06	0.043336945	0.043763697
398	2012-02-07	0.042795233	0.043621648
399	2012-02-08	0.043689057	0.043942843
400	2012-02-09	0.045449621	0.045480076
401	2012-02-10	0.041440953	0.041256081
402	2012-02-13	0.042497291	0.042027947
403	2012-02-14	0.047047671	0.046998136
404	2012-02-15	0.048212351	0.048174627
405	2012-02-16	0.049783315	0.050327867
406	2012-02-17	0.051923077	0.052209325
407	2012-02-21	0.050650054	0.050327867
408	2012-02-22	0.049891658	0.050327867
409	2012-02-23	0.050731311	0.050327867
410	2012-02-24	0.048618635	0.048357584
411	2012-02-27	0.048266522	0.048174627
412	2012-02-28	0.048781148	0.048357584
413	2012-02-29	0.047697725	0.047658358
414	2012-03-01	0.050406284	0.050327867
415	2012-03-02	0.049404117	0.048570704
416	2012-03-05	0.048672806	0.048357584
417	2012-03-06	0.046885157	0.046759766
418	2012-03-07	0.046912243	0.046759766
419	2012-03-08	0.046776815	0.046759766
420	2012-03-09	0.051300108	0.052209325
421	2012-03-12	0.054739978	0.054074094
422	2012-03-13	0.054956663	0.054074094
423	2012-03-14	0.052789816	0.052460611
424	2012-03-15	0.052004334	0.052209325

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426	2012-03-19	0.051950163	0.052209325
427	2012-03-20	0.051895991	0.052209325
428	2012-03-21	0.052410618	0.052209325
429	2012-03-22	0.050379198	0.050327867
430	2012-03-23	0.049512459	0.048570704
431	2012-03-26	0.058504875	0.059063267
432	2012-03-27	0.059967497	0.060291652
433	2012-03-28	0.059723727	0.060291652
434	2012-03-29	0.058315276	0.059063267
435	2012-03-30	0.058071506	0.059063267
436	2012-04-02	0.056283857	0.054726195
437	2012-04-03	0.060157096	0.060291652
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440	2012-04-09	0.046993499	0.046998136
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442	2012-04-11	0.046830986	0.046759766
443	2012-04-12	0.047778982	0.047922272
444	2012-04-13	0.048185265	0.048174627
445	2012-04-16	0.044555796	0.044909429
446	2012-04-17	0.044528711	0.044909429
447	2012-04-18	0.045666306	0.045597121
448	2012-04-19	0.047020585	0.046998136
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450	2012-04-23	0.043716143	0.044174068
451	2012-04-24	0.043391116	0.043763697
452	2012-04-25	0.046343445	0.046470381
453	2012-04-26	0.047914410	0.047922272
454	2012-04-27	0.047508126	0.047658358

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457	2012-05-02	0.049133261	0.048570704
458	2012-05-03	0.045124594	0.045480076
459	2012-05-04	0.043418202	0.043763697
460	2012-05-07	0.045151679	0.045480076
461	2012-05-08	0.038976165	0.038780533
462	2012-05-09	0.038624052	0.038780533
463	2012-05-10	0.046478873	0.046470381
464	2012-05-11	0.044555796	0.044909429
465	2012-05-14	0.038624052	0.038780533
466	2012-05-15	0.036917660	0.037224080
467	2012-05-16	0.036240520	0.036713000
468	2012-05-17	0.034588299	0.034500636
469	2012-05-18	0.031852654	0.032240238
470	2012-05-21	0.035130011	0.034739088
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472	2012-05-23	0.041224269	0.041256081
473	2012-05-24	0.039219935	0.039012790
474	2012-05-25	0.037946912	0.038152672
475	2012-05-29	0.043039003	0.043621648
476	2012-05-30	0.039572048	0.039329864
477	2012-05-31	0.037107259	0.037224080
478	2012-06-01	0.033450704	0.033168133
479	2012-06-04	0.032719393	0.032875750
480	2012-06-05	0.032800650	0.032875750
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488	2012-06-15	0.038217768	0.038152672
489	2012-06-18	0.043445287	0.043763697
490	2012-06-19	0.044122427	0.044174068
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492	2012-06-21	0.044393283	0.044581227
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494	2012-06-25	0.046885157	0.046759766
495	2012-06-26	0.042822319	0.043621648
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497	2012-06-28	0.042280607	0.042027947
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523	2012-08-06	0.033775731	0.033787057
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538	2012-08-27	0.033911159	0.033787057
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540	2012-08-29	0.034154930	0.034261737
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547	2012-09-10	0.031338028	0.032013774
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557	2012-09-24	0.040249187	0.040054642
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573	2012-10-16	0.033206934	0.033168133
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632	2013-01-14	0.047291441	0.047658358
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638	2013-01-23	0.054712893	0.054074094
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687	2013-04-04	0.070991333	0.071512967
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691	2013-04-10	0.070585049	0.070498407
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712	2013-05-09	0.145178765	0.144199982
713	2013-05-10	0.165113759	0.165102437
714	2013-05-13	0.195016238	0.195068181
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716	2013-05-15	0.186998917	0.188306451
717	2013-05-16	0.207069353	0.207087755
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721	2013-05-22	0.193499458	0.194223374
722	2013-05-23	0.208369447	0.207500532
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728	2013-06-03	0.207990249	0.208570465
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733	2013-06-10	0.228196100	0.227724493
734	2013-06-11	0.213082327	0.213098586
735	2013-06-12	0.221912243	0.221357360
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738	2013-06-17	0.234019515	0.234104872
739	2013-06-18	0.237242673	0.237144276
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1407	2016-02-11	0.364761647	0.364987731
1408	2016-02-12	0.366305525	0.366426468
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1411	2016-02-18	0.408911159	0.409646660
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1414	2016-02-23	0.437188529	0.436766148

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1425	2016-03-09	0.522535198	0.521794975
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1427	2016-03-11	0.519230769	0.519787073
1428	2016-03-14	0.539951232	0.540948689
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1757	2017-07-03	0.912296885	0.911875546
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1766	2017-07-17	0.822778995	0.822910547
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1778	2017-08-02	0.839897088	0.840153992
1779	2017-08-03	0.897318513	0.898056030
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