



Adidas Stock Summary  
ADDYY  
2013-2018

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MDM4U1

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## Business Description

### **Mission Statement:**

The mission statement of Adidas is “to be the global leader in the sporting goods industry with brands built on a passion for sports and a sporting lifestyle. We are committed to continuously strengthening our brands and products to improve our competitive position”.

### **Strategy Overview:**

With ‘Creating the New’, Adidas will get closer to them than ever before. To achieve that, Adidas company has a plan based on three strategic choices:

- ✧ Speed: Adidas will become the first true fast sports company: Fast in satisfying consumer needs, fast in internal decision-making.
- ✧ Cities: Adidas have identified six key cities in which they want to grow share of mind, share of market and share of trend.
- ✧ Open source: Adidas will be the first sports brand that invites athletes, consumers and partners to be part of their brands.

### **Principal Competitors:**

Nike Inc.; Fila Holding S.p.A.; New Balance Corporation; Fortune Brands Inc.; Brunswick Corp.; PUMA AG; Amer Sports Oyj.

### **History:**

- The name Adidas is an abbreviation of the name of founder Adolf (“Adi”) Dassler. The Dassler family began manufacturing shoes after World War I. At the 1936 Berlin Olympics, the American track-and-field star Jesse Owens wore shoes that were reportedly a gift from Adi Dassler. Owens’s medal-winning performances increased awareness of the Dassler brand around the world.
- After the disruptions of World War II, Adi and his brother Rudolf (“Rudi”) strove to rebuild the Dassler firm, but a personal breach between the brothers had become irreparable by 1948. The business therefore split in two: Rudi’s company was eventually called Puma, while Adi’s became Adidas.
- Adidas grew steadily during the 1950s as association football (soccer) players switched to the company’s shoes, which were light in weight and featured screw-in cleats. The company then developed a line of sporting goods, introducing soccer footballs in 1963.
- Four years later Adidas began to produce apparel.
- For many years Adidas was the biggest name in athletic shoes, but competition increased during the 1970s, notably from newer firms such as Nike.
- Adi Dassler died in 1978, and the company experienced falling market shares during the 1980s, despite an innovative endorsement deal with the rap group Run-D.M.C., creators of the hit song “My Adidas” (1986). (The company was to ally with hip-hop again in a 2016 deal with the rapper and entrepreneur Kanye West.)

- Between 1990 and 1993 Adidas was owned by the scandal-tainted French business executive Bernard Tapie, who failed to revive it.
- The company was sold to investors who brought in another Frenchman, Robert Louis-Dreyfus, as chief executive officer and chairman. Under his leadership, Adidas acquired the Salomon Group in 1997. Although best known for winter sports products, Salomon also owned the golf supplier TaylorMade.
- Adidas was renamed Adidas-Salomon AG and moved into retailing, following the lead of Nike, in 2001.
- In 2004 the company entered a successful partnership with the clothing designer Stella McCartney.
- In 2005 Adidas sold Salomon but held on to the TaylorMade brand. The following year the corporate name was changed back to Adidas AG.

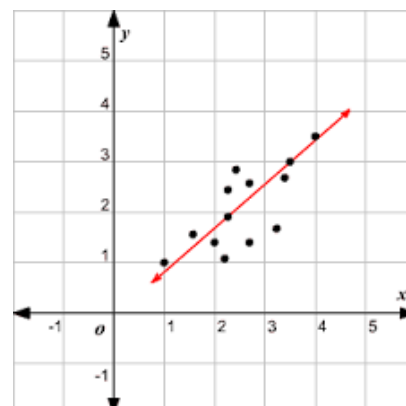
### Key Events and Dates:

DATES	KEY EVENTS
1926	Dassler family builds a factory to make athletic shoes.
1936	American runner Jesse Owens, wearing Dassler shoes, wins a gold medal in the 1936 Olympic Games.
1948	The Dassler brothers part ways, and Adi Dassler starts his own shoe company.
1949	Adidas is registered as a company.
1957	Adidas introduces a pioneering soccer shoe.
1978	Adi Dassler dies, and control of his company is handed to his family.
1990	French entrepreneur Bernard Tapie buys Adidas.
1993	Adidas acquires Sports Inc., a U.S. company; Tapie sells Adidas to a group of European investors, and Robert Louis-Dreyfus joins Adidas as CEO.
1995	Adidas goes public.
1997	Adidas acquires Salomon Worldwide and is renamed Adidas-Salomon AG.
2000	The company restructures in an effort to boost its image as a "lifestyle" brand.
2001	First Adidas Originals retail stores open in Berlin and Tokyo.
2002	The company acquires Arc'Teryx, a high-end equipment and apparel group based in Vancouver; opens first Adidas Originals store in United States.
2003	Cycling division Mavic-Adidas Cycling is formed; company fails in attempt to acquire golf ball manufacturer Top Flite.
2005	The company agrees to sell Salomon to AMER Sports in Finland; announces acquisition of Reebok International, to be completed in 2006.

## Mathematical Analysis Definitions

### Line of Best Fit

- A straight line that represents a trend in the scatter plot as long as the pattern is more or less linear.
- Should pass through as many points as possible, with about half the points above and half below.
- A solid line represents continuous data that are constantly changing.
- A dashed line represents continuous data that are constantly changing.



### Scatter plot

- A graph of plotted points that show the relationship between two sets of data.

### Linear Regression

- The formal process by which a line of best fit is mathematically determined.
- Equation:  $y = mx + b$  (m: slope, b: y-intercept)

n	represents number of term	
$\sum x$	represents the sum of x-values	$\sum y$ represents the sum of y-values
$\sum xy$	represents the sum of products = $x_1y_1 + x_2y_2 + \dots + x_ny_n$	$\sum x^2$ represents the sum of squared of x-values = $x_1^2 + \dots + x_n^2$

Slope of linear regression:

$$m = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

y-intercept of linear regression :

$$b = \frac{\sum y - m(\sum x)}{n}$$

### Linear Correlation

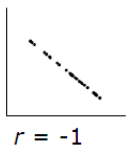
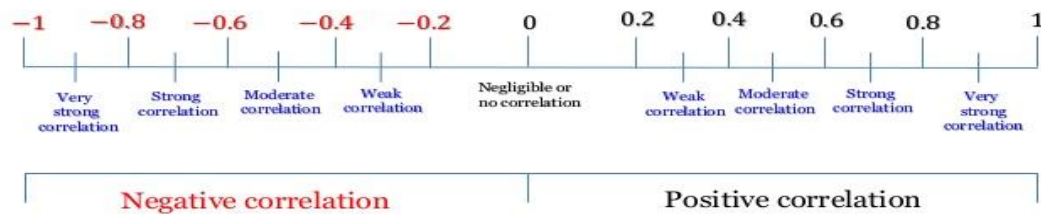
- A relationship in which a change in one variable tends to correspond to a proportional change in another variable.

## Correlation Coefficient ( $r$ )

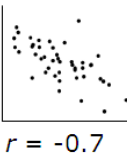
- A measure of how well a linear model fits a two-variable set of data.

### Correlation Coefficient Interpretation Guideline

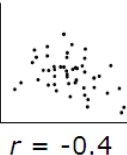
The correlation coefficient ( $r$ ) ranges from -1 (a perfect negative correlation) to 1 (a perfect positive correlation). In short,  $-1 \leq r \leq 1$ .



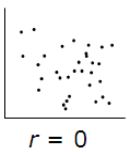
- A perfect negative correlation, the line of best fit has a negative slope.



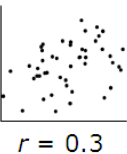
- A strong negative correlation, the line of best fit has a negative slope.



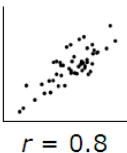
- A weak negative correlation, the line of best fit has a negative slope.



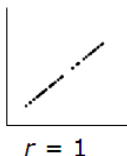
- There is no linear correlation.



- A weak positive correlation, the line of best fit has a positive slope.



- A strong positive correlation, the line of best fit has a positive slope.



- A perfect positive correlation, the line of best fit has a positive slope.

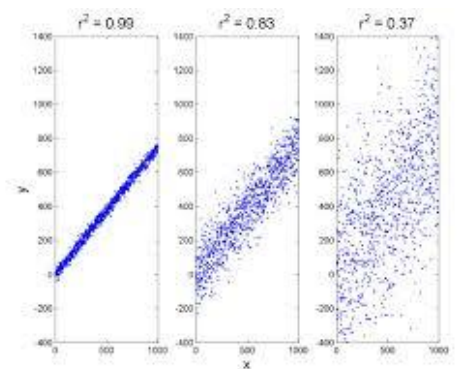
Formula:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2][n(\sum y^2) - (\sum y)^2]}}$$

n	represents number of term <sup>o</sup>
$\sum xy$	represents the sum of products = $x_1y_1 + x_2y_2 + \dots + x_ny_n$ <sup>o</sup>
$\sum x$	represents the sum of x <sup>o</sup>
$\sum y$	represents the sum of y <sup>o</sup>
$\sum x^2$	represents the sum of x-values = $x_1^2 + \dots + x_n^2$ <sup>o</sup>

### Coefficient of Determination

- The measure of the degree of linear correlation between two variables and the amount of trust in linear regression with regards to predicted outcomes through extrapolation and interpolation.
- With a value between 0 and 1, inclusively, the coefficient of determination is calculated as the square of the correlation coefficient (r) between the sample and predicted data



●  $(r^2)$

### Measures of Central Tendency $(\mu, \bar{x})$

#### Mean $(\mu, \bar{x})$

- The sum of the data entries divided by the number of entries.
- The average of the data values.

$$\bar{x} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

$$\mu = \frac{x_1 + x_2 + x_3 + \dots + x_n}{N}$$

$\bar{x}$ <sup>o</sup>	represents the sample mean <sup>o</sup>
n	represents the sample size <sup>o</sup>
$\mu$	represents the population mean <sup>o</sup>
N	represents the size of the population <sup>o</sup>

### ● Weighted Mean

- The mean of a set of numbers that are given weightings based on their frequency

$$\bar{x} = \frac{\sum f_i m_i}{\sum f_i} \quad \mu = \frac{\sum x_i w_i}{\sum w_i}$$

$f_i$	represents the frequency of each interval <sup>o</sup>
$m_i$	represents the midpoint of each interval <sup>o</sup>
$x_i$	represents each data value <sup>o</sup>
$w_i$	represents the weight <sup>o</sup>

### Median

- The middle value of all the data points when they are listed in order from least to greatest.
- When there is an even number of data values, the median would be the average of the two middle values.

### Mode

- The data value that occurs most often in the list of data points.
- It is possible to have no mode, one mode, or more than one mode.

### Outlier

- An element of the data set that is significantly different from the rest of the data points.

### Quartiles

- Quartiles are three points that divide the data set into 4 equal groups.
- The first quartile (Q1) is the middle number between the smallest number and the median; it is also the 25th percentile.
- The second quartile (Q2) is the median of the data set; it is also the 50th percentile.
- The third quartile (Q3) is the middle number between the median and the largest number in a data set; it is also the 75th percentile.

### Interquartile Range

- It is the difference between the first and third quartiles.
- $IOR = Q_3 - Q_1$

### Range

- The difference between the highest value and the lowest value of a data set.



## Standard Deviation $(\sigma, s)$

### Population Standard Deviation ( $\sigma$ )

- The average distance of the scores from the mean.
- The square root of the variance.
- It determines how close the values in a distribution are to the mean of the distribution.

N	represents the number of terms
$\mu$	represents the mean of all x values

$$\sigma = \sqrt{\frac{\sum(x - \mu)^2}{N}}$$

### Sample Standard Deviation (s)

- Samples rarely contain extreme values when compared to entire populations.
- As a result, the variance and standard deviation are less than would be expected.
- “n – 1” slightly increases their values.

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

n	represents the number of terms
$\bar{x}$	represents the mean of all x values

## Variance $(\sigma^2, s^2)$

- The average squared difference of the scores from the mean.
- The squared standard deviation

### Population Variance ( $\sigma^2$ )

$$\sigma^2 = \frac{\sum(x - \mu)^2}{N}$$

### Sample Variance ( $s^2$ )

$$s^2 = \frac{\sum(x - \bar{x})^2}{n - 1}$$

## Probability Distribution

### Distribution

- The probabilities for all possible outcomes of an experiment or sample space, often shown as a graph of probability versus the value of a random variable.

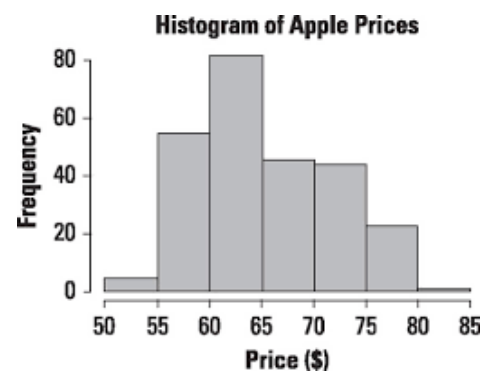
### Random variable

- A quantity that can have a range of values, designated by a capital letter  $X$ , with individual values designated by a lower-case  $x$ .

### HISTOGRAM

- A graph of a probability distribution in which equal intervals are marked on the horizontal axis and the probabilities (frequencies) associated with these intervals are indicated by the areas of the bars.

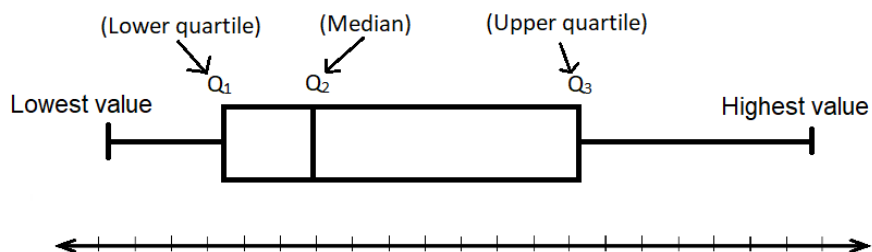
**SAMPLE HISTOGRAM**



### **Box and Whisker Plot**

- A graphic way to display the median, quartiles, and extremes of a data set on a number line to show the distribution of the data.
- A graph visually demonstrates the spread of distribution along a number line.

**SAMPLE BOX AND WHISKER PLOT**



# Data Analysis

## Year 2013 - 2018

### Line of best fit

Slope of the line:

$$m = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

$$m = \frac{(1259)(56821612.66) - (793170)(78119.22004)}{(1259)(665998410) - (793170)^2}$$

$$m = \frac{9576588580}{209373349300}$$

$$m = 0.04573929114$$

Y- intercept:

$$b = \frac{\sum y - m(\sum x)}{n}$$

$$b = \frac{(78119.22004) - (0.045739291)(793170)}{1259}$$

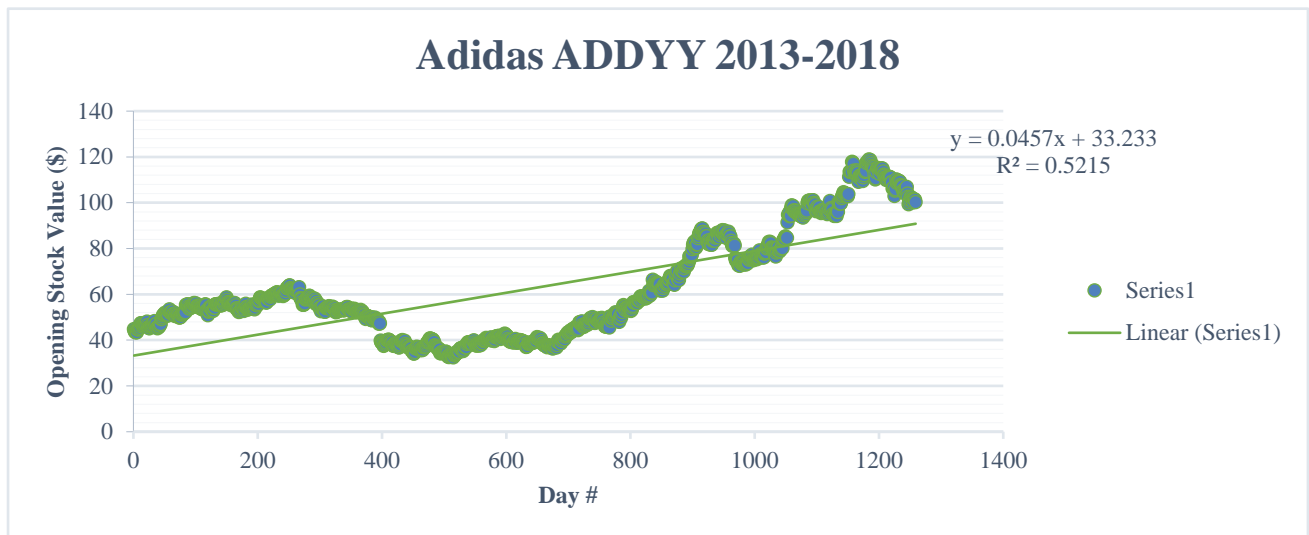
$$b = \frac{42840.1166}{1259}$$

$$b = 33.2328726$$

### Line of Best Fit:

$$Y = 0.04573929114x + 33.2328726$$

### Scatter Plot:



The scatter plot indicates a dramatic change of the stock value in Adidas downfall of Adidas stock then followed by a sharp increasing throughout these 5 years. The diagram clearly shows that the stock prices decreases all the way down from around 200<sup>th</sup> day to around 500<sup>th</sup> day. The minimum value appears at around 500<sup>th</sup> day for \$30. The dramatic downfall of Adidas may be caused by the increasing competition brought by other sports brands such as Nike. While after that, the stock prices increase all the way up to \$100 though there are some fluctuations. Despite the world remaining at an economic

downturn, Adidas could manage to increase their business and profit in the later years. In addition, Adidas recovers its positive reputation and minimizes employee turnover rate. It is reasonable to predict that Adidas will continue to climb in future years because of its experience from failure, and its reliable management which helps it increase its profit all way up.

### Linear Regression

$$Y = 0.04573929114x + 33.2328726$$

Coefficient of determination:  $r^2 = 0.722146196^2 = 0.5214951284$

#### One month:

Number of Days $1259 \div 5 \div 12 = 20.983$ $x = 1259 + 20.983$ $x = 1279.983333 = 1280$	Stock Prices: $y = (0.04573929114)(1280) + 33.2328726$ $y = 91.77916526$ Adidas's stock price in one month is estimated to be \$91.7792.
-----------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------

#### Six months:

Number of Days $1259 \div 5 \div 2 = 125.9$ $x = 1259 + 125.9$ $x = 1384.9 = 1385$	Stock Prices: $y = (0.04573929114)(1385) + 33.2328726$ $y = 96.5772169$ Adidas's stock price in six months is estimated to be \$96.5772.
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#### One year:

Number of Days $1259 \div 5 = 251.8$ $x = 1259 + 251.8$ $x = 1510.8 = 1511$	Stock Prices: $y = (0.04573929114)(1511) + 33.2328726$ $y = 102.3357937$ Adidas's stock price in one years is estimated to be \$102.3358.
--------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------

#### Ten years:

Number of Days $1259 * 2 = 2518$ $x = 1259 + 2518$ $x = 3777$	Stock Prices: $y = (0.04573929114)(3777) + 33.2328726$ $y = 205.9899486$ Adidas's stock price in one years is estimated to be \$205.9899.
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The coefficient of determination indicates that the linear regression can be trusted in extrapolation. The short-term estimations (one month, six months, one year) should be reasonable. Since in the short

term, the market remains constant, and Adidas does not have the tendency to dramatically change their operating structure. However, the long-term estimation (ten years) may not be reliable since the social condition and world market may change much at that time, which means Adidas will change their strategies in response to the new environment.

In general, I am very optimistic about the development prospects of Adidas. Although it decreased during 300<sup>th</sup> days to 500<sup>th</sup> days due to the harsh competition during that time, it bounced up at around 700<sup>th</sup> day and continued increasing after that. Adidas must have learnt experience from failure, and found an efficient way to manage the company, thus I believe Adidas is still a good investment. Its fast speed to offer products for consumers and its updated advertising ideas could also bring Adidas good reputation and confidence.

#### Correlation Coefficient:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2][n(\sum y^2) - (\sum y)^2]}}$$

$$r = \frac{(1259)(56821612.66) - (793170)(78119.22004)}{\sqrt{(1259)(665998410) - (793170)^2} \sqrt{(1259)(5514341.467) - (78119.22004)^2}}$$

$$= 0.722146196$$

The correlation coefficient indicates a strong positive correlation. The line of best fit has a positive slope with most of the data points very close to the line, and the stock price is increasing over the five years.

#### Standard Deviation:

$$\sigma = \sqrt{\frac{\sum (x - \mu)^2}{N}}$$

$$= \sqrt{\frac{667151.2051}{1259}}$$

$$= 23.01967948$$

#### Variance:

$$\sigma^2 = \frac{\sum (x - \mu)^2}{N}$$

$$= \frac{667151.2051}{1259}$$

$$= 529.9056434$$

Both the standard deviation and the variance points out the spread of the stock prices is wide. The stock prices are spread far from the mean value.

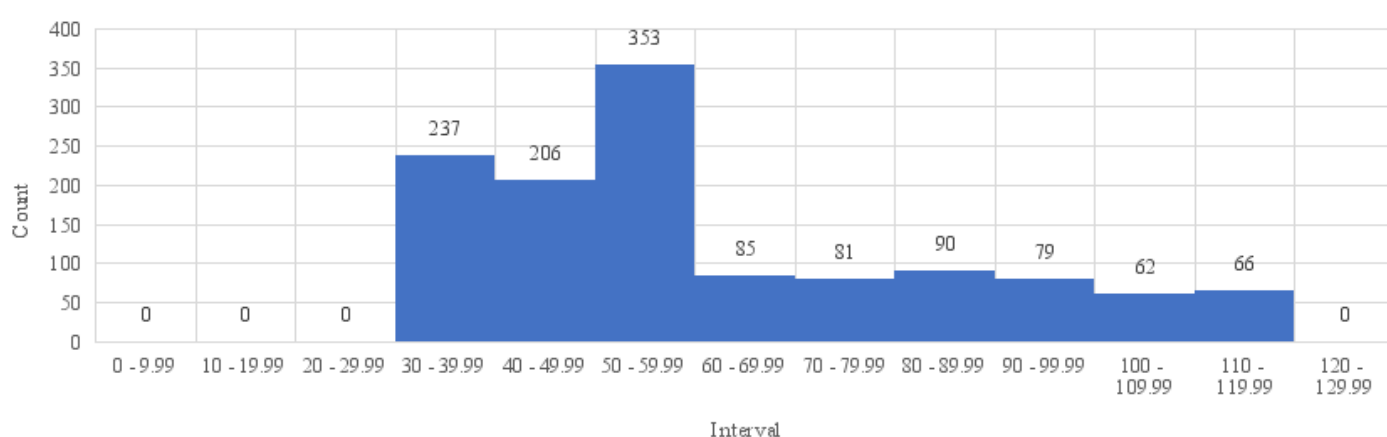
## Measure of Central Tendency:

	Day (x(	Open (y(
Mean	630	62.04862592
Median	N/A	54.490002
Mode	N/A	55.560001
Minimum	N/A	32.380001
Maximum	N/A	118.879997
Range	N/A	86.499996
N (Number of Days(	1259	N/A

## Probability Distribution:

Interval	Count
0 - 9.99	0
10 - 19.99	0
20 - 29.99	0
30 - 39.99	237
40 - 49.99	206
50 - 59.99	353
60 - 69.99	85
70 - 79.99	81
80 - 89.99	90
90 - 99.99	79
100 - 109.99	62
110 - 119.99	66
120 - 129.99	0
Sum	1259

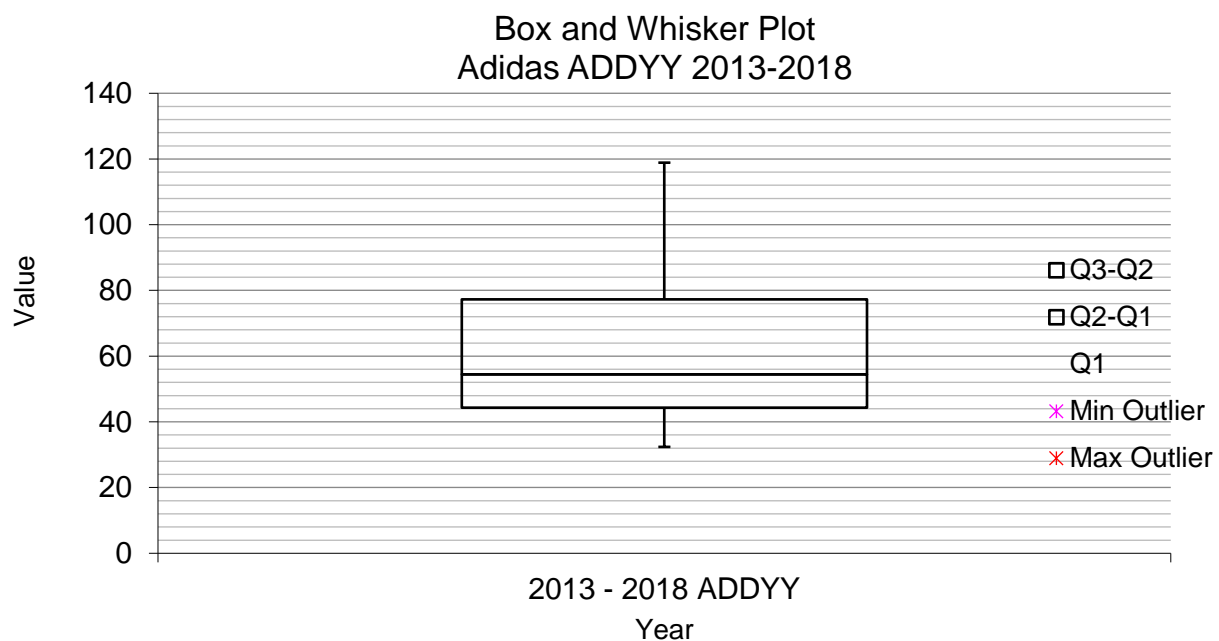
Adidas ADDYY Stock 2013-2018



The histogram indicates a single modal distribution, with the mode at 50 - 59.99 interval. Moreover, it shows a modal of right skewness, with more counts in interval 30 – 59.99, and less counts in interval 60 – 119.99.

**Box and Whisker Plot:**

Min	32.380001
Q1	44.325001
Median	54.490002
Q3	77.244999
Max	118.879997
IQR	32.919998
Range	86.499996



The box and whisker plot indicates the spread of data from Q1 to median is the smallest whereas the spread of data from median to Q3 is the largest. In addition, the interquartile range sits in the middle of the range and less than half of the range. There are no outliers.

## Year 2013

### Line of best fit

Slope of the line:

$$m = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

$$m = \frac{(252)(1783261.037) - (31878)(13509.87004)}{(252)(5366130) - (31878)(31878)}$$

$$m = 0.055687266$$

Y- intercept:

$$b = \frac{\sum y - m(\sum x)}{n}$$

$$b = \frac{(13509.87004) - (0.055687266)(31878)}{(252)}$$

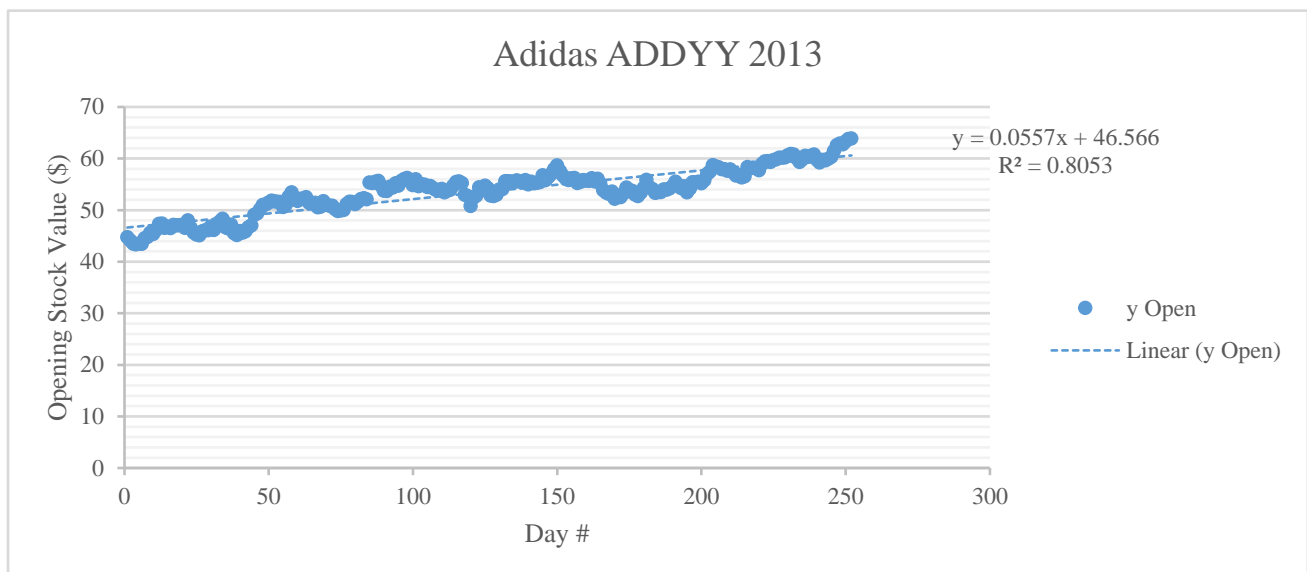
$$b = 46.56615629$$

Line of Best Fit:

$$Y = 0.055687266x + 46.56615629$$

Correlation of Determination:  $r^2 = 0.897406318^2 = 0.8053$

Scatter Plot:



The scatter plot points out a steady trend of increase in stock value of Adidas in year 2013. Although there are some fluctuations from day 125th to day 175th, the overall trend is still constantly increased. Adidas changed the game on February 13, 2013, when it introduced BOOST technology and the Energy BOOST for the first time at a global media event in New York. This new technology attracted many people to invest in Adidas, which might play the most important role in the constant increasing profit for 2013.



**Correlation Coefficient:**

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2][n(\sum y^2) - (\sum y)^2]}}$$

$$r = \frac{252(1783261.037) - (31878)(13509.87004)}{\sqrt{((252)(5366130) - (31878)(31878))((252)(729407.2551) - (13509.87004)(13509.87004))}}$$

$$= 0.897406318$$

The correlation coefficient indicates a strong positive correlation. The line of best fit has a positive slope with most of the data points very close to the line, and the stock price is increasing during 2013.

**Standard Deviation:**

$$\sigma = \sqrt{\frac{\sum (x - \mu)^2}{N}}$$

$$= \sqrt{\left(\frac{5135.078414}{252}\right)}$$

$$= 4.514121763$$

**Variance:**

$$\sigma^2 = \frac{\sum (x - \mu)^2}{N}$$

$$= \sqrt{\left(\frac{(5135.078414)(5135.078414)}{252}\right)}$$

$$= 20.37729529$$

Both the standard deviation and the variance point out that the spread of the stock values is very small, and the stock prices are close to the mean, which means there is little fluctuation.

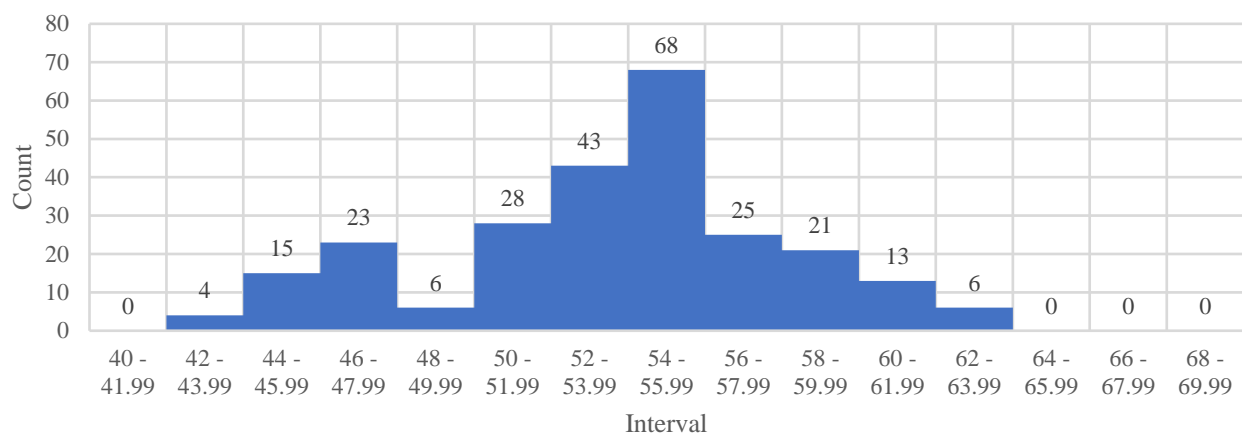
**Measure of Central Tendency:**

	Day (x(	Open (y(
Mean	126.5	53.6105954
Median	N/A	54.2250005
Mode	N/A	55.560001
Minimum	N/A	43.349998
Maximum	N/A	63.880001
Range	N/A	20.530003
N (Number of Days(	252	N/A

## Probability Distribution:

Interval for histogram	Count
40 - 41.99	0
42 - 43.99	4
44 - 45.99	15
46 - 47.99	23
48 - 49.99	6
50 - 51.99	28
52 - 53.99	43
54 - 55.99	68
56 - 57.99	25
58 - 59.99	21
60 - 61.99	13
62 - 63.99	6
64 - 65.99	0
66 - 67.99	0
68 - 69.99	0
Sum	252

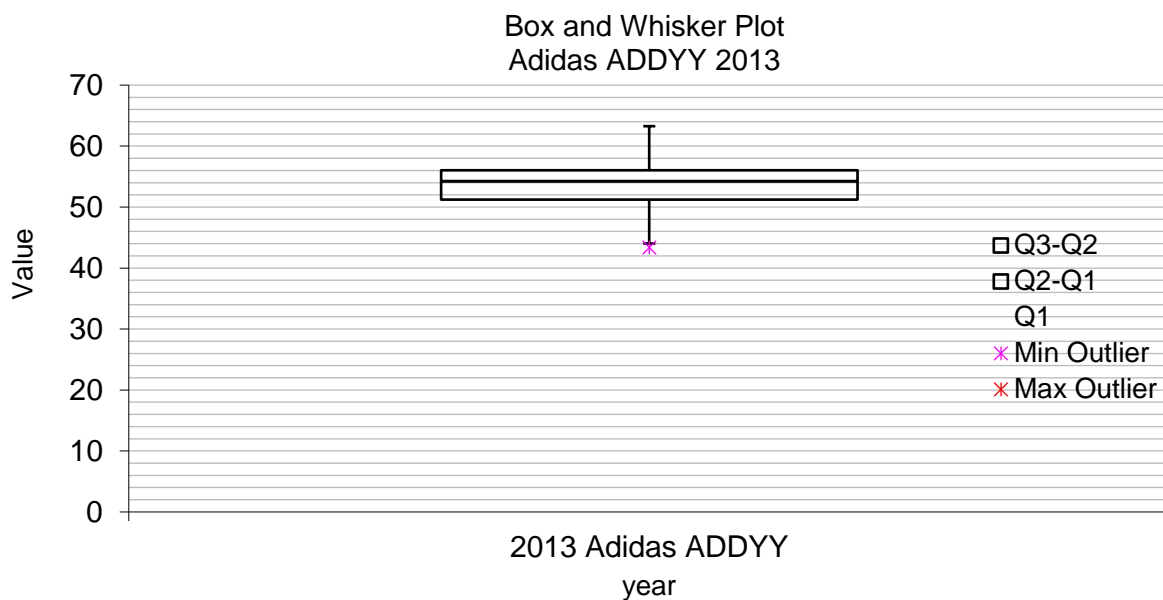
## Adidas ADDYY Stock 2013



The histogram states a unimodal distribution, with one mode at interval 54 – 55.99. The count first increases from 4 to 68 at 42 – 54 with an exception of 6 at 48 – 49.99. And then had less counts started interval 55.99, but had more counts ended at interval 63.99.

**Box and Whisker Plot:**

Min	43.349998
Q1	51.23749975
Median	54.2250005
Q3	56.04750075
Max	63.880001
IQR	4.810001
Range	20.530003



The box and whisker plot indicates the spread of data from Q1 to median is the largest whereas the spread of data from median to Q3 is the smallest. In addition, the interquartile range sits in the middle of the range and is less than half of the range. There is an outlier at 43.349998 which is also the min value.

## Year 2014

### Line of best fit

Slope of the line:

$$m = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

$$m = \frac{(252)(1350189.545) - (31878)(11892.76998)}{(252)(5366130) - (31878)(31878)}$$

$$m = -0.115664469$$

Y- intercept:

$$b = \frac{\sum y - m(\sum x)}{n}$$

$$b = \frac{(11892.76998) - (-0.115664469)(31878)}{(252)}$$

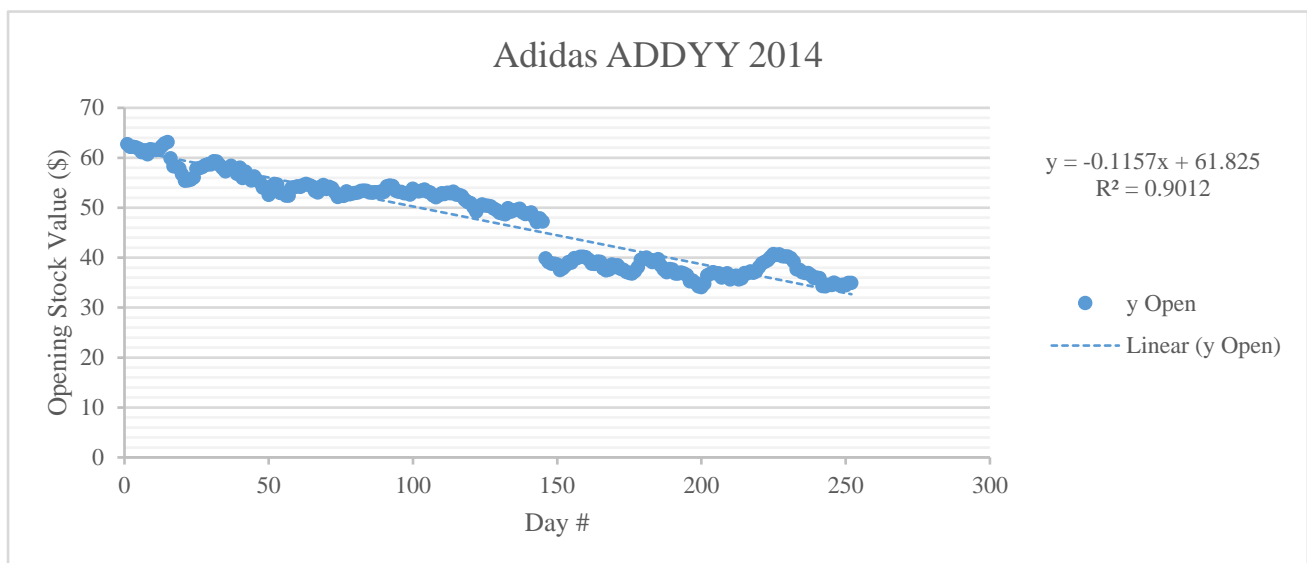
$$b = 61.82508704$$

Line of Best Fit:

$$Y = -0.115664469x + 61.82508704$$

Correlation of Determination:  $r^2 = (-0.949298526)^2 = 0.9012$

Scatter Plot:



The scatter plot points out a steady decreasing trend of the stock prices of Adidas in 2014. The increasing competition between Adidas and other sports brands may be responsible for such decrease. Nike, VF Corp, and Under Armour have each risen, while Adidas has steadily fallen in 2014. As Adidas Group CEO Herbert Hainer said, “In the U.S., we have not invested enough. I think in hindsight, we have not been as present in American football and in baseball as we should be. These are big sports in America. And I think we need closer contact to the consumer in America”. Moreover, Eric Tracy, an analyst with Janney Capital Markets, adds, “The easy answer is they haven’t been keeping pace on the innovation front. And Reebok has been an albatross on their neck”. Falling behind the innovation and insufficient investment in U.S. led to its constant downfall throughout 2014.

**Correlation Coefficient:**

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2][n(\sum y^2) - (\sum y)^2]}}$$

$$r = \frac{(252)(1350189.545) - (31878)(11892.76998)}{\sqrt{((252)(5366130) - (31878)(31878))((252)(581059.2029) - (11892.76998)(11892.76998))}}$$

$$r = -0.949298526$$

The correlation coefficient indicates a strong negative correlation. The line of best fit has a negative slope with most of the data points very close to the line, and the stock price is decreasing during 2014.

**Standard Deviation:**

$$\begin{aligned}\sigma &= \sqrt{\frac{\sum (x - \mu)^2}{N}} \\ &= \sqrt{\left(\frac{19797.38664}{252}\right)} \\ &= 8.863467611\end{aligned}$$

**Variance:**

$$\begin{aligned}\sigma^2 &= \frac{\sum (x - \mu)^2}{N} \\ &= \sqrt{\left(\frac{(19797.38664)(19797.38664)}{252}\right)} \\ &= 78.5610580912\end{aligned}$$

Both the standard deviation and the variance point out that the spread of the stock values is small but relatively larger than which in 2013. The stock prices are close to the mean, which means there is little fluctuation.

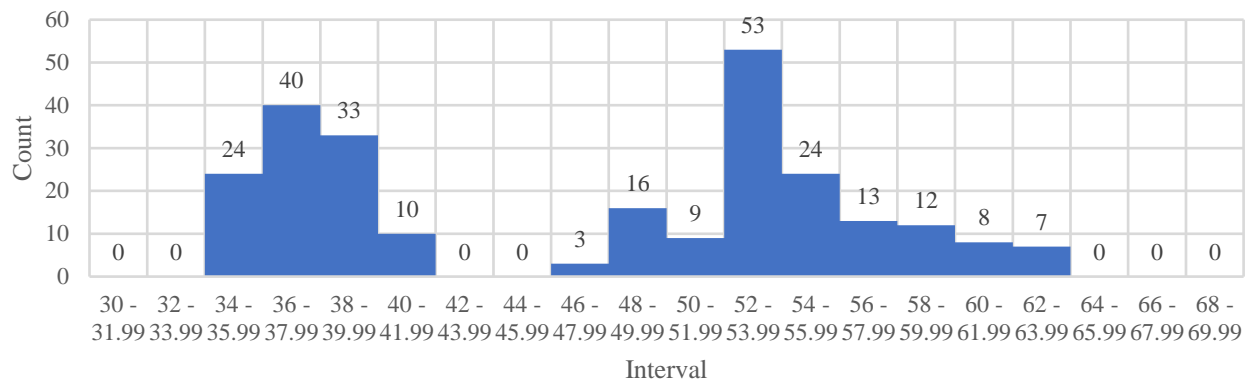
**Measure of Central Tendency:**

	Day (x(	Open (y(
Mean	126.5	47.19353165
Median	N/A	49.934999
Mode	N/A	36.869999
Minimum	N/A	34.049999
Maximum	N/A	63.099998
Range	N/A	29.049999
N (Number of Days(	252	N/A

## Probability Distribution:

Revised Interval for histogram	Count
30 - 31.99	0
32 - 33.99	0
34 - 35.99	24
36 - 37.99	40
38 - 39.99	33
40 - 41.99	10
42 - 43.99	0
44 - 45.99	0
46 - 47.99	3
48 - 49.99	16
50 - 51.99	9
52 - 53.99	53
54 - 55.99	24
56 - 57.99	13
58 - 59.99	12
60 - 61.99	8
62 - 63.99	7
64 - 65.99	0
66 - 67.99	0
68 - 69.99	0
Sum	155

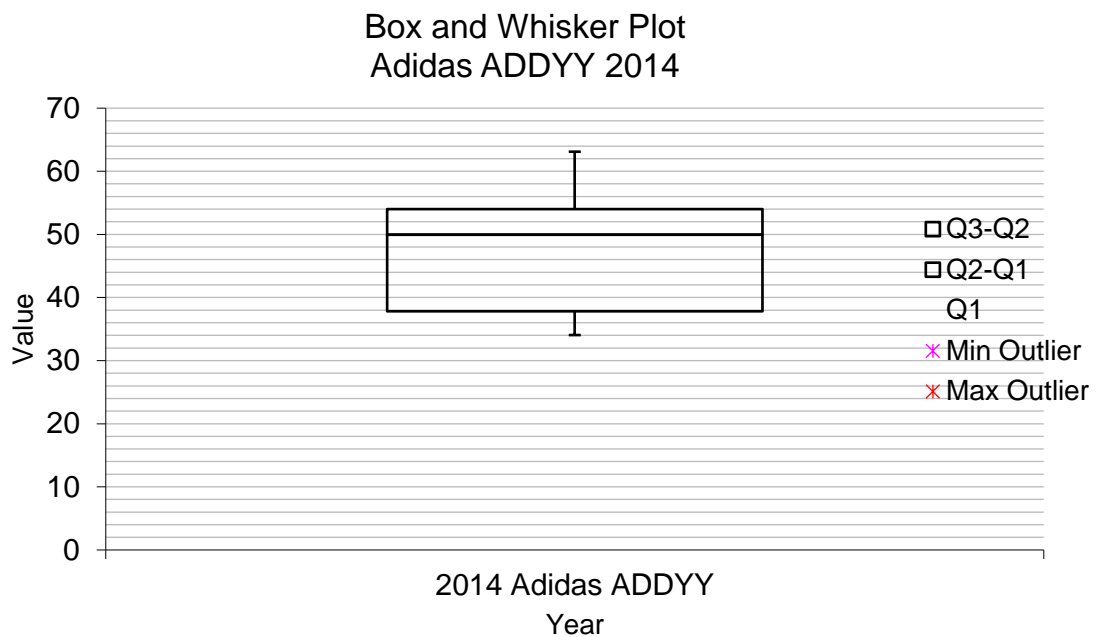
## Adidas ADDYY Stock 2014



The histogram states a bi-modal distribution, with one mode at interval 36 – 37.99 and the other mode at 52 – 53.99. The count increased from 24 to 40 at interval 34 – 36, then decreased from 40 to 0 at interval 38 – 44. The count then increased from 0 to 53 at interval 46 – 52 with exception at 50 – 51.99, and then it decreased from 53 to 0 at interval 52 – 69.99.

**Box and Whisker Plot:**

Min	34.049999
Q1	37.83250025
Median	49.934999
Q3	54.0200005
Max	63.099998
IQR	16.18750025
Range	29.049999



The box and whisker plot indicates the spread of data from Q1 to median is the largest whereas the spread of data from median to Q3 is the smallest. In addition, the interquartile range sits in the middle of the range and is approximately half of the range. There are no outliers.

## Year 2015

### Line of best fit

Slope of the line:

$$m = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

$$m = \frac{(252)(1350429.509) - (31878)(10208.47999)}{(252)(5366130) - (31878)(31878)}$$

$$m = 0.044284965$$

Y- intercept:

$$b = \frac{\sum y - m(\sum x)}{n}$$

$$b = \frac{(10208.47999) - (0.044284965)(31878)}{(252)}$$

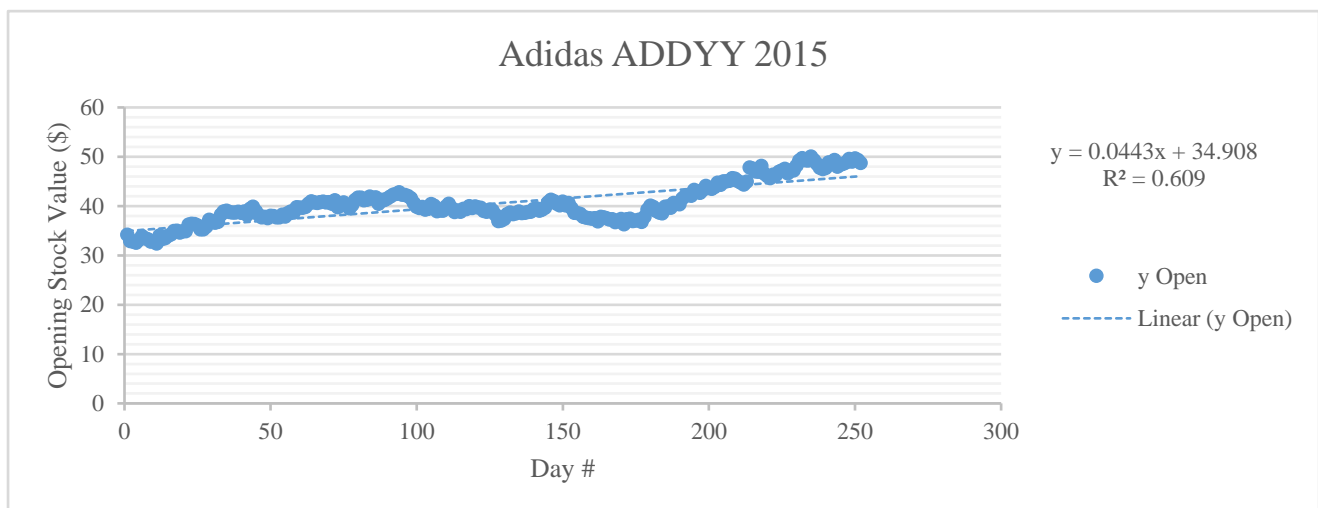
$$b = 34.90779315$$

### Line of Best Fit:

$$Y = 0.044284965x + 34.90779315$$

Correlation of Determination:  $r^2 = (0.780402651)^2 = 0.609$

### Scatter Plot:



The scatter plot indicates a modest increasing trend in stock prices with some fluctuation. Despite an environment of ongoing economic challenges, and an everchanging, but always fierce, competitive landscape, Adidas reversed its inferior position in sports brand competition in 2014, and continued to increase its revenue in 2015. In March 2015, the next five-year strategic business plan for the company was presented. 'Creating the New' is the strategy and attitude that leads Adidas into the future. The strategy translates that competence in sports into streetwear and fashion because sport is an attitude and a lifestyle. Everything the company does is rooted in sports. As the brown shoe category was not core to this strategy, 2015 saw the divestiture of the Rockport brand. This allowed the company to reduce complexity and focus on the Adidas and Reebok brands. These brands connect with consumers; therefore, their success defines the success of the business. The new strategy and new products introduced into Adidas brought its increasing profit throughout 2015.



**Correlation Coefficient:**

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2][n(\sum y^2) - (\sum y)^2]}}$$

$$r = \frac{(252)(1350429.509) - (31878)(10208.47999)}{\sqrt{((252)(5366130) - (31878)(31878))((252)(417838.1665) - (10208.47999)(10208.47999))}}$$

$$r = 0.780402651$$

The correlation coefficient indicates a relative strong positive correlation. The line of best fit has a positive slope with most of the data points very close to the line, and the stock price is increasing during 2015.

**Standard Deviation:****Variance:**

$$\begin{aligned}\sigma &= \sqrt{\frac{\sum (x - \mu)^2}{N}} \\ &= \sqrt{\left(\frac{4294.263358}{252}\right)} \\ &= 4.128041619\end{aligned}$$

$$\begin{aligned}\sigma^2 &= \frac{\sum (x - \mu)^2}{N} \\ &= \sqrt{\left(\frac{(4294.263358)(4294.263358)}{252}\right)} \\ &= 17.0407276082\end{aligned}$$

Both the standard deviation and the variance point out that the spread of the stock values is small. The stock prices are close to the mean, which means there is little fluctuation.

**Measure of Central Tendency:**

	Day (x(	Open (y(
Mean	126.5	40.50984121
Median	N/A	39.664999
Mode	N/A	35.259998
Minimum	N/A	32.380001
Maximum	N/A	50
Range	N/A	17.619999
N (Number of Days(	250	N/A

## Probability Distribution:

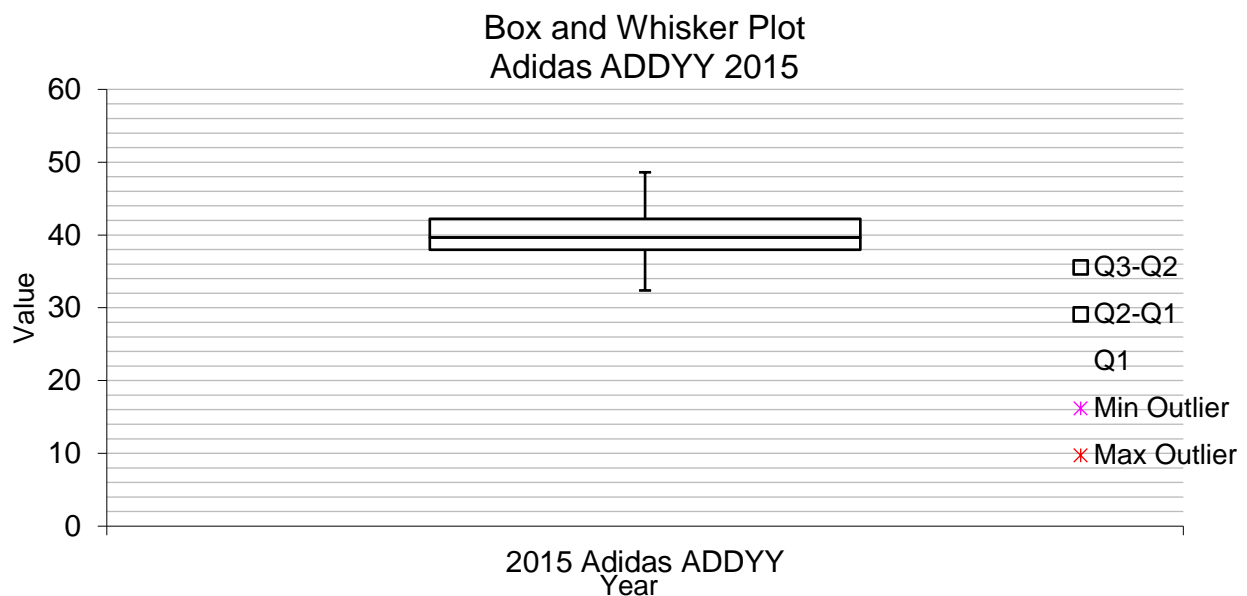
Revised Interval for histogram	Count
30 - 31.99	0
32 - 33.99	13
34 - 35.99	11
36 - 37.99	39
38 - 39.99	77
40 - 41.99	45
42 - 43.99	16
44 - 45.99	13
46 - 47.99	17
48 - 49.99	20
Sum	231



The histogram points out a unimodal distribution, with the mode at the 38 – 39.99 interval. The counts first increased from 13 to 77 at interval 32 – 38, and then decreased from 77 to 13 at interval 39.99 – 45.99. A slight increase then appeared from 13 to 20 at interval 44 – 49.99.

**Box and Whisker Plot:**

Min	32.380001
Q1	37.9525015
Median	39.664999
Q3	42.21499925
Max	50
IQR	4.26249775
Range	17.619999



The box and whisker plot indicates the spread of data from Q1 to median is approximately equal to the spread of data from median to Q3. In addition, the interquartile range sits in the middle of the range and is less than half of the range. There are no outliers.

## Year 2016

### Line of best fit

Slope of the line:

$$m = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

$$m = \frac{(252)(2401420.032) - (31878)(17410.08002)}{(252)(5366130) - (31878)(31878)}$$

$$m = 0.149257973$$

Y- intercept:

$$b = \frac{\sum y - m(\sum x)}{n}$$

$$b = \frac{(17410.08002) - (0.149257973)(31878)}{(252)}$$

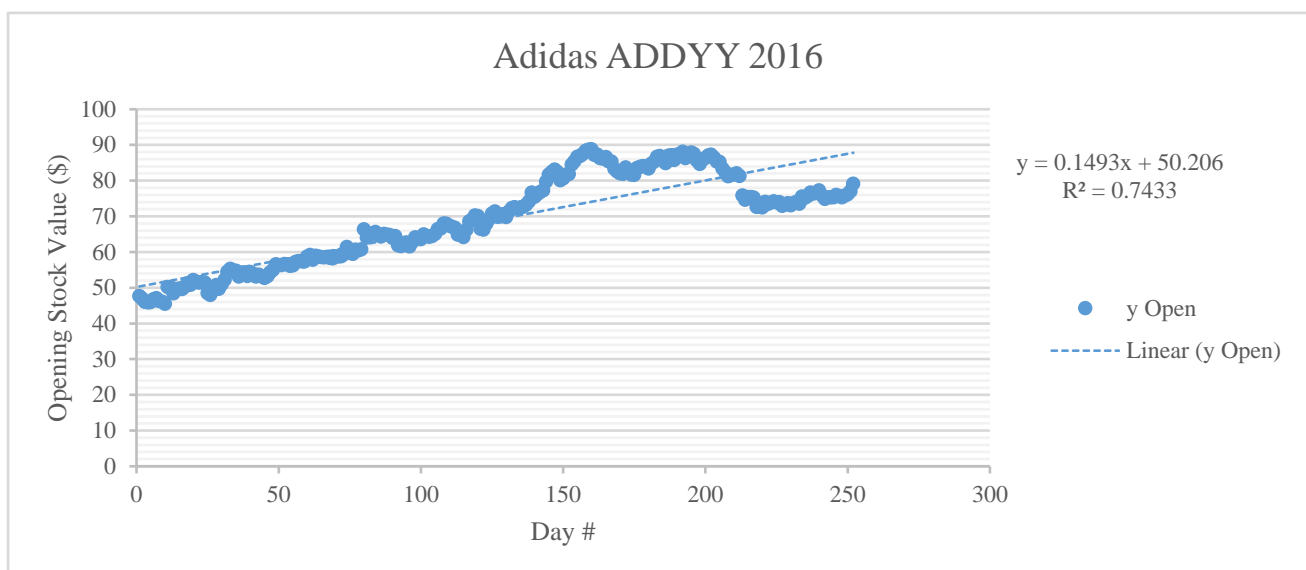
$$b = 50.20648554$$

### Line of Best Fit:

$$Y = 0.149257973x + 50.20648554$$

Correlation of Determination:  $r^2 = (0.862162343)^2 = 0.7433$

### Scatter Plot:



The scatter plot indicates moderate increasing trend with much fluctuations happened in later days (150<sup>th</sup> day to 250<sup>th</sup> day) of the year 2016. After 15 years, Herbert Hainer passed the CEO baton to Kasper Rorsted in October 2016. Transitioning to Adidas after leading the German consumer goods company Henkel for eight years, the Dane was well received among employees, media and investors alike. As fashion and sportswear industries continued to revolutionize with health and fitness merging into a lifestyle concept, Rorsted began steering the company to new successes in a digital era, building on the previously established strategy, 'Creating The New'. The new strategy introduced in 2015 still played an important role in stock increasing in 2016, while the slight decrease and fluctuation may be caused by the administrative changes. All in all, Adidas remains its increasing trend throughout 2016. Moreover, the overall increasing trend (the slope) is larger than which in 2013 – 2015.

**Correlation Coefficient:**

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2][n(\sum y^2) - (\sum y)^2]}}$$

$$r = \frac{(252)(2401420.032) - (31878)(17410.08002)}{\sqrt{((252)(5366130) - (31878)(31878))((252)(1242788.802) - (17410.08002)(17410.08002))}}$$

$$r = 0.862162343$$

The correlation coefficient indicates a strong positive correlation, and it is stronger than which in 2015. The line of best fit has a positive slope with most of the data points very close to the line, and the stock price is increasing during 2016.

**Standard Deviation:**

$$\begin{aligned}\sigma &= \sqrt{\frac{\sum (x - \mu)^2}{N}} \\ &= \sqrt{\left(\frac{39967.82497}{252}\right)} \\ &= 12.59374766\end{aligned}$$

**Variance:**

$$\begin{aligned}\sigma^2 &= \frac{\sum (x - \mu)^2}{N} \\ &= \sqrt{\left(\frac{(39967.82497)(39967.82497)}{252}\right)} \\ &= 158.6024801238\end{aligned}$$

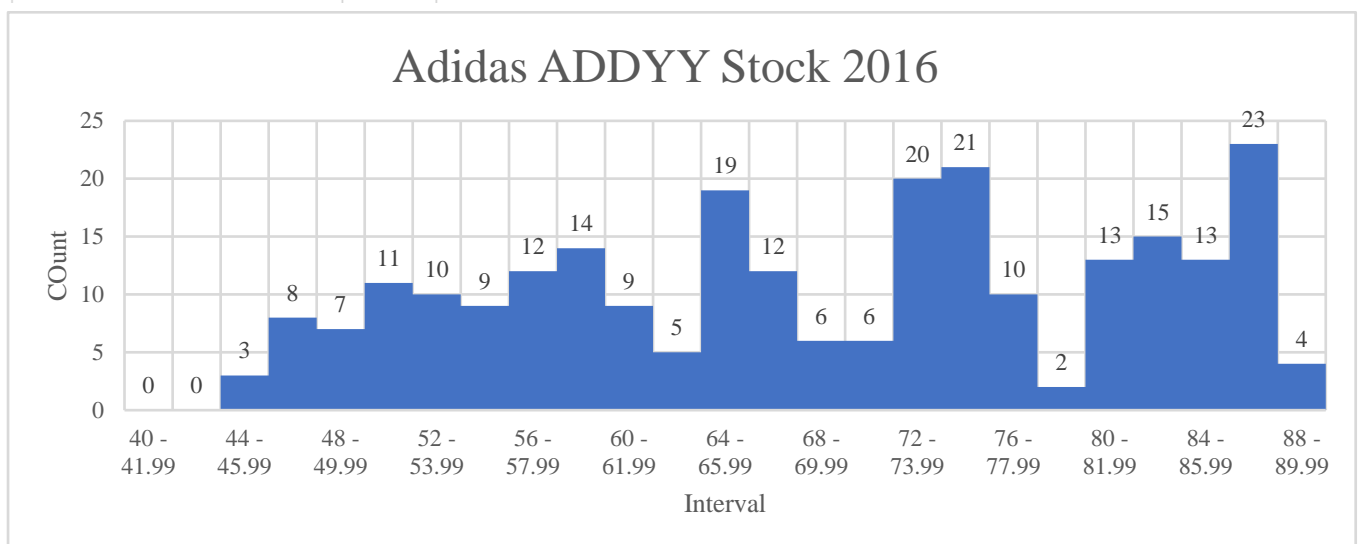
Both the standard deviation and the variance point out that the spread of the stock values is relatively wide. The stock prices are relatively farther to the mean, which means there is more fluctuation than the previous year 2013 - 2015.

**Measure of Central Tendency:**

	Day (x(	Open (y(
Mean	126.5	69.08761911
Median	N/A	70.100002
Mode	N/A	54.200001
Minimum	N/A	45.48
Maximum	N/A	88.709999
Range	N/A	43.229999
N (Number of Days(	252	N/A

### Probability Distribution:

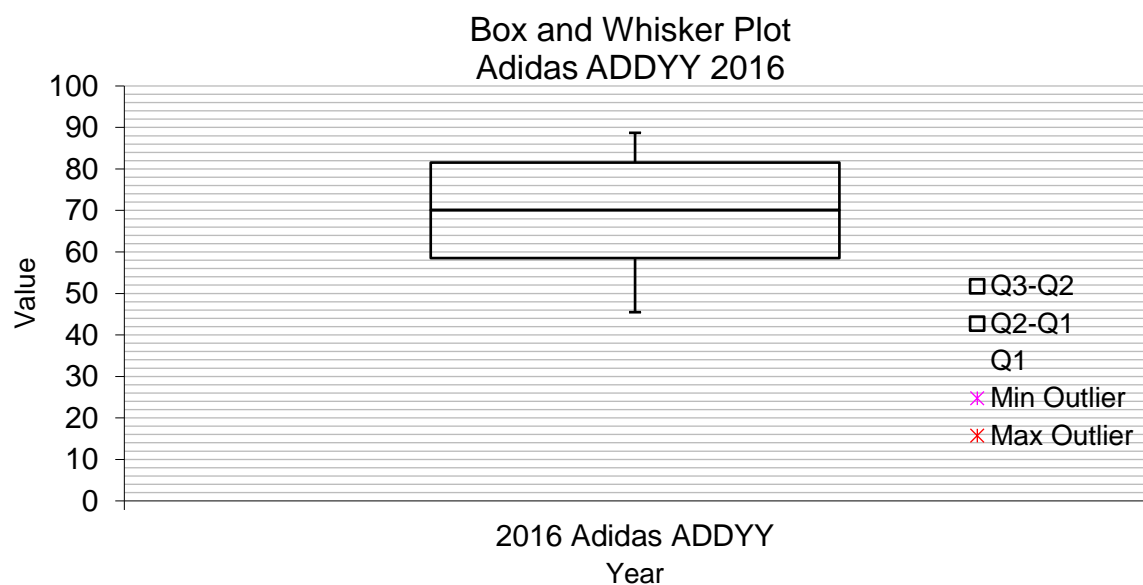
Revised Interval for histogram	Count
40 - 41.99	0
42 - 43.99	0
44 - 45.99	3
46 - 47.99	8
48 - 49.99	7
50 - 51.99	11
52 - 53.99	10
54 - 55.99	9
56 - 57.99	12
58 - 59.99	14
60 - 61.99	9
62 - 63.99	5
64 - 65.99	19
66 - 67.99	12
68 - 69.99	6
70 - 71.99	6
72 - 73.99	20
74 - 75.99	21
76 - 77.99	10
78 - 79.99	2
80 - 81.99	13
82 - 83.99	15
84 - 85.99	13
86 - 87.99	23
88 - 89.99	4
Sum	174



The histogram points out a multi-modal distribution, with about three modes. One mode is at interval 64 - 65.99. The second mode is at interval 72 - 75.99. The other mode is at interval 86 - 87.99. There is no clearly constant increase or decrease of counts in the histogram. Most of the prices in 2016 was around \$87, which results in the skewness.

### Box and Whisker Plot:

Min	45.48
Q1	58.5149995
Median	70.100002
Q3	81.52000225
Max	88.709999
IQR	23.00500275
Range	43.229999



The box and whisker plot indicates the spread of data from Q1 to median is approximately equal to the spread of data from median to Q3. In addition, the interquartile range sits in the middle of the range and is larger than half of the range. There are no outliers.

## Year 2017

### Line of best fit

Slope of the line:

$$m = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

$$m = \frac{(251)(3333435.922) - (31626)(25098.02002)}{(251)(5302626) - (31626)(31626)}$$

$$m = 0.129831455$$

Y- intercept:

$$b = \frac{\sum y - m(\sum x)}{n}$$

$$b = \frac{(25098.02002) - (0.129831455)(31626)}{(251)}$$

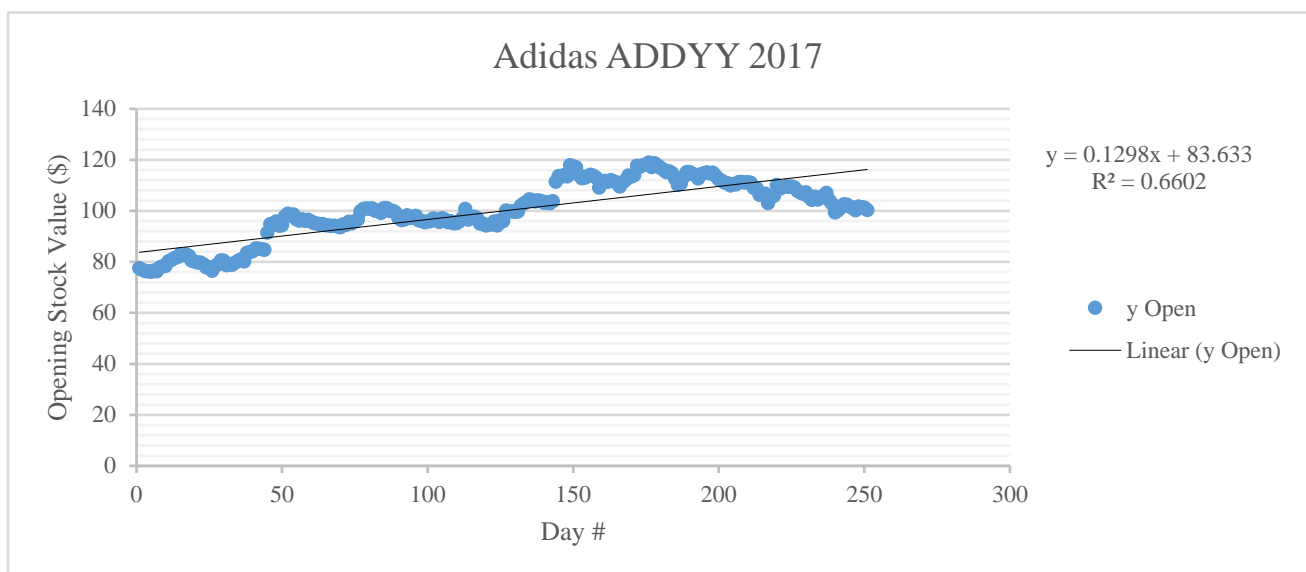
$$b = 83.63334837$$

### Line of Best Fit:

$$Y = 0.129831455x + 83.63334837$$

Correlation of Determination:  $r^2 = (0.812535772)^2 = 0.6602$

### Scatter Plot:



The scatter plot indicates weak increasing trend with slight decreasing trend happened in later days (150<sup>th</sup> day to 250<sup>th</sup> day) of the year 2017. With the divestiture of its hockey brand CCM and its golf brands TaylorMade, Adams Golf and Ashworth the company further contributed to its strategy “Creating the New” and focused on its core competencies in footwear and apparel and its major brands Adidas and Reebok. The continued application of the new strategy focused mainly on shoes and clothes, which led its stock value to increase. Although the stock prices decreased in later days, which might be caused by the competition presented among sports brands, 2017 was still a good year for Adidas stocks.



**Correlation Coefficient:**

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2][n(\sum y^2) - (\sum y)^2]}}$$

$$r = \frac{(251)(3333435.922) - (31626)(25098.02002)}{\sqrt{((251)(5302626) - (31626)(31626))((251)(2543248.04) - (25098.02002)(25098.02002))}}$$

$$r = 0.812535772$$

The correlation coefficient indicates a strong positive correlation, and it is stronger than which in 2015 but weaker than which in 2016. The line of best fit has a positive slope with most of the data points very close to the line, and the stock price is increasing during 2017.

**Standard Deviation:**

$$\begin{aligned}\sigma &= \sqrt{\frac{\sum (x - \mu)^2}{N}} \\ &= \sqrt{\left(\frac{33644.02065}{251}\right)} \\ &= 11.57756118\end{aligned}$$

**Variance:**

$$\begin{aligned}\sigma^2 &= \frac{\sum (x - \mu)^2}{N} \\ &= \sqrt{\left(\frac{(33644.02065)(33644.02065)}{251}\right)} \\ &= 134.0399228766\end{aligned}$$

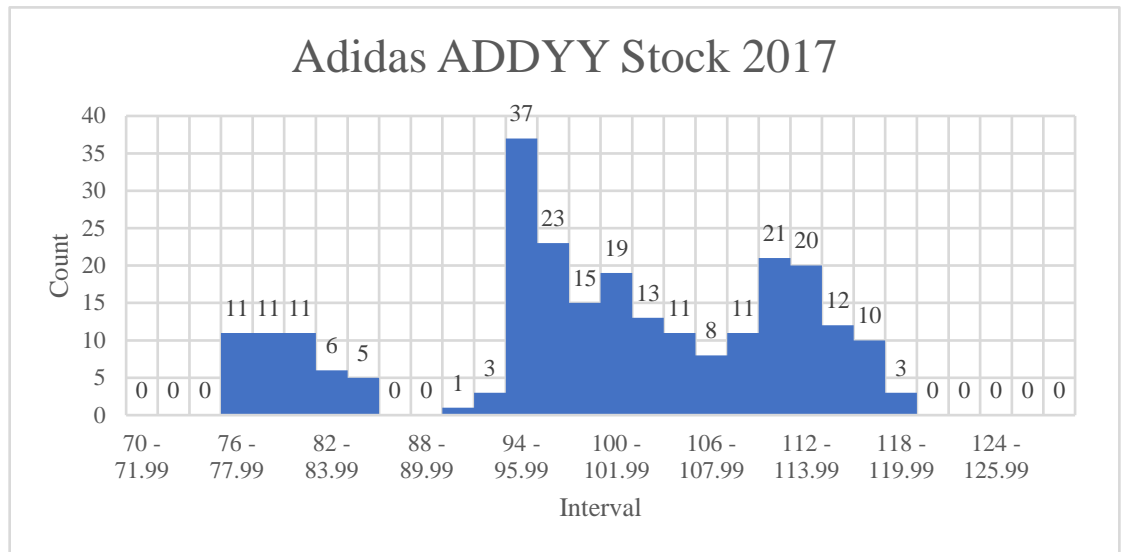
Both the standard deviation and the variance point out that the spread of the stock values is relatively wide. Although they are smaller than which in 2016, the stock prices are still relatively farther to the mean, which means there are some fluctuations presenting.

**Measure of Central Tendency:**

	Day (x(	Open (y(
Mean	126	99.99211164
Median	N/A	100.089996
Mode	N/A	113.980003
Minimum	N/A	76.010002
Maximum	N/A	118.879997
Range	N/A	42.869995
N (Number of Days(	251	N/A

### Probability Distribution:

Interval	Count
70 - 71.99	0
72 - 73.99	0
74 - 75.99	0
76 - 77.99	11
78 - 79.99	11
80 - 81.99	11
82 - 83.99	6
84 - 85.99	5
86 - 87.99	0
88 - 89.99	0
90 - 91.99	1
92 - 93.99	3
94 - 95.99	37
96 - 97.99	23
98 - 99.99	15
100 - 101.99	19
102 - 103.99	13
104 - 105.99	11
106 - 107.99	8
108 - 109.99	11
110 - 111.99	21
112 - 113.99	20
114 - 115.99	12
116 - 117.99	10
118 - 119.99	3
120 - 121.99	0
122 - 123.99	0
124 - 125.99	0
126 - 127.99	0
128 - 129.99	0
Sum	128



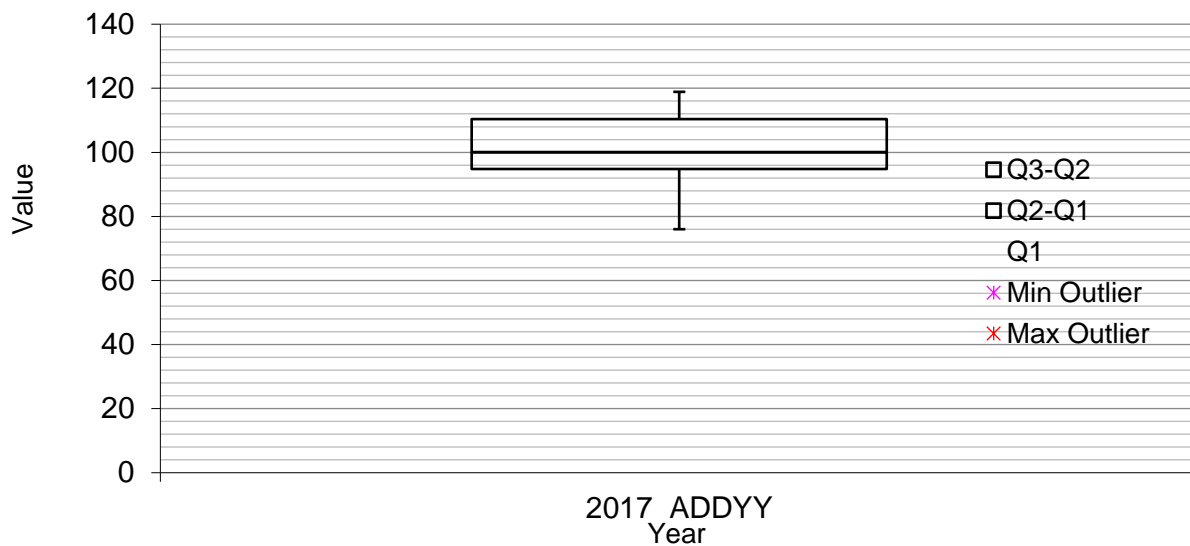
### Analysis of Histogram:

The histogram indicates a unimodal distribution that is in the middle. The mode 37 is at interval 94 – 95.99. Most of the stock prices lies around the higher end of the range, result in slightly left skewness. The counts of stock prices remained the same for 76 – 82, and then increased to 37.

**Box and Whisker Plot:**

Min	76.010002
Q1	94.795002
Median	100.089996
Q3	110.34
Max	118.879997
IQR	15.544998
Range	42.869995

Box and Whisker Plot  
Adidas ADDYY 2017



The box and whisker plot indicates the spread of data from Q1 to median is the smallest whereas the spread of data from median to Q3 is the largest. In addition, the interquartile range sits in the middle of the range and is less than half of the range.

There are no outliers.

## Pre-Journal

I am surprised at first when I heard about this project requirement at the beginning of the semester, since I never thought about I could analyze one company's stock. I used to believe this culminating project would need some knowledge about business, which I never learned before. Although I have used Excel before, I am not quite familiar with graphing with it.

Nevertheless, I am glad that I learned many techniques and theoretical knowledge in Data Management throughout this semester, which are quite useful for me to analyze the stock. More importantly, the most complex calculating processes are shown step by step in class. I initially did not understand how the calculations shown in class could help to analyze the stock. However, with more and more calculations and definitions appearing in class, I gradually build a clear framework of the stock report in my mind.

When choosing the stock, Adidas quickly comes to my mind. Adidas is a pretty famous and popular brand in the world, especially in my homeland China. My family always like to buy clothes, shoes and sports equipment from Adidas, not only because of the good quality, but also its cheap price. Moreover, I found it interesting that Adidas has been declined in sales and reputation and almost died during 1970s to 1980s. It may be caused by the increased competition presented among several famous sports brands, such as Nike and New Balance. While it rises again after that, and continued to lead the second sports brands in the world. I am interested in how a company could recover from its downfall in world market. As a result, I chose Adidas to analyze for this time.

In conclusion, I wish I will be able to determine if Adidas is a good investment through the analysis of the five-year stock history. I hope to use Excel more efficiently in creating diagrams. More importantly, I wish I could apply my knowledge learned in Data Management course to my culminating project. As a Chinese old saying, "You can never get your experience only from reading".

## Post-Journal

Now I finally finish this culminating project. I can certainly say that I have gained more knowledge of stocks as well as the knowledge learned in class before. Although I spent a lot time to do it, the benefits are worthy.

To start with, a close insight of the stock price and company history gives me better understanding of the scatterplots. Throughout this culminating project, I learned how to use history, investment records, and important events to find the specific reasons causing its trend. I can use the events happened throughout the period to help analyze the stock trend. For example, Adidas stock prices declined dramatically during 2014. I am really interested in the cause of that, thus I searched the history of Adidas in 2014. I found that Adidas made two essential mistakes that year, which led its decreasing of stock prices. The first mistake is its insufficient investment in U.S. Also, it stuck to its old strategy, which made Adidas fall much behind the innovation front. These two mistakes worked together to cause the downfall of Adidas in 2014. Without the knowledge from history on website, I could not figure out why the stock prices continued to decline all the way down.

Moreover, all the analysis of five-year raw data on the closing stock price really reinforced my theoretical knowledge. I could generate all graphs (histogram, scatter plot, box and whisker plot) using Excel myself. More importantly, I could figure out the purpose of each one – the scatter plot shows the correlation between the data set and linear regression, the histogram shows the spread of data set, and the box and whisker plot states five areas to show the data spread generally as well.

In addition, I learned how to make extrapolation of the stock prices in the future. The extrapolation may be helpful under the condition where there are no big structural changes in company, and the world market does not change so much or so fast. When we look at the stock prices in 2013, we could find a steadily increasing trend. If the extrapolation is made in 2013, a continuous increasing rate may be estimated. While the stock prices decreased sharply in 2014, which was certainly surprising. Therefore, extrapolation could be useful, but certainly has limit.

In conclusion, Adidas occupies the second place in American sports brands. Although it had some decline in the past years (2014), it is still a good investment since Adidas could reverse its inferior place, climbed to the top, and continued to increase its stock value. The new strategy played an important role in its recovery.

## Reflection

The Excel report and Word report were finally done now. This project surely brought me tons of benefits. I learned not only how to apply the class materials on certain problems, but the Excel and analysis skills were improved as well.

To start with, I read others' analysis before I started to do it, thus I first had an overall understanding of this culminating project. When I did my report, I found it really boring to do the calculations and the graph – since they are the same steps repeated for several times. While through the experience of doing so, I became more professional in Excel and Word. I am more efficient in creating diagrams and analyze them. I also believe this skill would be really helpful for me not only in universities but also in society since many workplaces need skills of Excel. Therefore, I am able to gain an advantage in my future studies.

Secondly, various calculations – standard deviation, correlation coefficient, and linear regression really helped to better understand the class materials. All kinds of graphs provided me with a vivid way to see the stock prices trends or counts. I now know how to interpret each graph thoroughly.

Lastly, the stock analysis gave me a first glance at business area. Although I did mostly in Data Management, I still get in touch with business this time. My mom learned business and worked on it. She encouraged me to study business in universities as well though I am not very interested in it since I did not have any understanding of it. While through this experience, I got some interest in business now, which I guessed may change my future major or even job. It offered me more possibilities and views to the world, thus I am truly thankful to this experience.

In conclusion, the culminating project is hard for me at first. While eventually I overcome it with all my efforts, and learned much from it. I am glad that I could get such a valuable experience to analyze a stock using my existing knowledge. I wish the report could show my efforts and all knowledge I learned through this experience.

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Adidas Stock Summary  
ADDYY  
2013-2018

Judy Fu

Mr.Buzzelli

MDM4U1