CENTRAL WASHINGTON UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE

Project 2
Math 567

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Contents

1 Introduction

Say something about stock plotting here?
What is time series analysis? What is correlation? What are linear regression models?
Why is it useful, why do people do it? What reasons would we have for plotting closing prices?

1.1 Apple

Say something about apple stocks here.

1.2 Microsoft

Say something about Microsoft stocks here.

2 Methods

Describe data source: yahoo. Describe how we use 6 month intervals. Describe R environment. Describe methods we used to make graphs Describe method we used to make Time Series Analysis Describe method we use to do Correlation Describe method we use to do Regression

3 Results and Analysis

3.1 Overview

3.1.1 Apple overview Plots

Discuss

3.1.2 Microsoft overview Plots

Discuss

3.1.3 Superimposed ms and apple

Discuss

3.1.4 Correlation

Discuss correlation overall. Show additional correlation data such as with the index and with gold and oil and other commodities.

3.2 January - June 2011

3.2.1 Plots

Discuss apple chart Discuss Microsoft chart

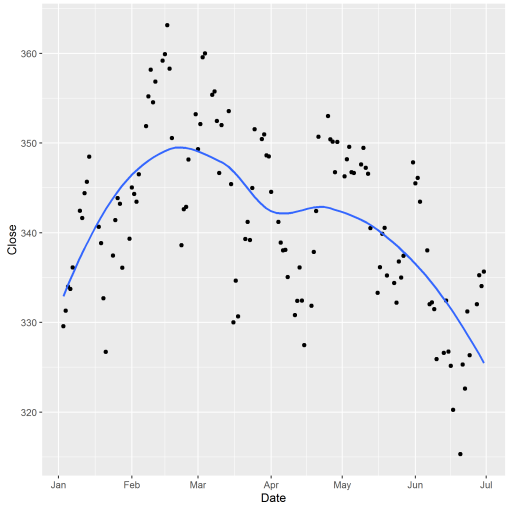

Figure 3.1: Scatter plot with graph of Apple stock

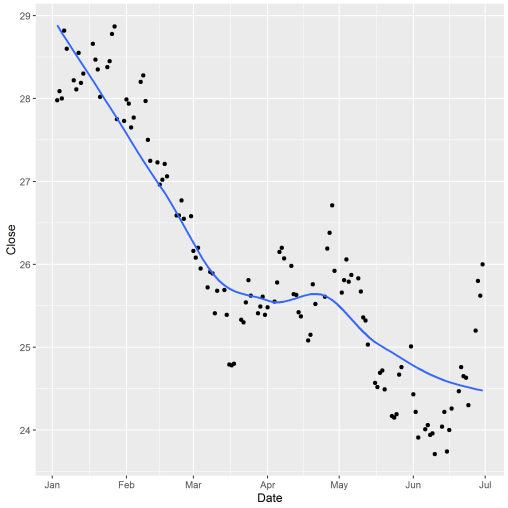

Figure 3.2: Scatter plot with graph of Microsoft stock

3.2.2 Correlation

	MSFT	AAPL	IXIC	NDX
MSFT	1.0000000	0.3445364	0.1506836	0.2355084
AAPL	0.3445364	1.0000000	0.6437584	0.7502995
IXIC	0.1506836	0.6437584	1.0000000	0.9818467
NDX	0.2355084	0.7502995	0.9818467	1.0000000

Figure 3.3: Correlation table for Microsoft and Apple against two index stocks

Insert correlation table MS vs apple Discuss any interesting overall observations here

3.2.3 Regression

Show regression lines for MS and apple.
Discuss regression lines.
List y intercept, slope overall.

3.2.4 Analysis

Discuss any interesting overall observations here

3.3 July - December 2011

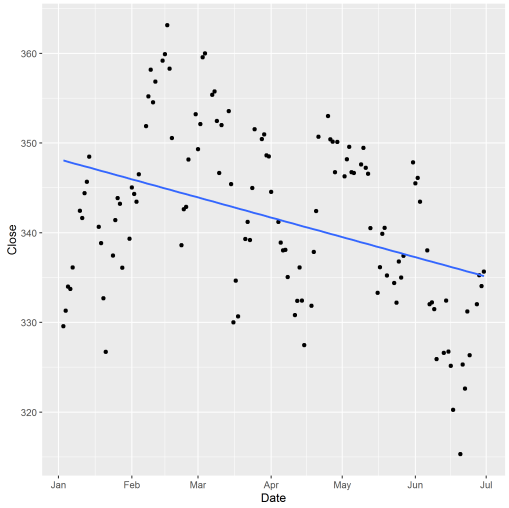

Figure 3.4: Linear regression line of Apple closing prices.

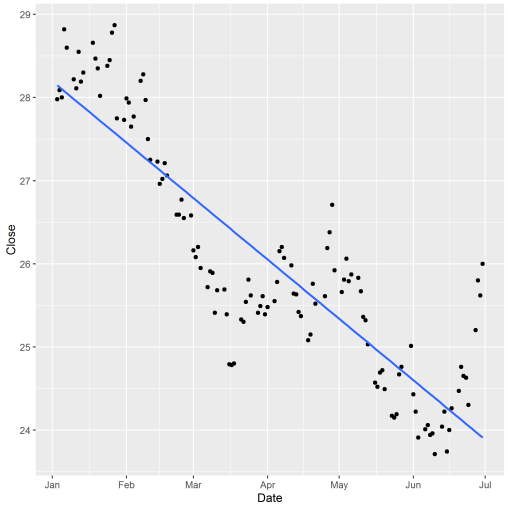

Figure 3.5: Linear regression line of Microsoft closing prices.

```
Call:
lm(formula = AAPL.df$AAPL.Close ~ date)

Residuals:
    Min      1Q  Median      3Q     Max
-20.584  -5.836  -1.212   8.254  18.250

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 348.20967    1.59788 217.920  < 2e-16 ***
date         -0.07239    0.01523  -4.754 5.46e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 8.871 on 123 degrees of freedom
Multiple R-squared:  0.1552,    Adjusted R-squared:  0.1484
F-statistic:  22.6 on 1 and 123 DF,  p-value: 5.461e-06
```

Figure 3.6: Linear regression line of Apple closing prices.

```
Call:
lm(formula = MSFT.df$MSFT.Close ~ date)

Residuals:
     Min       1Q   Median       3Q      Max
-1.64314 -0.47328 -0.05564  0.50645  2.09172

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 28.195772   0.122016  231.08   <2e-16 ***
date        -0.023819   0.001163  -20.49   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.6774 on 123 degrees of freedom
Multiple R-squared:  0.7734,    Adjusted R-squared:  0.7715
F-statistic: 419.8 on 1 and 123 DF,  p-value: < 2.2e-16
```

Figure 3.7: Linear regression line of Microsoft closing prices.

3.3.1 Plots

Discuss apple chart Discuss Microsoft chart

3.3.2 Correlation

Insert correlation table MS vs apple Discuss any interesting overall observations here

3.3.3 Regression

Show regression lines for MS and apple.
Discuss regression lines.
List y intercept, slope overall.

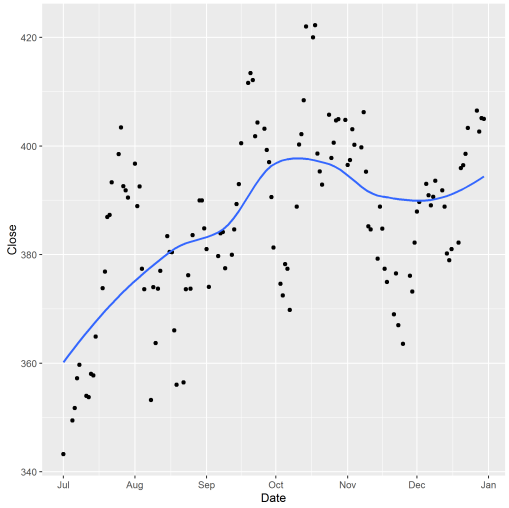

Figure 3.8: Scatter plot with graph of Apple stock

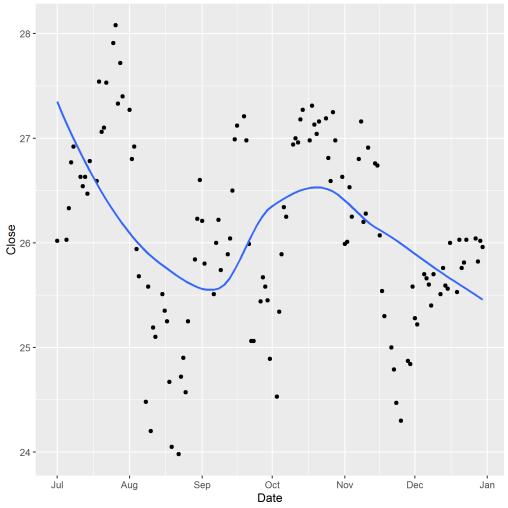

Figure 3.9: Scatter plot with graph of Microsoft stock

	MSFT	AAPL	IXIC	NDX
MSFT	1.0000000	0.4448634	0.7773338	0.8391909
AAPL	0.4448634	1.0000000	0.1168616	0.3659684
IXIC	0.7773338	0.1168616	1.0000000	0.9476133
NDX	0.8391909	0.3659684	0.9476133	1.0000000

Figure 3.10: Correlation table for Microsoft and Apple against two index stocks

3.3.4 Analysis

Discuss any interesting overall observations here
Discuss any interesting overall observations here

3.4 January - June 2012

3.4.1 Plots

Discuss apple chart Discuss Microsoft chart

3.4.2 Correlation

Insert correlation table MS vs apple Discuss any interesting overall observations here

3.4.3 Regression

Show regression lines for MS and apple.

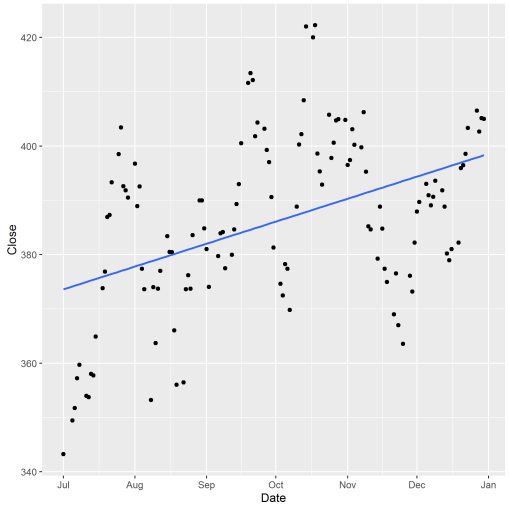

Figure 3.11: Linear regression line of Apple closing prices.

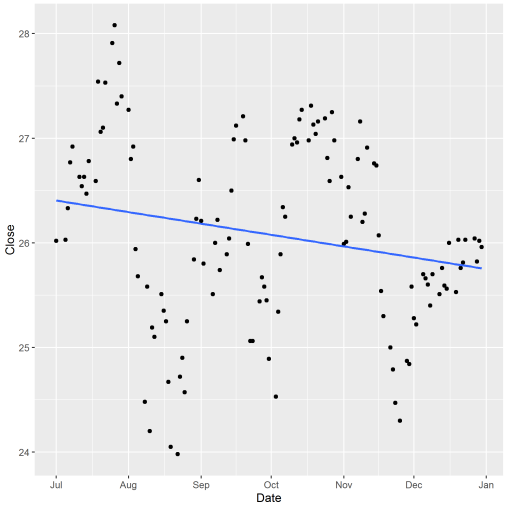

Figure 3.12: Linear regression line of Microsoft closing prices.

```
Call:
lm(formula = AAPL.df$AAPL.Close ~ date)

Residuals:
    Min      1Q  Median      3Q     Max
-30.350  -9.997  -0.639  10.834  34.140

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 373.61006    2.60261 143.552  < 2e-16 ***
date          0.13572    0.02467   5.501 2.04e-07 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 14.56 on 125 degrees of freedom
Multiple R-squared:  0.1949,    Adjusted R-squared:  0.1885
F-statistic: 30.27 on 1 and 125 DF,  p-value: 2.038e-07
```

Figure 3.13: Linear regression line of Apple closing prices.

```
Call:
lm(formula = MSFT.df$MSFT.Close ~ date)

Residuals:
     Min       1Q   Median       3Q      Max
-2.23936 -0.58976  0.03914  0.74489  1.76448

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 26.404567   0.156393 168.835   <2e-16 ***
date        -0.003562   0.001482  -2.403   0.0177 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.8747 on 125 degrees of freedom
Multiple R-squared:  0.04414,   Adjusted R-squared:  0.0365
F-statistic: 5.773 on 1 and 125 DF,  p-value: 0.01775
```

Figure 3.14: Linear regression line of Microsoft closing prices.

Discuss regression lines.
List y intercept, slope overall.

3.4.4 Analysis

Discuss any interesting overall observations here

3.5 July - December 2012

3.5.1 Plots

Discuss apple chart Discuss Microsoft chart

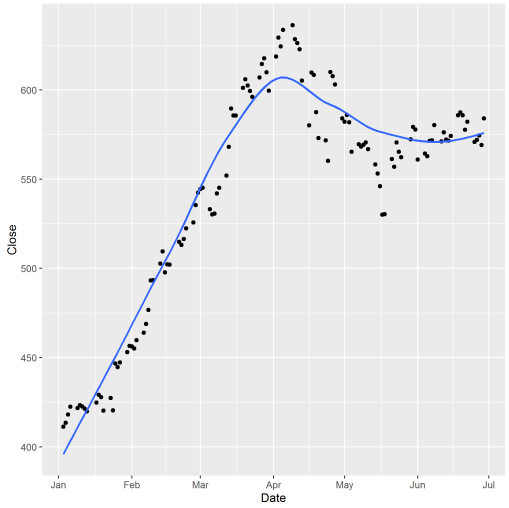

Figure 3.15: Scatter plot with graph of Apple stock

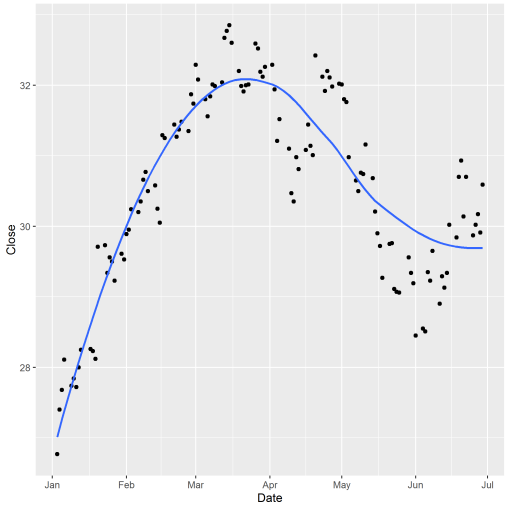

Figure 3.16: Scatter plot with graph of Microsoft stock

	MSFT	AAPL	IXIC	NDX
MSFT	1.0000000	0.6185238	0.9321473	0.8966496
AAPL	0.6185238	1.0000000	0.7417850	0.8486539
IXIC	0.9321473	0.7417850	1.0000000	0.9820017
NDX	0.8966496	0.8486539	0.9820017	1.0000000

Figure 3.17: Correlation table for Microsoft and Apple against two index stocks

3.5.2 Correlation

Insert correlation table MS vs apple Discuss any interesting overall observations here

3.5.3 Regression

Show regression lines for MS and apple.
Discuss regression lines.
List y intercept, slope overall.

3.5.4 Analysis

Discuss any interesting overall observations here

3.6 January - June 2013

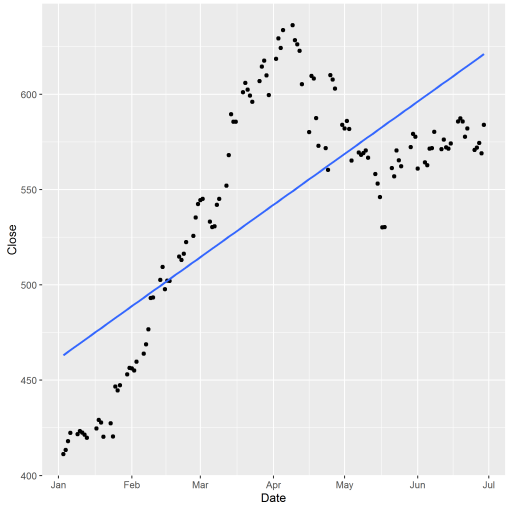

Figure 3.18: Linear regression line of Apple closing prices.

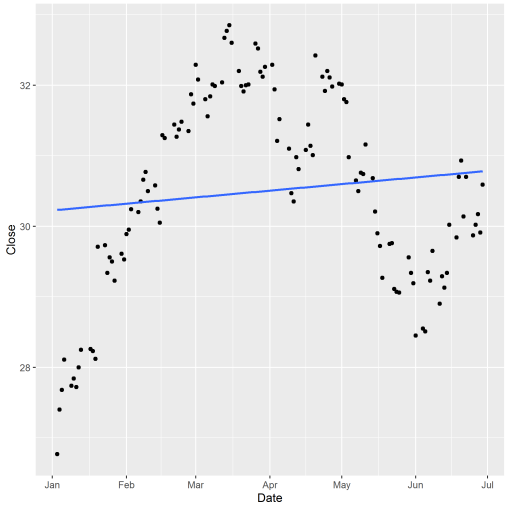

Figure 3.19: Linear regression line of Microsoft closing prices.

```
Call:
lm(formula = AAPL.df$AAPL.Close ~ date)

Residuals:
    Min      1Q  Median      3Q     Max
-61.366 -34.644  -6.672  28.714  88.003

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 461.36370    7.73048   59.68   <2e-16 ***
date          0.88750    0.07332   12.10   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 42.74 on 123 degrees of freedom
Multiple R-squared:  0.5436,    Adjusted R-squared:  0.5399
F-statistic: 146.5 on 1 and 123 DF,  p-value: < 2.2e-16
```

Figure 3.20: Linear regression line of Apple closing prices.

```
Call:
lm(formula = MSFT.df$MSFT.Close ~ date)

Residuals:
    Min      1Q  Median      3Q     Max
-3.4623 -0.9275  0.0333  1.3432  2.3962

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 30.226163   0.252425 119.743   <2e-16 ***
date         0.003075   0.002394   1.285    0.201
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.395 on 123 degrees of freedom
Multiple R-squared:  0.01324,   Adjusted R-squared:  0.005215
F-statistic:  1.65 on 1 and 123 DF,  p-value: 0.2014
```

Figure 3.21: Linear regression line of Microsoft closing prices.

3.6.1 Plots

Discuss apple chart Discuss Microsoft chart

3.6.2 Correlation

Insert correlation table MS vs apple Discuss any interesting overall observations here

3.6.3 Regression

Show regression lines for MS and apple.
Discuss regression lines.
List y intercept, slope overall.

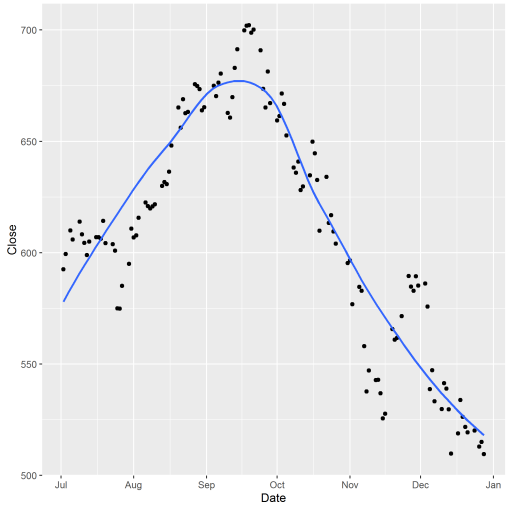

Figure 3.22: Scatter plot with graph of Apple stock

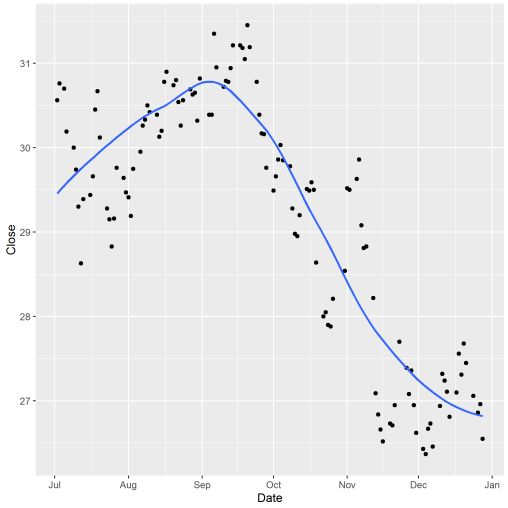

Figure 3.23: Scatter plot with graph of Microsoft stock

	MSFT	AAPL	IXIC	NDX
MSFT	1.0000000	0.8350667	0.5190070	0.6250235
AAPL	0.8350667	1.0000000	0.7089352	0.8036774
IXIC	0.5190070	0.7089352	1.0000000	0.9813014
NDX	0.6250235	0.8036774	0.9813014	1.0000000

Figure 3.24: Correlation table for Microsoft and Apple against two index stocks

3.6.4 Analysis

Discuss any interesting observations here.

3.7 July - December 2013

3.7.1 Plots

Discuss apple chart Discuss Microsoft chart

3.7.2 Correlation

Insert correlation table MS vs apple Discuss any interesting overall observations here

3.7.3 Regression

Show regression lines for MS and apple.
Discuss regression lines.

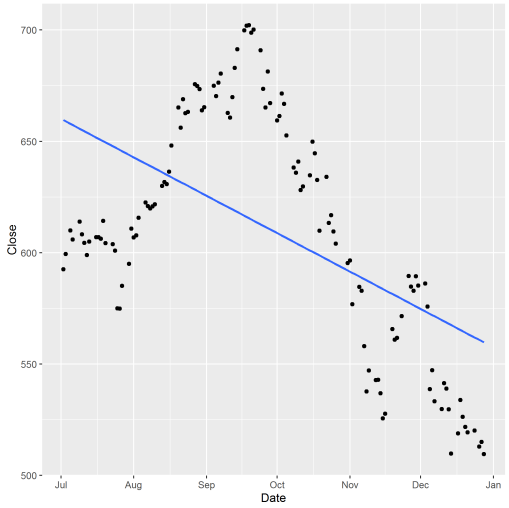

Figure 3.25: Linear regression line of Apple closing prices.

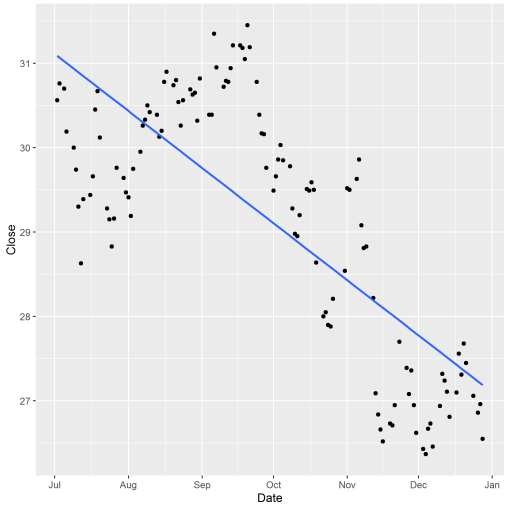

Figure 3.26: Linear regression line of Microsoft closing prices.

```
Call:
lm(formula = AAPL.df$AAPL.Close ~ date)

Residuals:
    Min      1Q  Median      3Q     Max
-71.748 -41.833  -4.425  37.359  86.605

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 660.09874    7.85069  84.082  < 2e-16 ***
date         -0.55754    0.07557  -7.377 2.15e-11 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 43.94 on 122 degrees of freedom
Multiple R-squared:  0.3085,    Adjusted R-squared:  0.3028
F-statistic: 54.43 on 1 and 122 DF,  p-value: 2.154e-11
```

Figure 3.27: Linear regression line of Apple closing prices.

```
Call:
lm(formula = MSFT.df$MSFT.Close ~ date)

Residuals:
     Min       1Q   Median       3Q      Max
-2.24043 -0.78367  0.00396  0.78122  2.10467

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 31.110083   0.173810  178.99   <2e-16 ***
date        -0.021787   0.001673  -13.02   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.9728 on 122 degrees of freedom
Multiple R-squared:  0.5816,    Adjusted R-squared:  0.5781
F-statistic: 169.6 on 1 and 122 DF,  p-value: < 2.2e-16
```

Figure 3.28: Linear regression line of Microsoft closing prices.

List y intercept, slope overall.

3.7.4 Analysis

Discuss any interesting overall observations here

3.8 January - June 2014

3.8.1 Plots

Discuss apple chart Discuss Microsoft chart

3.8.2 Correlation

Insert correlation table MS vs apple Discuss any interesting overall observations here

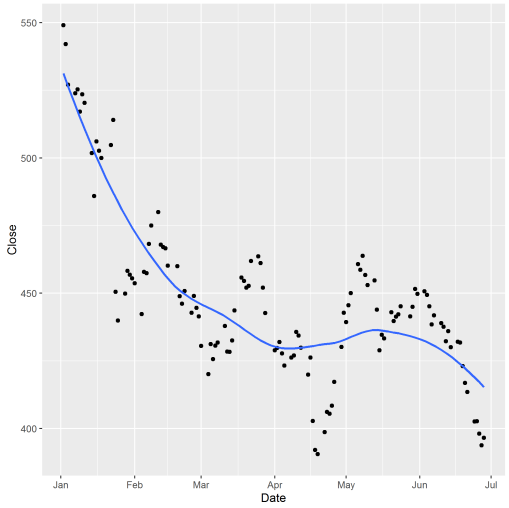

Figure 3.29: Scatter plot with graph of Apple stock

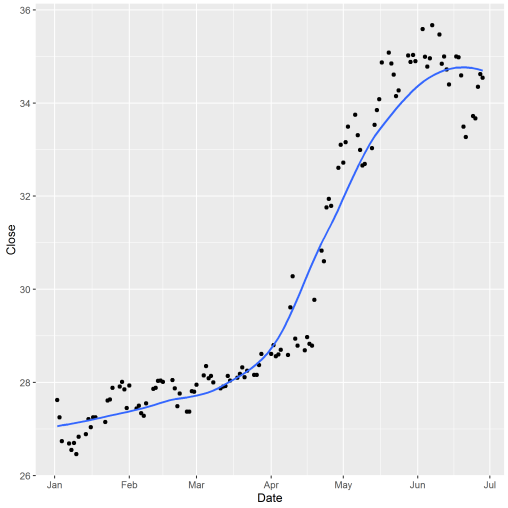

Figure 3.30: Scatter plot with graph of Microsoft stock

	MSFT	AAPL	IXIC	NDX
MSFT	1.0000000	-0.4422400	0.9486100	0.9423945
AAPL	-0.4422400	1.0000000	-0.4387663	-0.3454218
IXIC	0.9486100	-0.4387663	1.0000000	0.9897863
NDX	0.9423945	-0.3454218	0.9897863	1.0000000

Figure 3.31: Correlation table for Microsoft and Apple against two index stocks

3.8.3 Regression

Show regression lines for MS and apple.
Discuss regression lines.
List y intercept, slope overall.

3.8.4 Analysis

Discuss any interesting overall observations here
Discuss any interesting overall observations here

3.9 July - December 2014

3.9.1 Plots

Discuss apple chart Discuss Microsoft chart

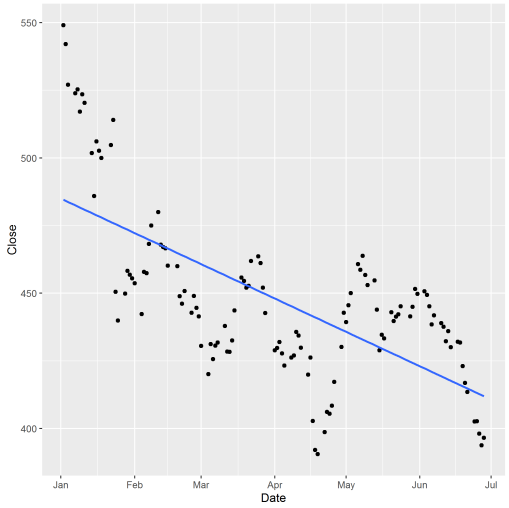

Figure 3.32: Linear regression line of Apple closing prices.

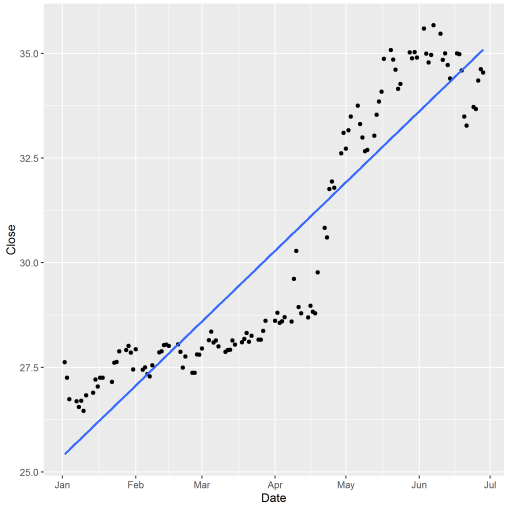

Figure 3.33: Linear regression line of Microsoft closing prices.

```
Call:
lm(formula = AAPL.df$AAPL.Close ~ date)

Residuals:
    Min      1Q  Median      3Q     Max
-50.122 -18.123  -0.312  17.593  64.483

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 484.95766    4.22671  114.74   <2e-16 ***
date         -0.41024    0.04058  -10.11   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 23.41 on 122 degrees of freedom
Multiple R-squared:  0.4558,    Adjusted R-squared:  0.4514
F-statistic: 102.2 on 1 and 122 DF,  p-value: < 2.2e-16
```

Figure 3.34: Linear regression line of Apple closing prices.

```
Call:
lm(formula = MSFT.df$MSFT.Close ~ date)

Residuals:
    Min      1Q  Median      3Q     Max
-2.4237 -1.1220  0.2174  1.0014  2.1917

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 25.373761   0.217740  116.53   <2e-16 ***
date         0.054579   0.002091   26.11   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.206 on 122 degrees of freedom
Multiple R-squared:  0.8482,    Adjusted R-squared:  0.8469
F-statistic: 681.6 on 1 and 122 DF,  p-value: < 2.2e-16
```

Figure 3.35: Linear regression line of Microsoft closing prices.

3.9.2 Correlation

Insert correlation table MS vs apple Discuss any interesting overall observations here

3.9.3 Regression

Show regression lines for MS and apple.
Discuss regression lines.
List y intercept, slope overall.

3.9.4 Analysis

Discuss any interesting overall observations here
Discuss any interesting overall observations here

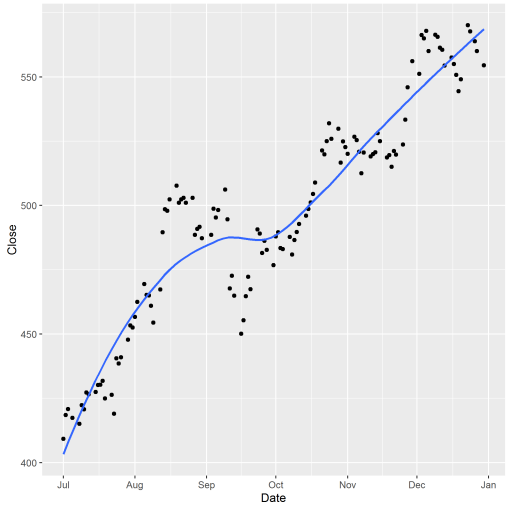

Figure 3.36: Scatter plot with graph of Apple stock

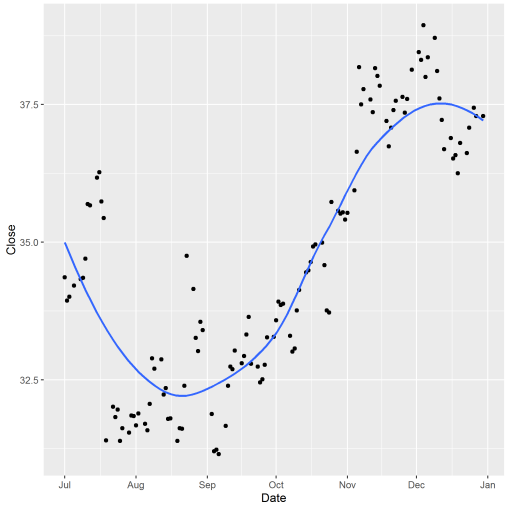

Figure 3.37: Scatter plot with graph of Microsoft stock

	MSFT	AAPL	IXIC	NDX
MSFT	1.0000000	0.6333784	0.7602917	0.7761854
AAPL	0.6333784	1.0000000	0.8935789	0.9031647
IXIC	0.7602917	0.8935789	1.0000000	0.9985740
NDX	0.7761854	0.9031647	0.9985740	1.0000000

Figure 3.38: Correlation table for Microsoft and Apple against two index stocks

3.10 January - June 2015

3.10.1 Plots

Discuss apple chart Discuss Microsoft chart

3.10.2 Correlation

Insert correlation table MS vs apple Discuss any interesting overall observations here

3.10.3 Regression

Show regression lines for MS and apple.
Discuss regression lines.
List y intercept, slope overall.

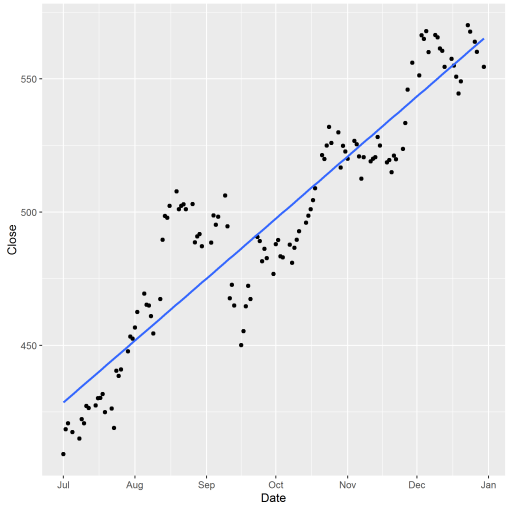

Figure 3.39: Linear regression line of Apple closing prices.

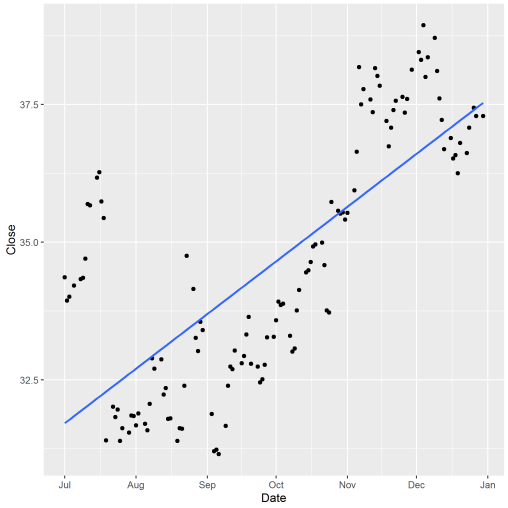

Figure 3.40: Linear regression line of Microsoft closing prices.

```
Call:
lm(formula = AAPL.df$AAPL.Close ~ date)

Residuals:
    Min      1Q  Median      3Q     Max
-36.260 -11.771  -3.285  10.370  42.375

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 428.58840    2.88583  148.51   <2e-16 ***
date          0.75055    0.02773   27.06   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 16.35 on 125 degrees of freedom
Multiple R-squared:  0.8542,    Adjusted R-squared:  0.8531
F-statistic: 732.5 on 1 and 125 DF,  p-value: < 2.2e-16
```

Figure 3.41: Linear regression line of Apple closing prices.

```
Call:
lm(formula = MSFT.df$MSFT.Close ~ date)

Residuals:
    Min      1Q  Median      3Q     Max
-2.7039 -1.0700 -0.3028  1.1713  4.0789

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 31.711446   0.272269  116.47   <2e-16 ***
date         0.031976   0.002616   12.22   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.543 on 125 degrees of freedom
Multiple R-squared:  0.5444,    Adjusted R-squared:  0.5407
F-statistic: 149.4 on 1 and 125 DF,  p-value: < 2.2e-16
```

Figure 3.42: Linear regression line of Microsoft closing prices.

3.10.4 Analysis

Discuss any interesting overall observations here

3.11 July - December 2015

3.11.1 Plots

Discuss apple chart Discuss Microsoft chart

3.11.2 Correlation

Insert correlation table MS vs apple Discuss any interesting overall observations here

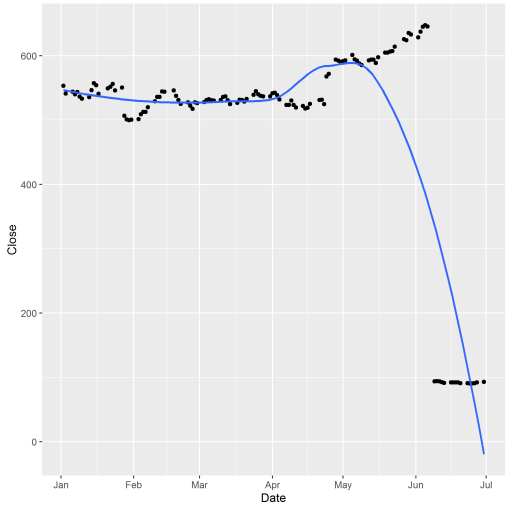

Figure 3.43: Scatter plot with graph of Apple stock

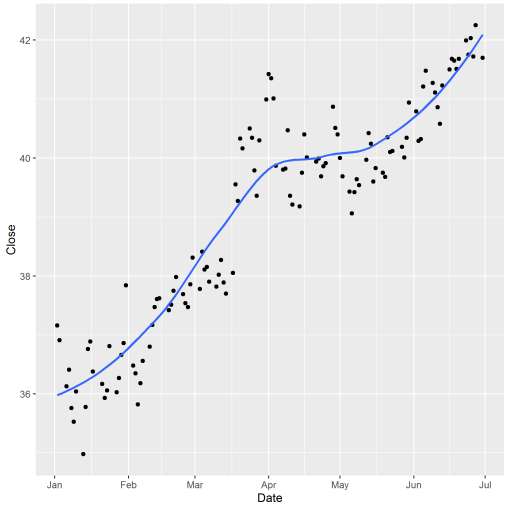

Figure 3.44: Scatter plot with graph of Microsoft stock

	MSFT	AAPL	IXIC	NDX
MSFT	1.0000000	-0.4096498	0.3273532	0.5376690
AAPL	-0.4096498	1.0000000	-0.5364466	-0.5781071
IXIC	0.3273532	-0.5364466	1.0000000	0.9294151
NDX	0.5376690	-0.5781071	0.9294151	1.0000000

Figure 3.45: Correlation table for Microsoft and Apple against two index stocks

3.11.3 Regression

Show regression lines for MS and apple.
Discuss regression lines.
List y intercept, slope overall.

3.11.4 Analysis

Discuss any interesting overall observations here

3.12 Forecasting and Analysis

Describe how well the models work for the performance over the next 6 months.

4 Conclusions

Discuss anything particularly interesting.

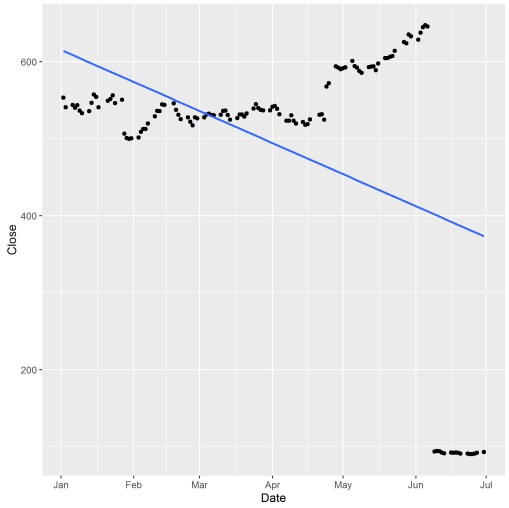

Figure 3.46: Linear regression line of Apple closing prices.

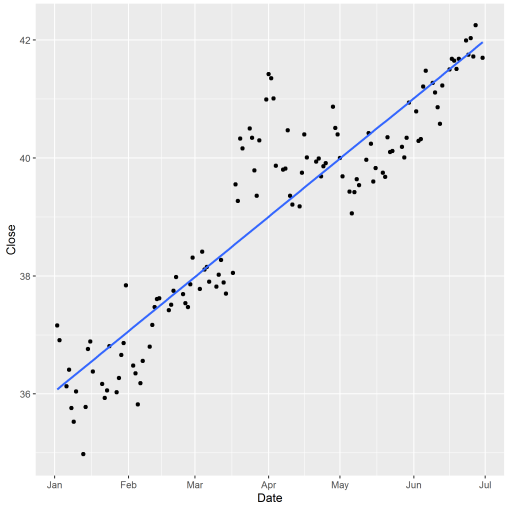

Figure 3.47: Linear regression line of Microsoft closing prices.

```
Call:
lm(formula = AAPL.df$AAPL.Close ~ date)

Residuals:
     Min       1Q   Median       3Q      Max
-307.915  -54.767    6.549   75.249  240.358

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 615.3549    25.9727  23.692  < 2e-16 ***
date         -1.3443     0.2488  -5.403  3.3e-07 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 143.4 on 122 degrees of freedom
Multiple R-squared:  0.1931,    Adjusted R-squared:  0.1865
F-statistic: 29.19 on 1 and 122 DF,  p-value: 3.298e-07
```

Figure 3.48: Linear regression line of Apple closing prices.

```
Call:
lm(formula = MSFT.df$MSFT.Close ~ date)

Residuals:
     Min       1Q   Median       3Q      Max
-1.46041 -0.54052 -0.08736  0.28590  2.41396

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 36.04570    0.13462  267.75   <2e-16 ***
date         0.03289    0.00129   25.51   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.7435 on 122 degrees of freedom
Multiple R-squared:  0.8421,    Adjusted R-squared:  0.8408
F-statistic: 650.5 on 1 and 122 DF,  p-value: < 2.2e-16
```

Figure 3.49: Linear regression line of Microsoft closing prices.

Talk about how short term stock analysis is more likely to be useful due to stocks being similar to chaotic systems with little long term predictability.
Discuss how linear models are not likely to be best and future work should focus on better models.
What did we just do?

References

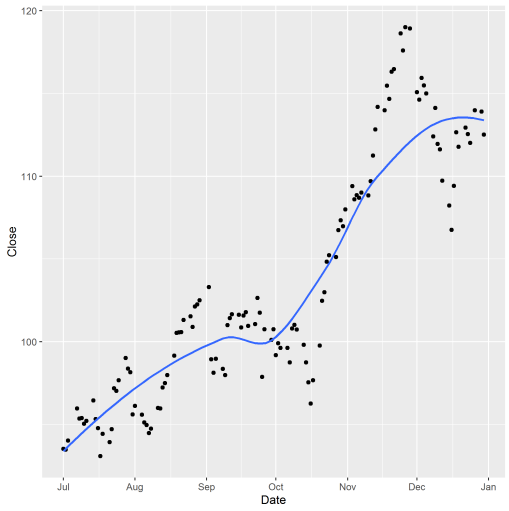

Figure 3.50: Scatter plot with graph of Apple stock

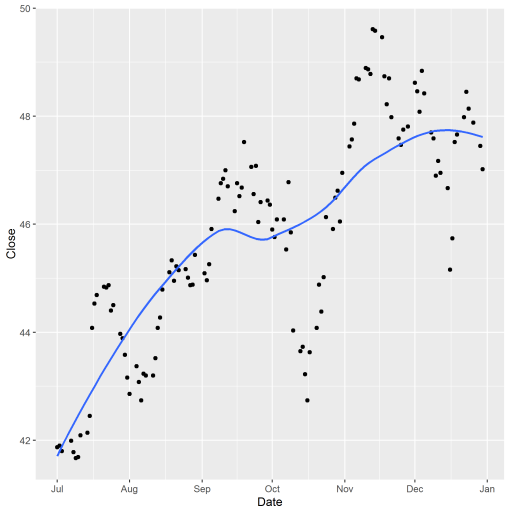

Figure 3.51: Scatter plot with graph of Microsoft stock

	MSFT	AAPL	IXIC	NDX
MSFT	1.0000000	0.8404415	0.8113685	0.3607278
AAPL	0.8404415	1.0000000	0.8621569	0.4642707
IXIC	0.8113685	0.8621569	1.0000000	0.5389417
NDX	0.3607278	0.4642707	0.5389417	1.0000000

Figure 3.52: Correlation table for Microsoft and Apple against two index stocks

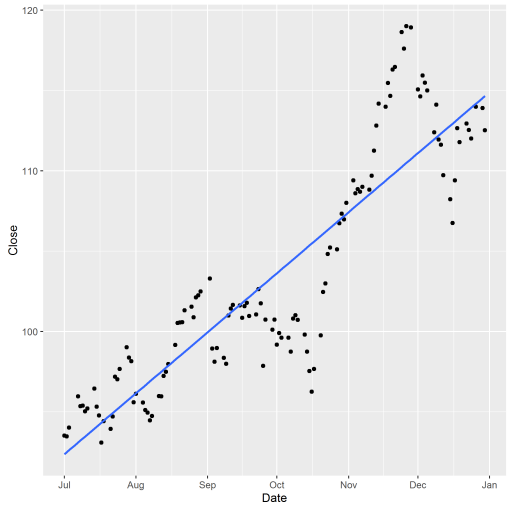

Figure 3.53: Linear regression line of Apple closing prices.

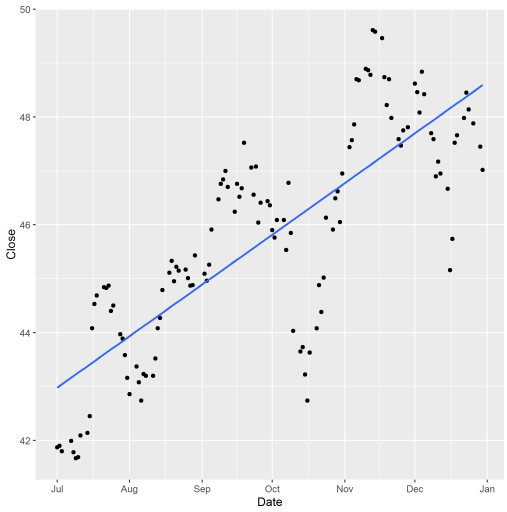

Figure 3.54: Linear regression line of Microsoft closing prices.

```
Call:
lm(formula = AAPL.df$AAPL.Close ~ date)

Residuals:
    Min      1Q  Median      3Q     Max
-9.2139 -1.7646 -0.0648  2.1004  8.5046

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 92.36904    0.59108  156.27   <2e-16 ***
date         0.12248    0.00566   21.64   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.338 on 125 degrees of freedom
Multiple R-squared:  0.7893,    Adjusted R-squared:  0.7876
F-statistic: 468.3 on 1 and 125 DF,  p-value: < 2.2e-16
```

Figure 3.55: Linear regression line of Apple closing prices.

```
Call:
lm(formula = MSFT.df$MSFT.Close ~ date)

Residuals:
    Min      1Q  Median      3Q     Max
-3.5401 -0.9211  0.1323  0.8929  2.4662

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 42.979319   0.221941  193.65   <2e-16 ***
date         0.030848   0.002125   14.52   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.253 on 125 degrees of freedom
Multiple R-squared:  0.6277,    Adjusted R-squared:  0.6247
F-statistic: 210.7 on 1 and 125 DF,  p-value: < 2.2e-16
```

Figure 3.56: Linear regression line of Microsoft closing prices.

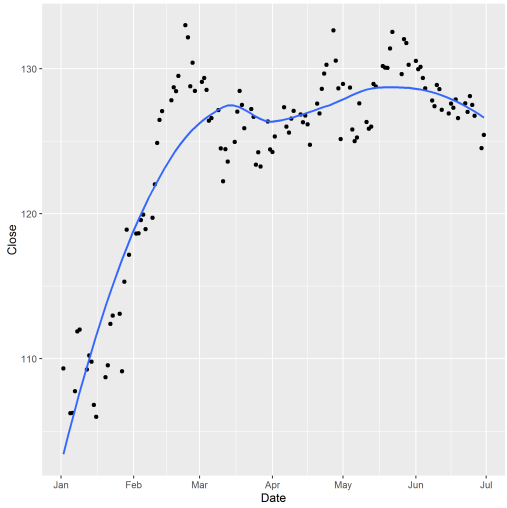

Figure 3.57: Scatter plot with graph of Apple stock

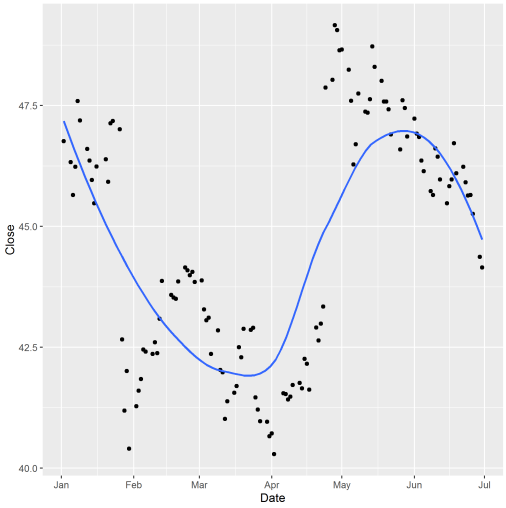

Figure 3.58: Scatter plot with graph of Microsoft stock

	MSFT	AAPL	IXIC	NDX
MSFT	1.00000000	0.02779751	0.2670101	0.08026199
AAPL	0.02779751	1.00000000	0.8950548	0.29240687
IXIC	0.26701007	0.89505479	1.0000000	0.41574385
NDX	0.08026199	0.29240687	0.4157439	1.00000000

Figure 3.59: Correlation table for Microsoft and Apple against two index stocks

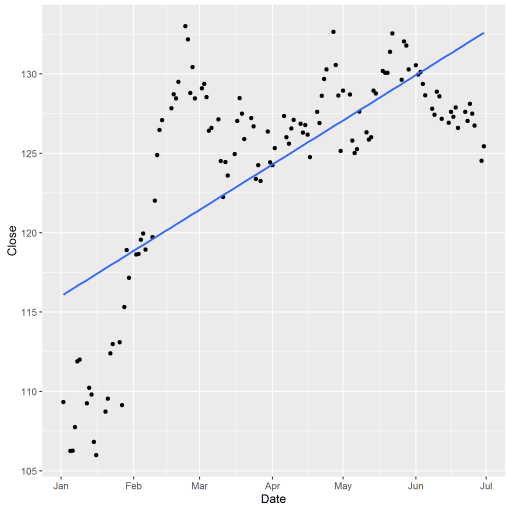

Figure 3.60: Linear regression line of Apple closing prices.

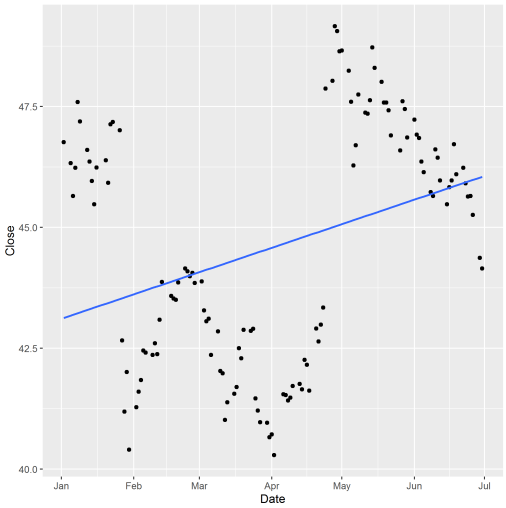

Figure 3.61: Linear regression line of Microsoft closing prices.

```
Call:
lm(formula = AAPL.df$AAPL.Close ~ date)

Residuals:
    Min      1Q  Median      3Q     Max
-11.400  -3.201   0.451   2.501  12.107

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 1.160e+02  8.803e-01  131.78   <2e-16 ***
date        9.219e-02  8.393e-03   10.98   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.839 on 122 degrees of freedom
Multiple R-squared:  0.4972,    Adjusted R-squared:  0.4931
F-statistic: 120.6 on 1 and 122 DF,  p-value: < 2.2e-16
```

Figure 3.62: Linear regression line of Apple closing prices.

```
Call:
lm(formula = MSFT.df$MSFT.Close ~ date)

Residuals:
    Min      1Q  Median      3Q     Max
-4.3056 -1.9056 -0.0607  2.1388  4.3641

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 43.111742   0.424893 101.465  < 2e-16 ***
date         0.016306   0.004051   4.025 9.92e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.336 on 122 degrees of freedom
Multiple R-squared:  0.1172,    Adjusted R-squared:  0.11
F-statistic:  16.2 on 1 and 122 DF,  p-value: 9.925e-05
```

Figure 3.63: Linear regression line of Microsoft closing prices.

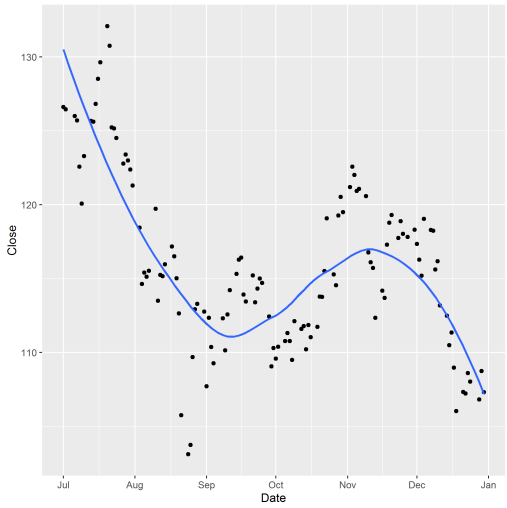

Figure 3.64: Scatter plot with graph of Apple stock

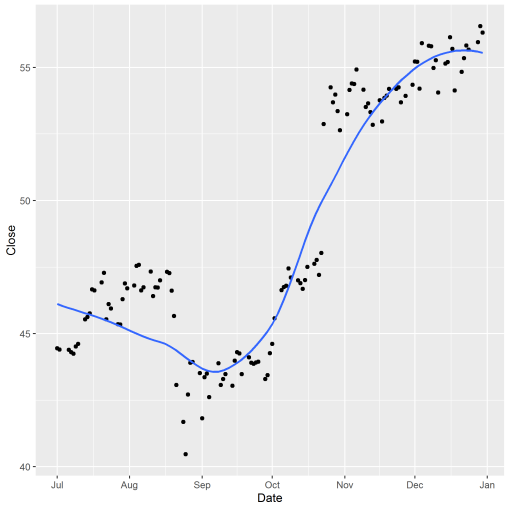

Figure 3.65: Scatter plot with graph of Microsoft stock

	MSFT	AAPL	IXIC	NDX
MSFT	1.000000000	-0.007284759	0.6024174	0.006118763
AAPL	-0.007284759	1.000000000	0.6558588	-0.360490379
IXIC	0.602417397	0.655858782	1.0000000	-0.324674116
NDX	0.006118763	-0.360490379	-0.3246741	1.000000000

Figure 3.66: Correlation table for Microsoft and Apple against two index stocks

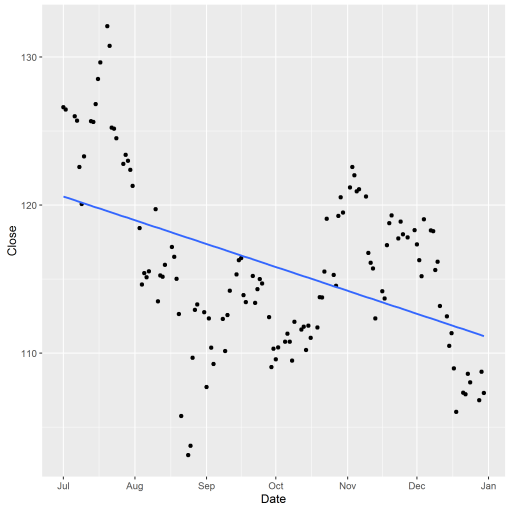

Figure 3.67: Linear regression line of Apple closing prices.

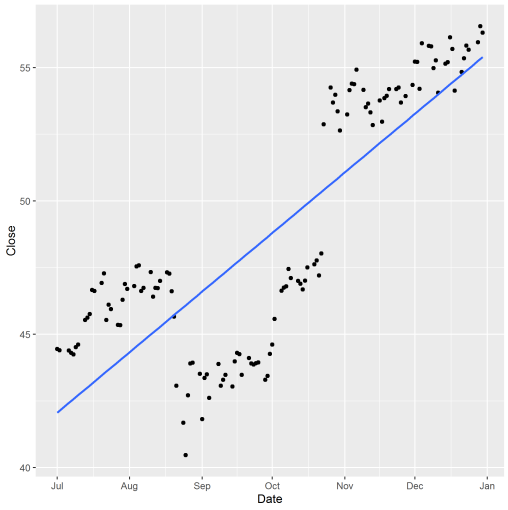

Figure 3.68: Linear regression line of Microsoft closing prices.

```
Call:
lm(formula = AAPL.df$AAPL.Close ~ date)

Residuals:
     Min       1Q   Median       3Q      Max
-14.6668  -3.7463  -0.9891   4.7623  12.4717

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 120.58172    0.92838 129.884  < 2e-16 ***
date         -0.05176    0.00886  -5.842  4.2e-08 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 5.229 on 125 degrees of freedom
Multiple R-squared:  0.2144,    Adjusted R-squared:  0.2082
F-statistic: 34.12 on 1 and 125 DF,  p-value: 4.204e-08
```

Figure 3.69: Linear regression line of Apple closing prices.

```
Call:
lm(formula = MSFT.df$MSFT.Close ~ date)

Residuals:
   Min     1Q Median     3Q    Max
-5.621 -2.668  1.227  1.987  3.754

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 42.060826   0.482157   87.23   <2e-16 ***
date         0.073270   0.004602   15.92   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.716 on 125 degrees of freedom
Multiple R-squared:  0.6698,    Adjusted R-squared:  0.6671
F-statistic: 253.5 on 1 and 125 DF,  p-value: < 2.2e-16
```

Figure 3.70: Linear regression line of Microsoft closing prices.