Analyzing SP 500 Index

using time series and machine learning methods

Yanni Ge Ying Shi Hairong Xie

University of California,Berkeley

March 17, 2014

Whose mind are we going to change? About what?

We are going to change/reinforce individual investors' mind about tracking and predicting SP500 index.

Data

SP500 data exacted from Yahoo Finance:

	AA	AAPL	ABC	ABT	ACE	ACN	ACT	ADBE	ADI
Date									
2010-01-05	15.38	206.05	24.95	22.90	43.80	38.89	39.89	37.70	27.96
2010-01-06	16.18	202.77	24.72	23.02	43.20	39.30	40.02	37.62	27.91
2010-01-07	15.84	202.40	24.32	23.21	43.45	39.27	39.70	36.89	27.69
2010-01-08	16.23	203.75	24.58	23.33	43.20	39.11	39.41	36.69	27.84
2010-01-11	16.64	201.95	24.86	23.45	43.67	39.07	39.77	36.21	27.69
2010-01-12	14.80	199.65	25.03	23.38	43.76	38.82	39.72	35.66	26.54
2010-01-13	15.24	202.47	25.52	23.61	43.90	39.27	40.89	36.28	26.53
2010-01-14	15.08	201.29	25.68	23.63	44.32	39.61	41.10	35.90	26.50
2010-01-15	14.91	197.93	25.40	23.69	43.85	39.33	40.90	35.87	25.61

LASSO

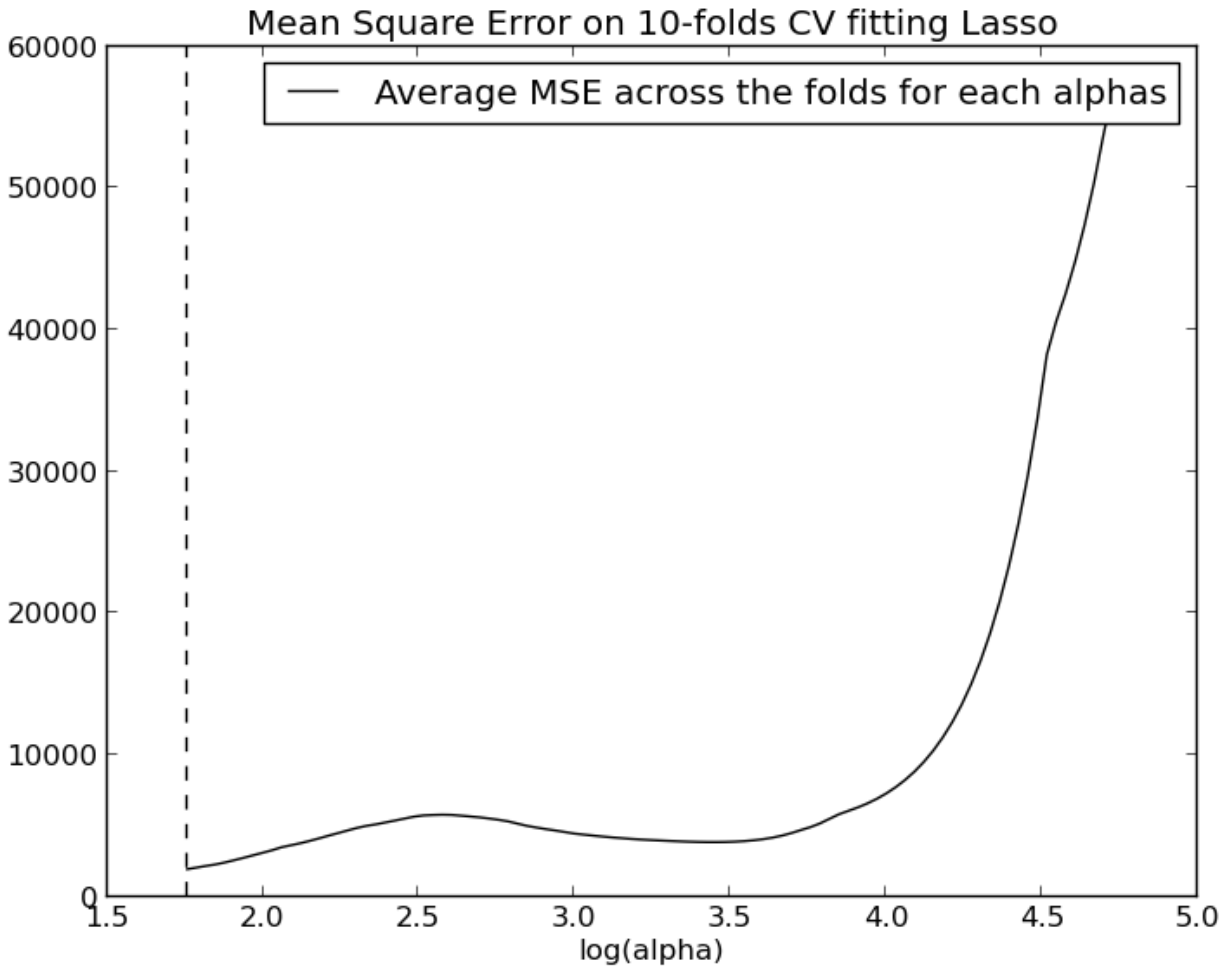

Figure 1: Average of MSE on 10-fold cross-validation by fitting LASSO; alpha with to the least average MSE is picked

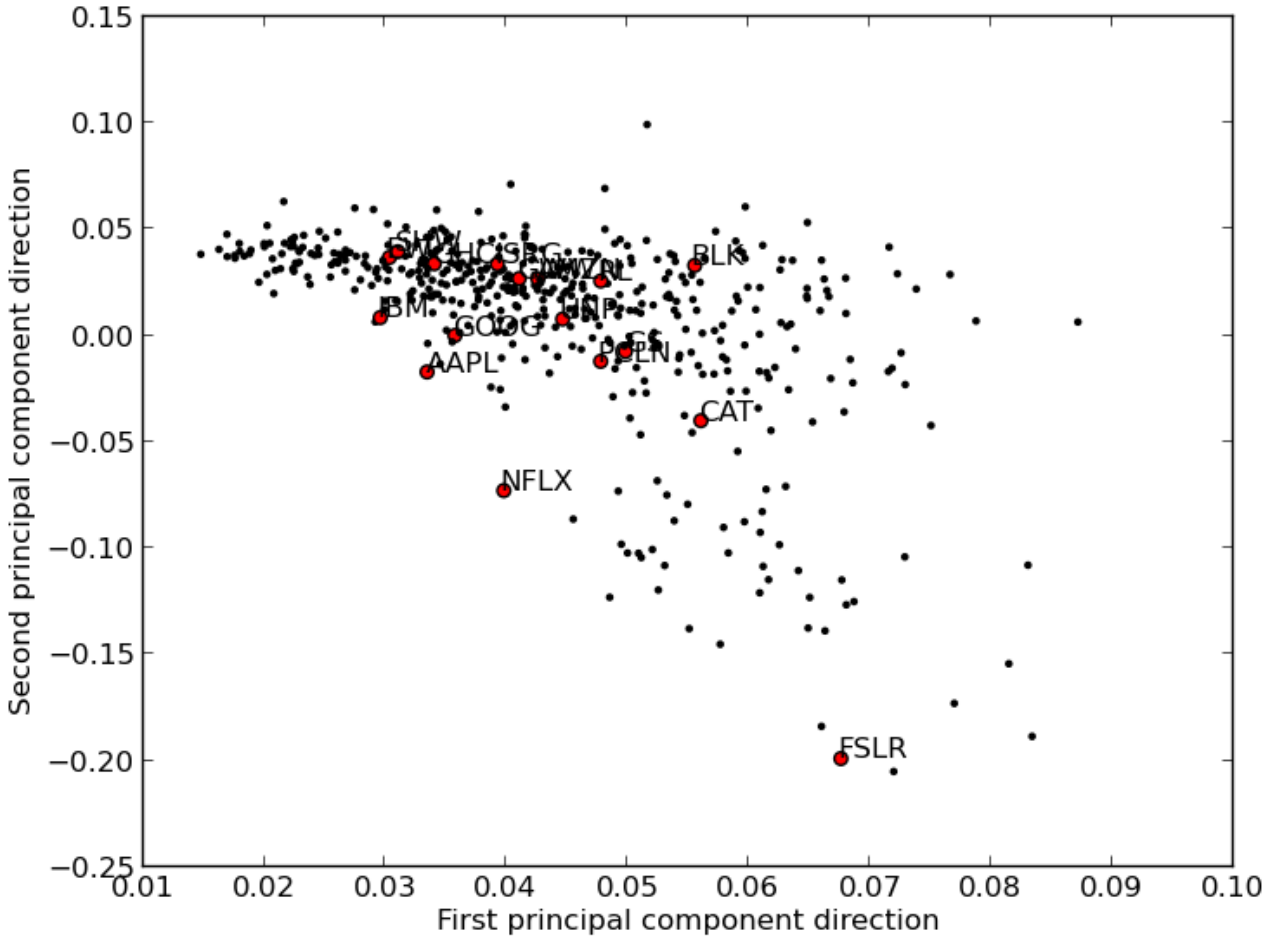

Figure 2: First eigenvector vs. second eigenvector with the selected 17 companies labeled

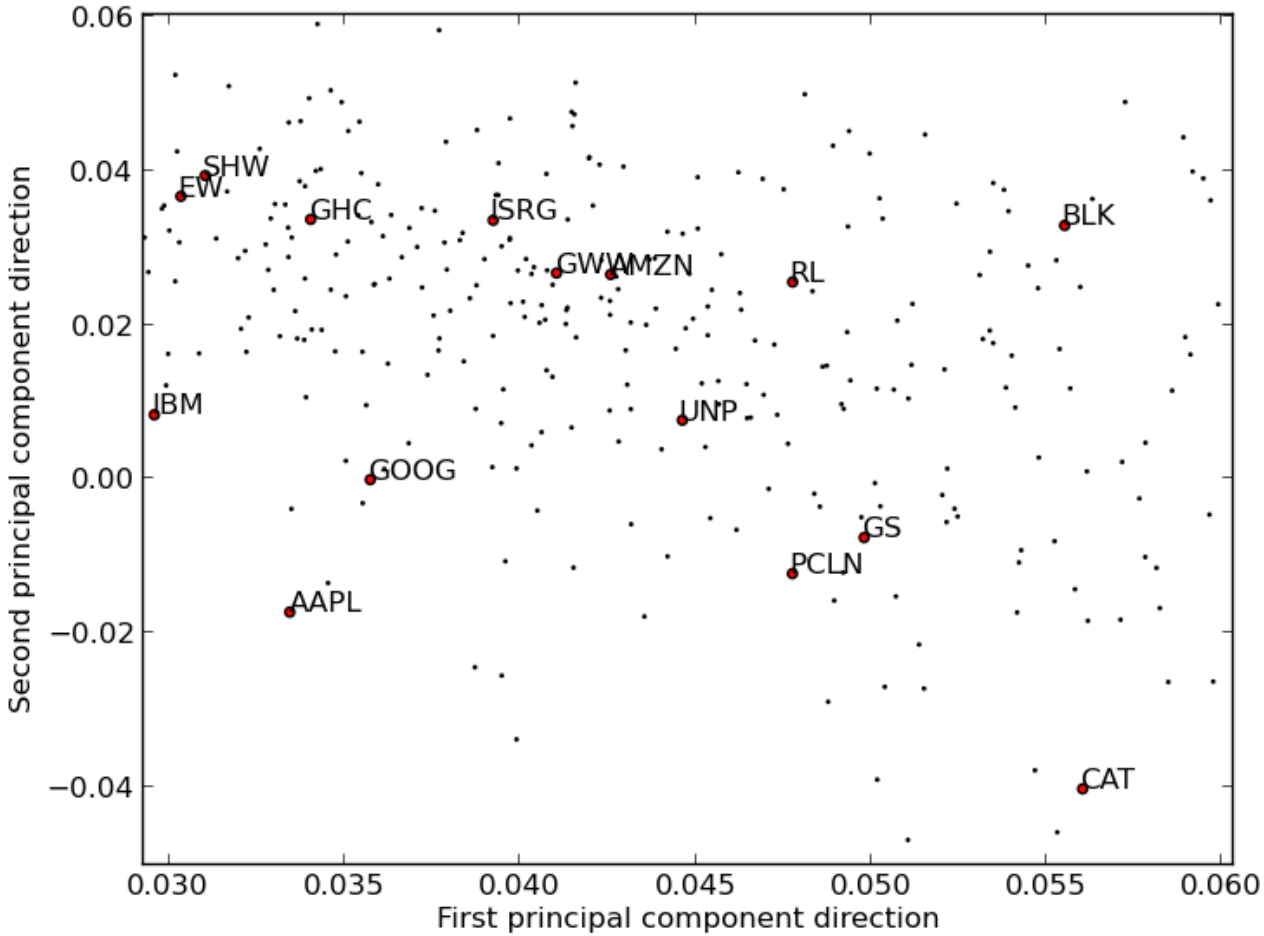

Figure 3: Zoomed-in version

Density Plot

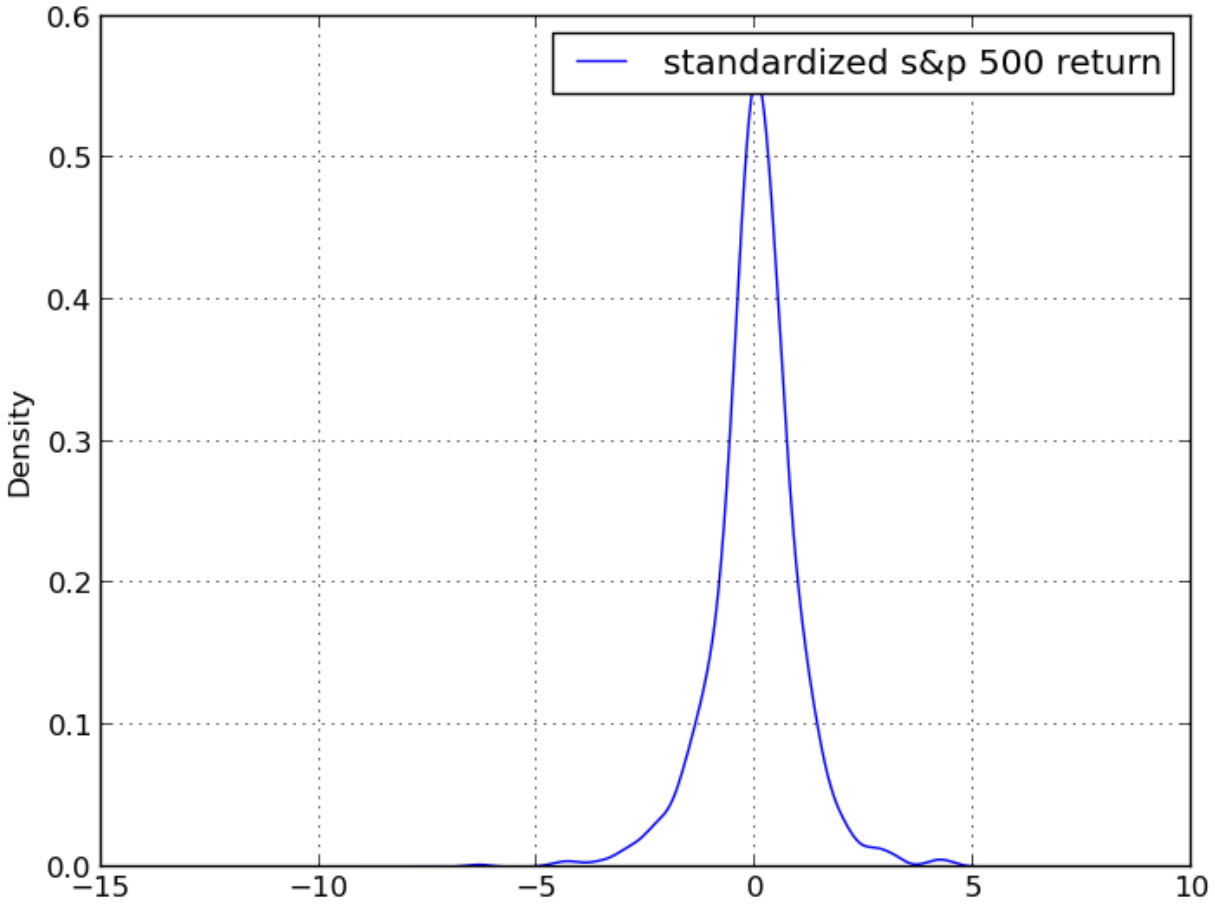

Figure 4: Density plot of standardized SP500 index

Density Plot

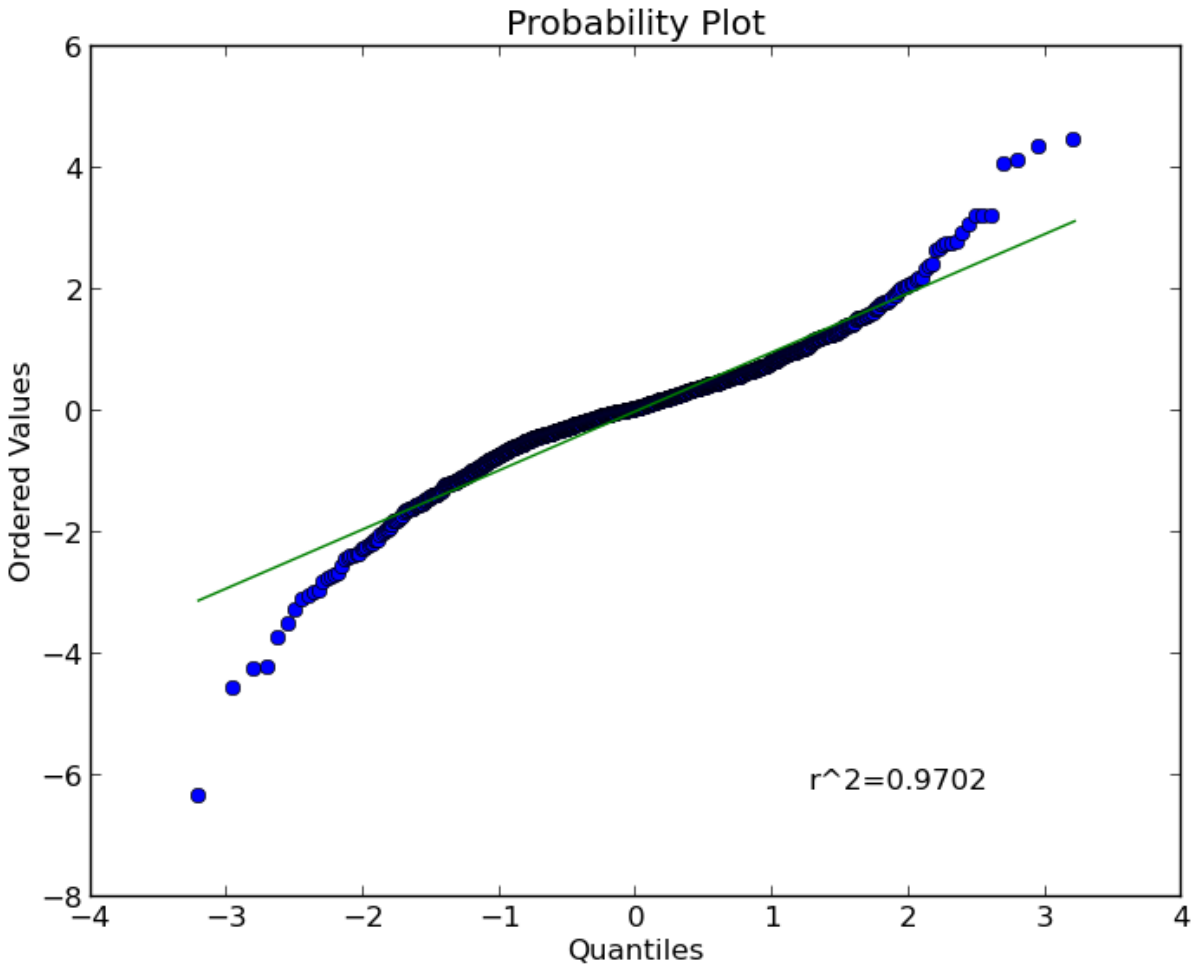

Figure 5: QQ-norm of SP500 index

Density Plot

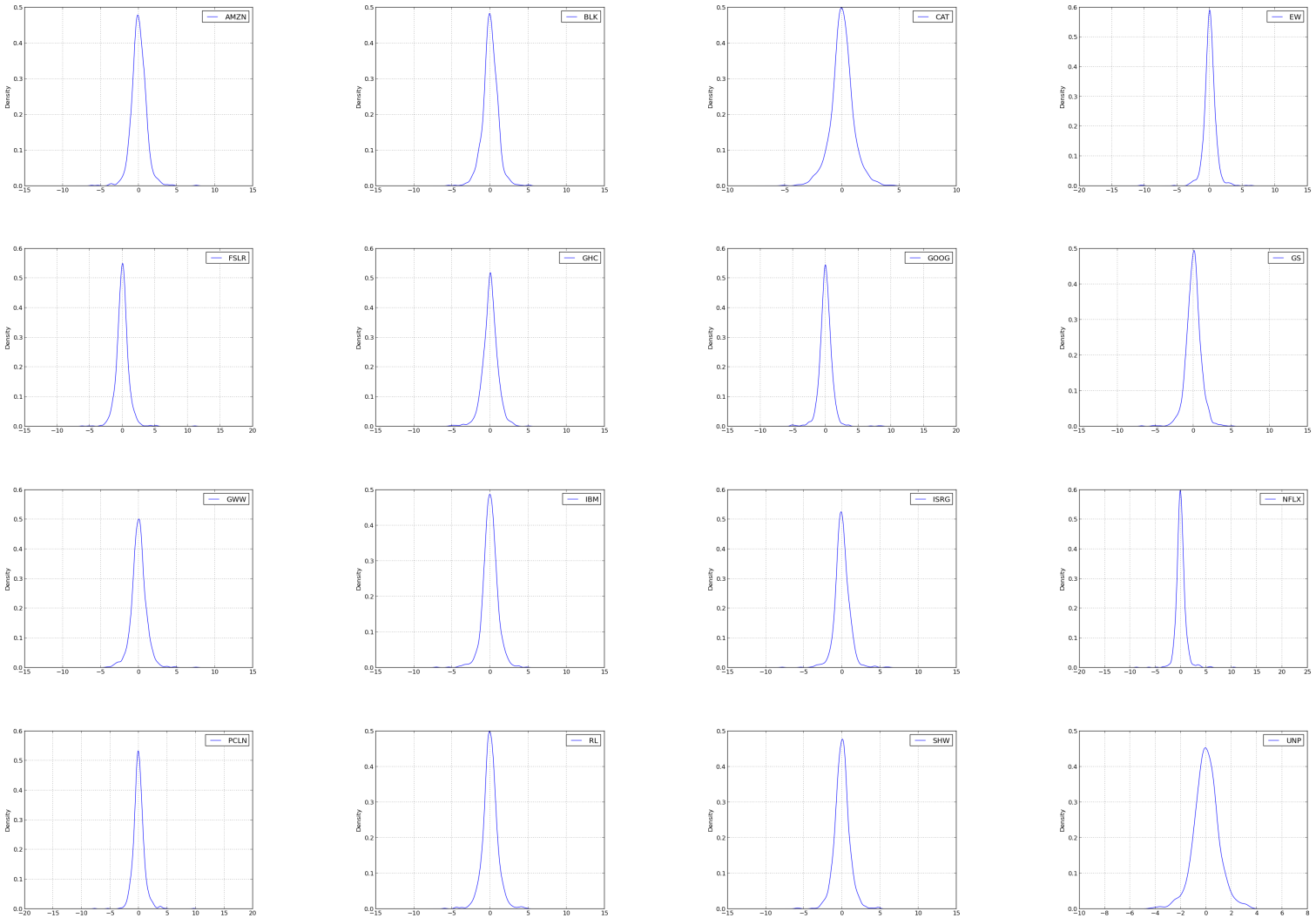

Figure 6: Density plots of standardized 16 stocks

Density Plot

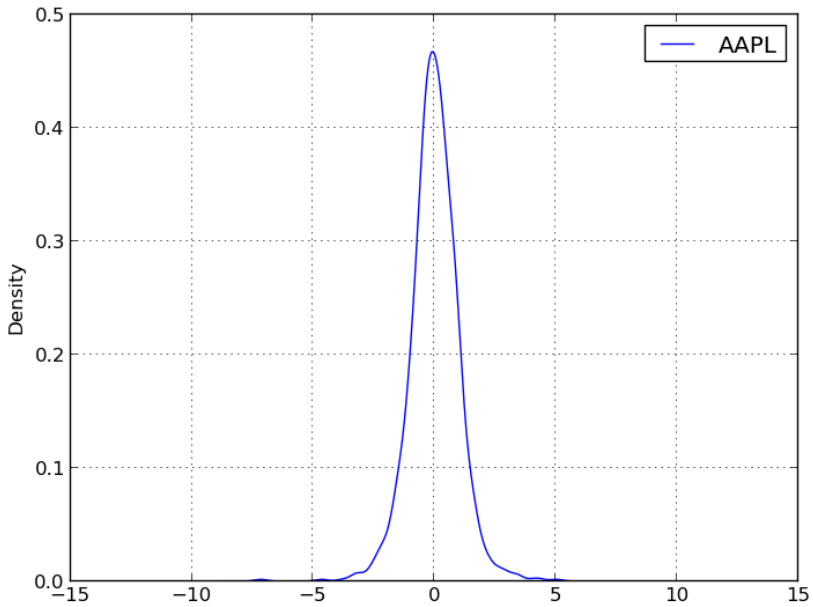

Figure 7: Density plot of standardized Apple stock

mean return: 0.104%
Mar 14,2014: 525.69
expectation for Mar 17: $524.69 \times (1 + 0.104\%) = 525.24$
$P(\text{AdjClose} >= 525.24) \approx 0.5$

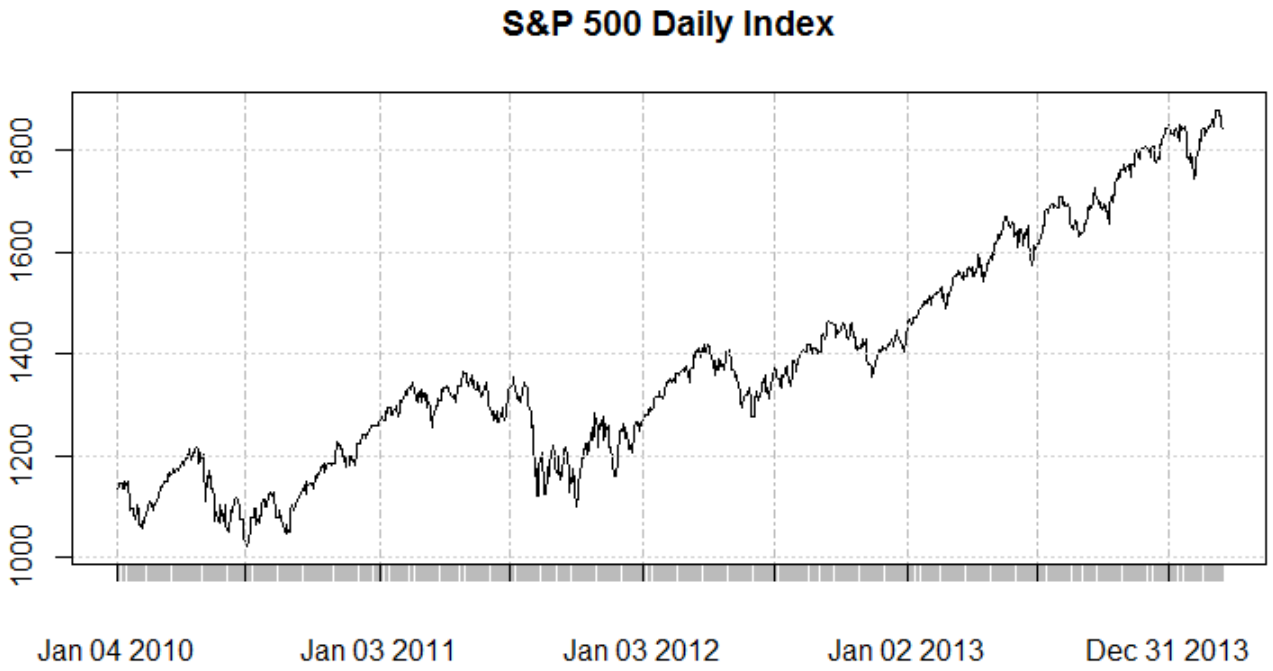

Figure 8: SP500 daily prices from Jan 4, 2010 to now

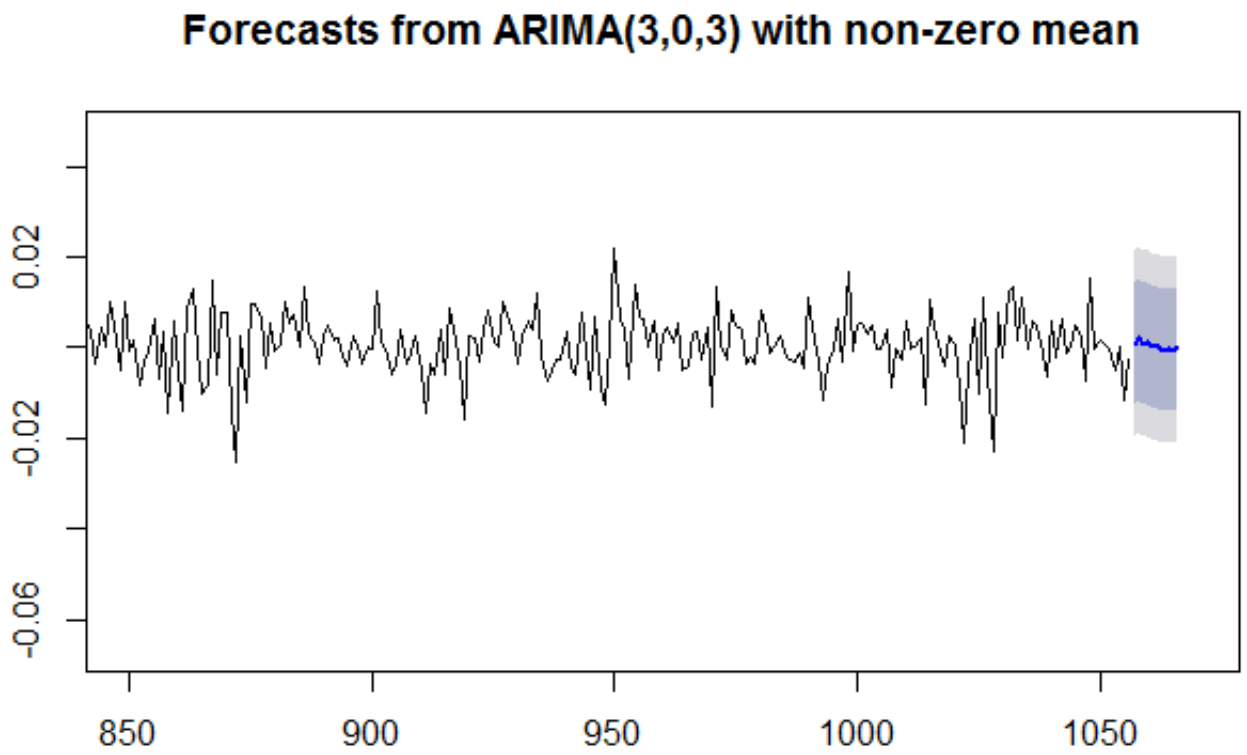

Figure 9: use ARIMA model to predict next 10-day daily return with 90% and 95% confidence interval

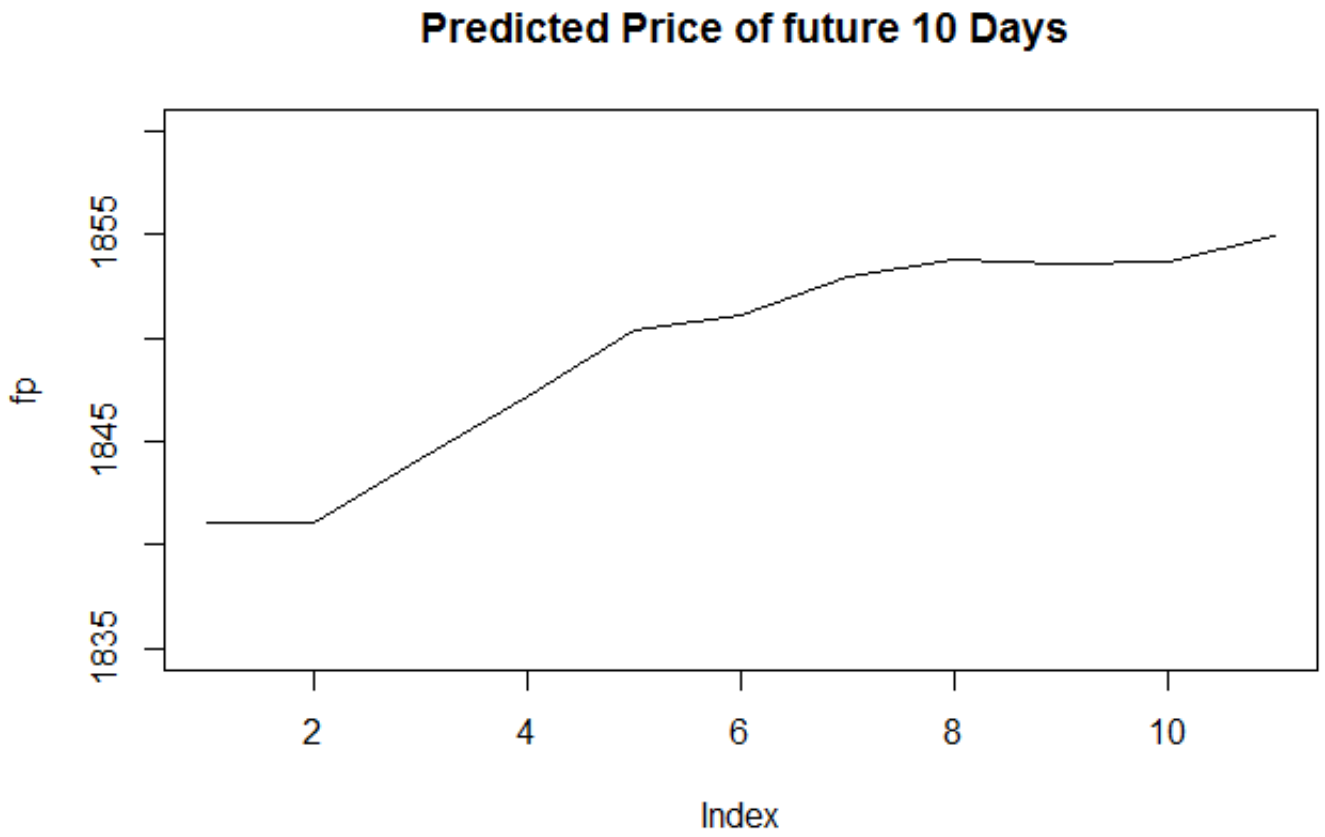

Figure 10: Predicted price of next 10 days based on predicted returns

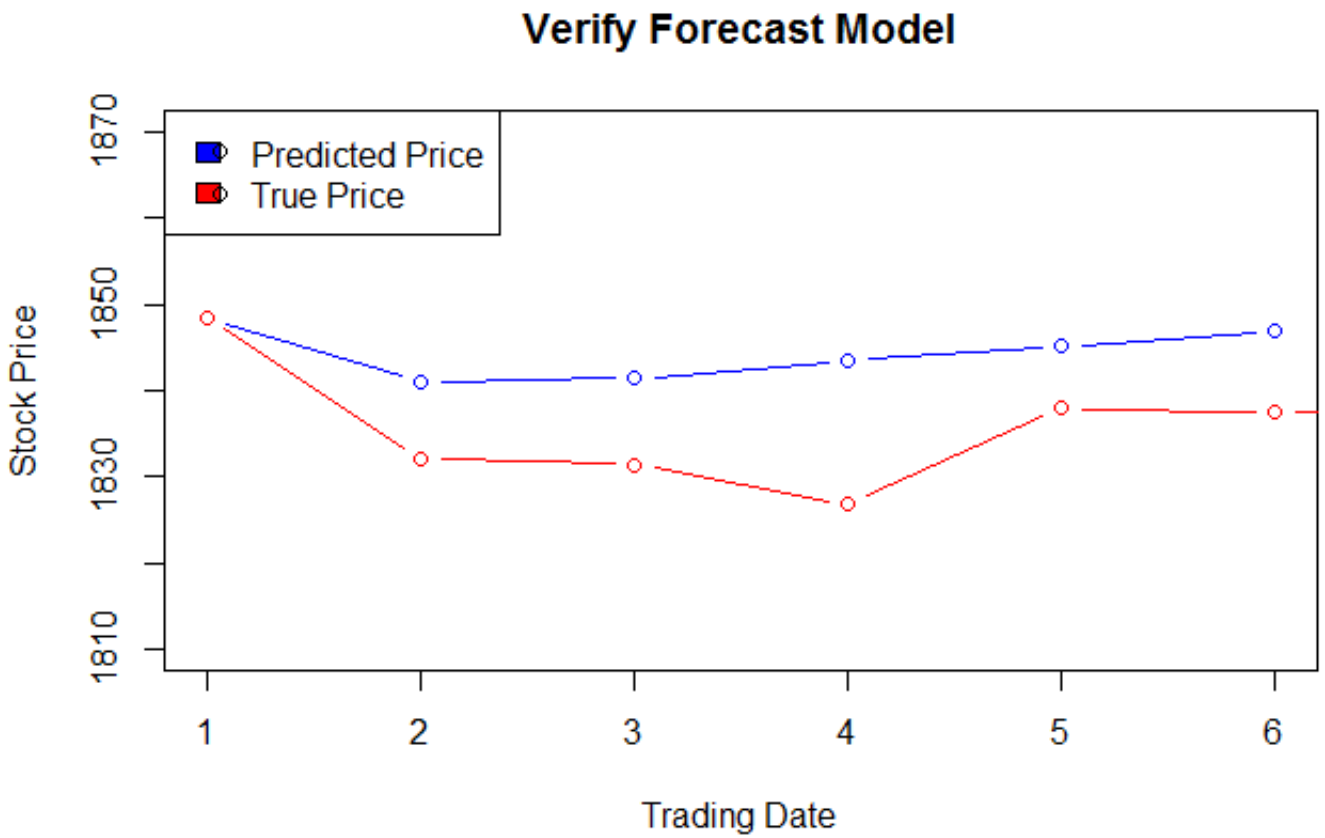

Figure 11: Use daily price from 2012 to 2013 as training set and first week of 2014 as testing set to verify the model

Thank You

Thank you!