

# **Stevens Institute of Technology**

FE 511 A - Intro to Bloomberg and Thomson Reuters

# **Final Project Report**

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# Part 1 - Trading on TD Ameritrade

## Trading Strategies

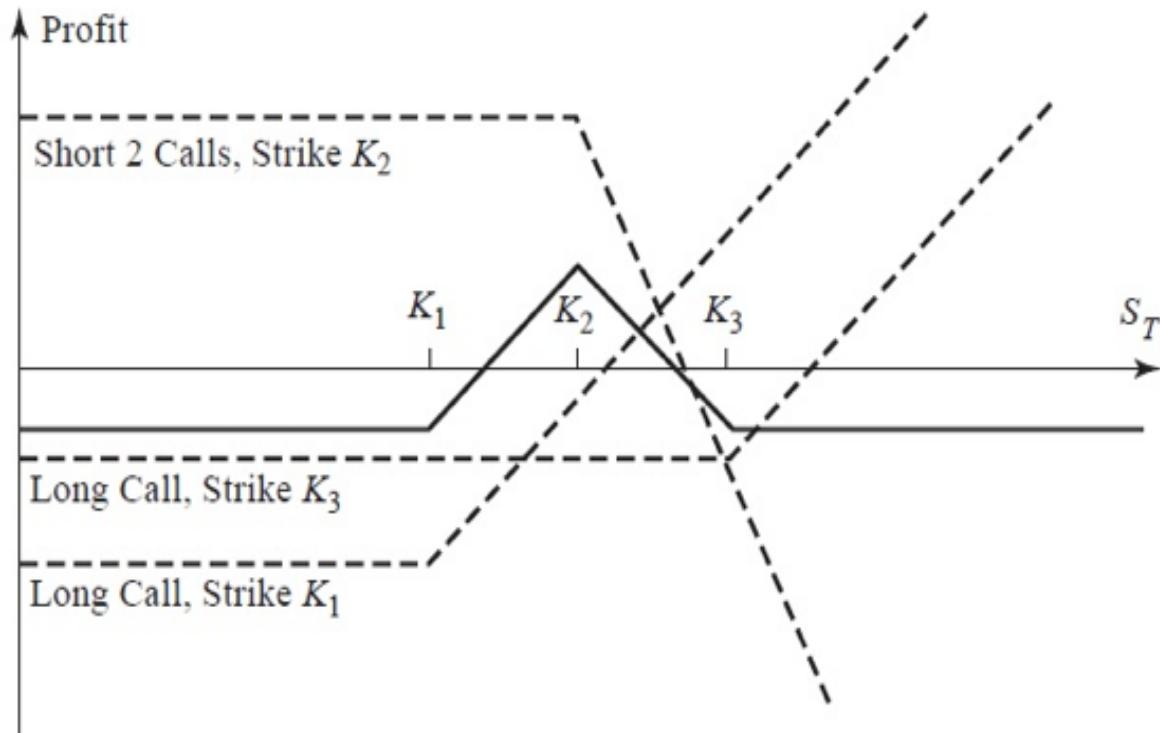
### Butterfly Spread

Butterfly spread uses four option contracts with the same expiration but three different strike prices to create a range of prices the strategy can profit from.

The trader shorts (sells) two option contracts at the middle strike price and buys one option contract at a lower strike price and one at higher strike price. Both puts and calls can be used for a butterfly spread.

Butterfly spreads have limited risk, meaning you can only lose initial investment. Your maximum return is when the price of the underlying asset remains around the middle strike price.

This strategy is used when the trader thinks that the price of the underlying will not move much from the current price. In other words, the trader has Short volatility. It can be created manually by the trader or can be bought as a whole spread.



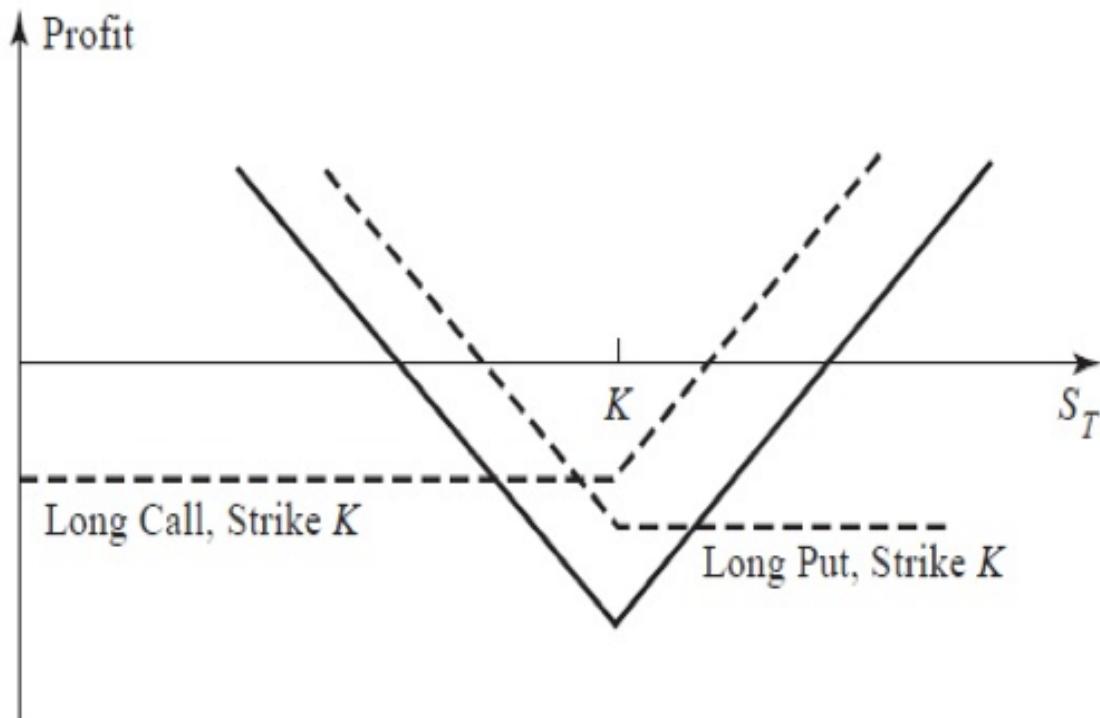
The above image represents the butterfly spread using CALL option. Here we can see that there is a long position at strike  $K_1$  and  $K_3$  and two short positions at strike  $K_2$ .

## Straddle

Straddle uses 2 options contracts with the same expiration and at the same strike price. The trader holds a long position (buys) in 1 call option contract and 1 put option contract.

Straddle has limited risk, meaning you can only lose your initial investment. Your maximum return is when the price of the underlying asset moves significantly from the strike price.

This strategy is used when the trader thinks that the price of the underlying will move significantly from the current price. The trade has Long Volatility. Straddle can be created manually or can be bought as a whole.



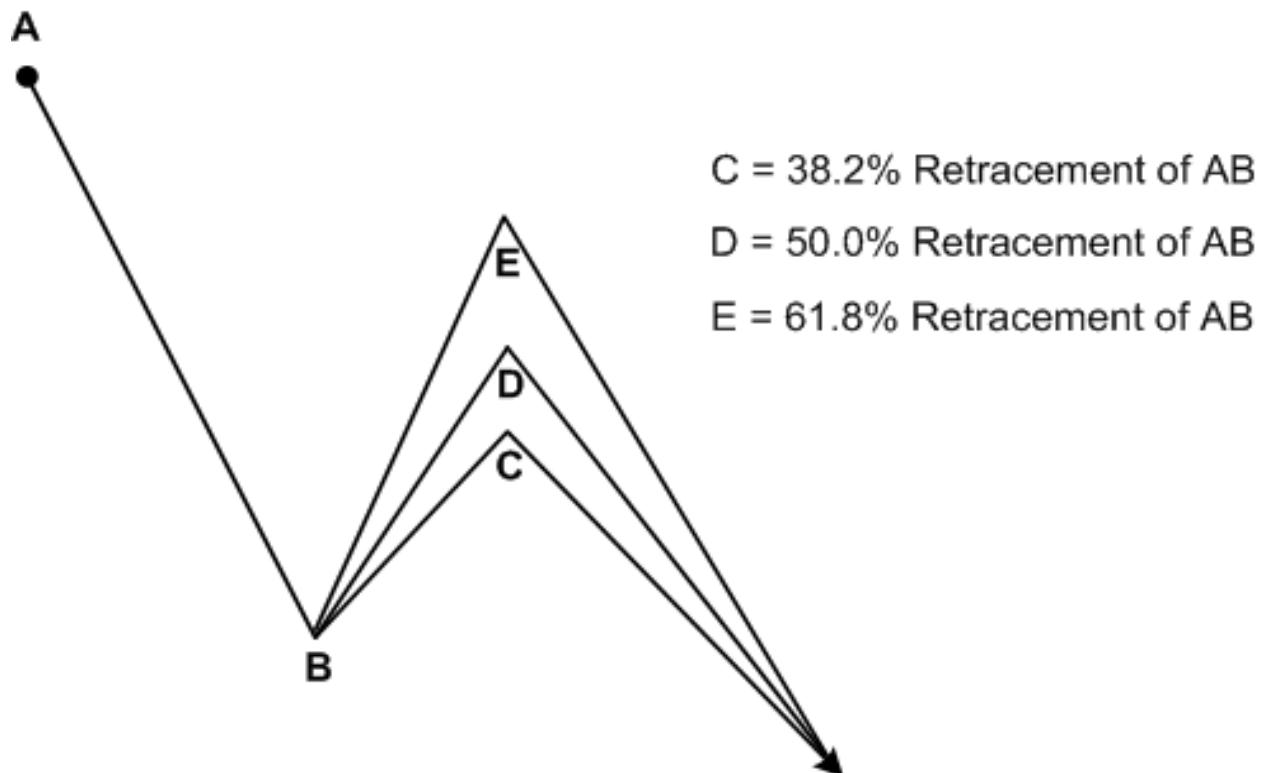
The above image represents the Straddle. Here we can see that there is a Long Position in a call option and a put option at strike price  $K$ . We can clearly see that the trader makes a profit if the price of underlying stock moves away from strike  $K$ .

## Fibonacci Retracement

A Fibonacci retracement is a term used in technical analysis that refers to areas of support (price stops going lower) or resistance (price stops going higher). Fibonacci retracement levels use horizontal lines to indicate areas of support or resistance at the key Fibonacci levels before the trend continues in the original direction. These levels are created by drawing a trendline between the high and low and then dividing the vertical distance by the key Fibonacci ratios of 23.6%, 38.2%, 50%, 61.8% and 100%.

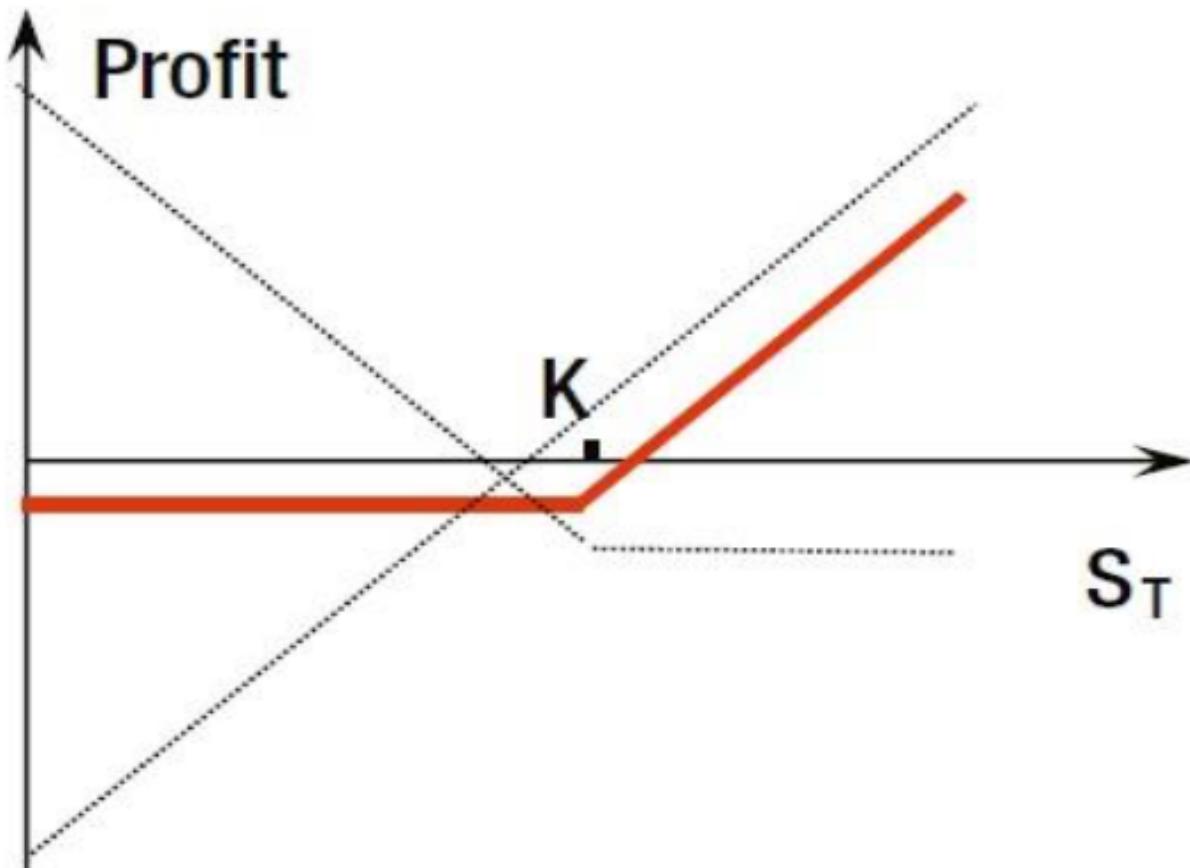
Fibonacci retracement levels are static prices that do not change, unlike moving averages. The static nature of the price levels allows for quick and easy identification. This allows traders and investors to anticipate and react prudently when the price levels are tested. These levels are inflection points where some type of price action is expected, either a rejection or a break.

The most significant Fibonacci retracement level to watch for is the 0.618. This is the inverse of the golden ratio, 1.618 or phi. The 0.618 retracement level tends to be the maximum pullback zone where fear climaxes as the final sellers throw in the towel and bargain hunters rush into the stock to resume the uptrend. On downtrends, the 0.618 price level should be where the final buyers are exhausted as sellers take the opportunity to unload their positions and short-sellers jump off the fence to push down the price and resume the downtrend. Some traders prefer to wait for two to three candlestick closes above or below a Fibonacci retracement level to confirm support or resistance before placing a trade.



## Buying Stocks and Options

In this strategy we simply buy stocks which are expected to rise. To hedge the loss, in case the stock price goes down, we buy put option contracts.



The above image represents the strategy used to hedge the loss from a stock if the price of the stock is going down. Here we can see that there is a long position in a put option at strike  $K$  and a stock. We can clearly see that the trader makes a profit if the price of the underlying rises considering the trader already has a stock. The loss which can occur due to negative movement of price is hedged using the put option. The loss is limited to the premium paid to buy the put option,

# Implementation of Trading Strategies

## Butterfly Spread

- Money invested in **Home Depot (HD)**
- **K1 = 122** : Bought 100 calls at a strike price of 122 . Call price: \$3.65
- **K3 = 130** : Bought another 100 calls at a strike price of 130 . Call price: \$0.03
- **K2 = 126** : Shorted 200 options at a strike price of 126 (K2=126). Call price: \$0.49

## Straddle

- Money invested in **Cisco (CSCO)**
- **K = 31.5** : Shorted 1000 calls at a strike price of 31.5. Call price: \$0.74
- **K = 31.5** : Shorted 1000 puts at a strike price of 31.5. Call price: \$0.56

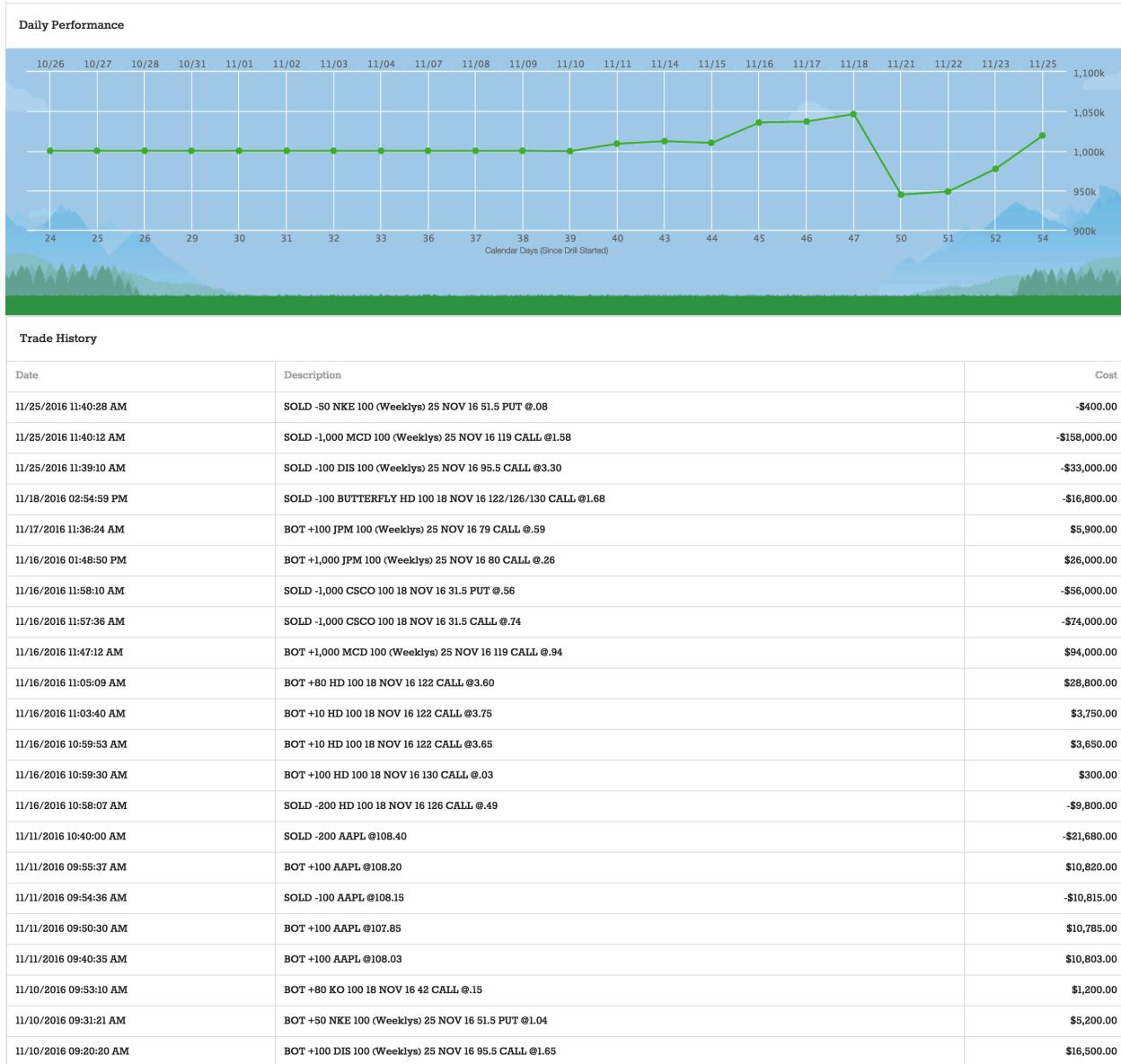
## Fibonacci Retracement

- Money invested in **JPMorgan (JPM)**
- **A = 80** : Bought 1000 calls at a strike price of 80. Call price: \$0.26
- **B = 79** : Bought 100 calls at a strike price of 79. Call price: \$0.59

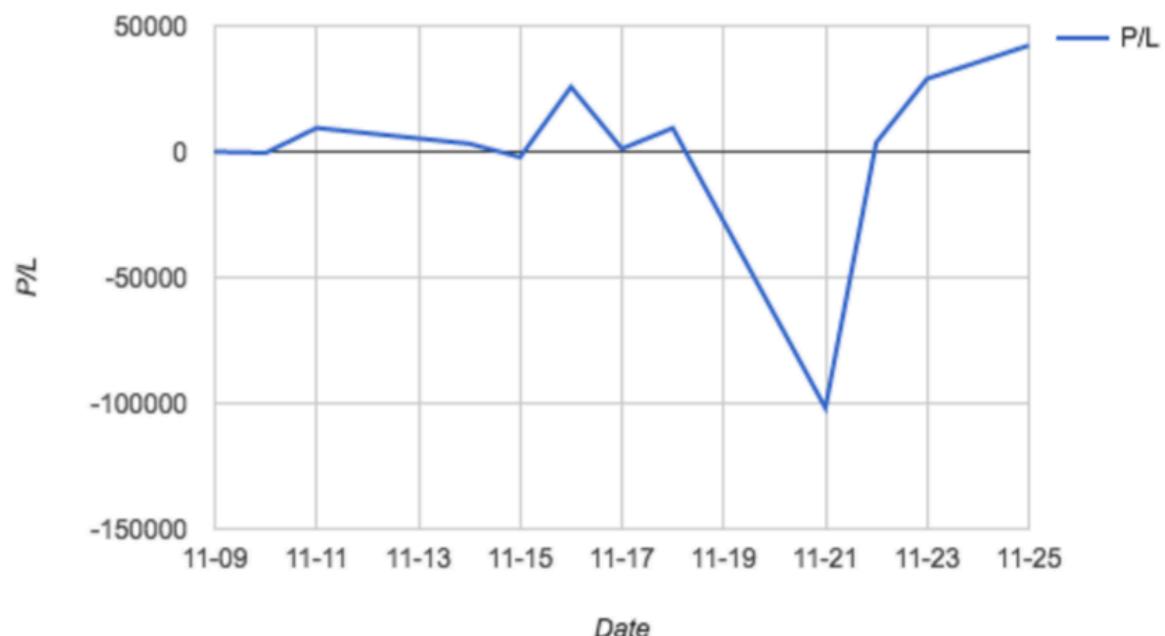
## Buying Stocks and Options

We also invested Money for buying stocks of Apple, Disney, Nike, Coca-cola and McDonalds.

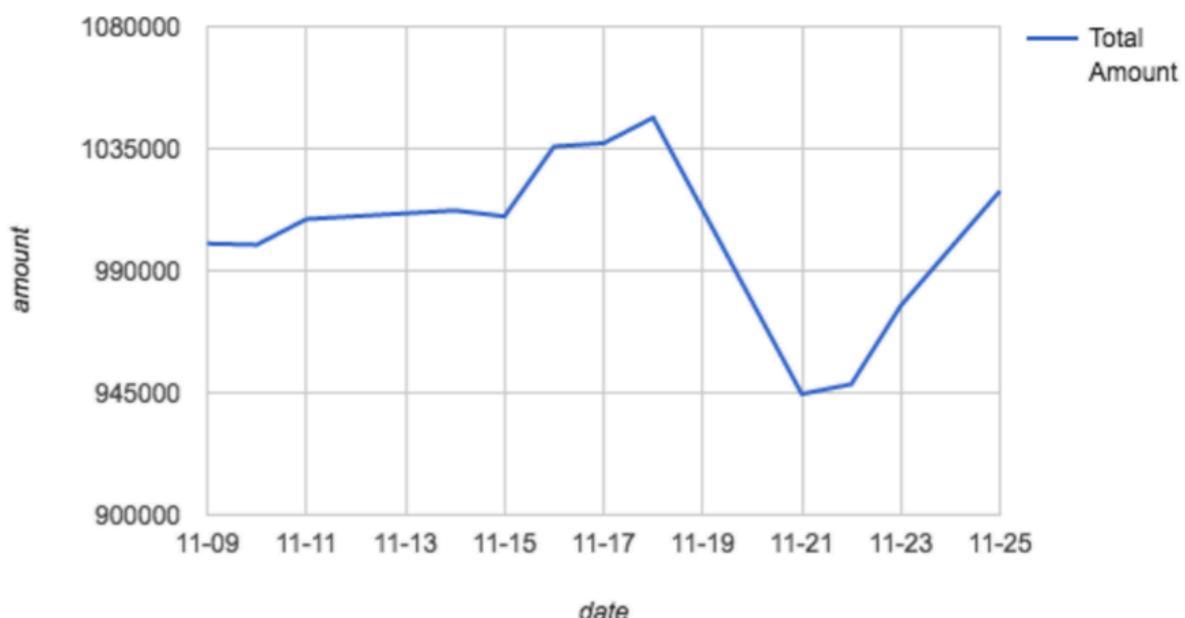
# Trading History



### P/L vs. Date



### amount vs. date



## Part 2.1 - Portfolio Analysis

### 1. The stock of interest: Disney (NYSE: DIS)

- a. Type: Price; Period: Daily; Select: Statistics check box to show Histogram window
- b. Type: Historical Volatility; Level 30 Days; Period: Daily; Select: Statistics Histogram



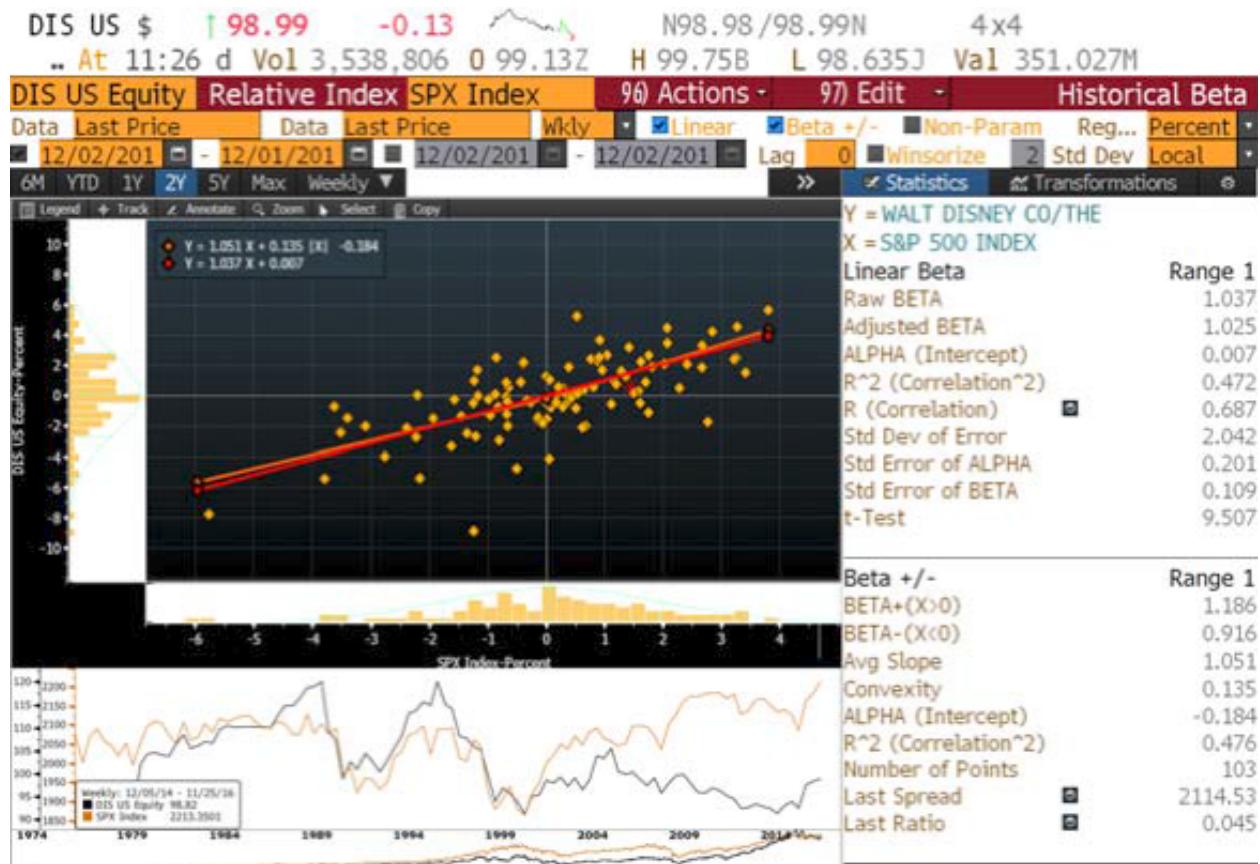
We observed the data from the period 06/01/2016 to 12/01/2016. The historical volatility has a low of 8.665 in the period while the price has a low of 90.83. In the same period, the historical volatility has a high of 17.295 while the price has a high of 100.20. At these extreme points, the historical volatility values seem to mirror the graph the price.

## 2. The stock of interest: Disney (DIS)



- The time period for the regression is 12/02/2014 to 12/01/2016.
- Variation in the equity is about 47%, explained by changes in the S&P 500 as the value of R^2 as 0.472.
- The equity will very slightly perform when the index returns are flat. This results from the value of intercept being +0.007. When X=0 in the regression equation, the dependent variable is equal to the intercept. Here, the intercept is referred to as alpha.
- The equity will on average be more volatile than the index. This factor follows from the slope of the regression line of 1.037 (i.e. for every 1% change in the index, we expect the fund's return to change by 1.037%). Here, the slope is referred as beta.
- When we click BETA +/- checkbox on the BETA screen, the below output is displayed. We find that BETA+ is 1.186, BETA- is 0.916 and the convexity is found to be 0.135.

- Its raw beta has the value of 1.037 while the adjusted beta has the value of 1.025. Raw beta refers the historical Beta, based on the observed relationship between the security's returns and the returns of the index while the adjusted Beta is an estimate of a security's future Beta. We observe that the estimated beta is reducing than the raw beta performed by the current regression analysis. That means for every 1% change in the index, we expect the fund's return to change by 1.025% in the future.
- 'HELP' function in Bloomberg explains the calculation of adjusted beta as follows: 'An estimate of a security's future beta. The adjusted beta is an estimate of a security's future beta. The adjusted beta is derived from historical data, but modified by the assumption that a security's beta moves toward the market average over time. Appears if you choose Linear in the control area. Adjusted Beta is an estimation of a security's future beta. The calculation is: Adjusted Beta = (0.67 \* Raw Beta) + (0.33 \* 1.0).'



### 3. Stock of interest: Disney (DIS)

- As found earlier in the above question, we observe that it has a very high positive correlation of 0.687. Disney is highly correlated with the S&P 500 which represents the market.
- Variation in the equity is about 47%, explained by changes in the S&P 500 as the value of R^2 as 0.472.
- The equity will very slightly perform when the index returns are flat. This results from the value of intercept being +0.007. When X=0 in the regression equation, the dependent variable is equal to the intercept. Here, the intercept is referred to as alpha.
- The equity will on average be more volatile than the index. This factor follows from the slope of the regression line of 1.037 (i.e. for every 1% change in the index, we expect the fund's return to change by 1.037%). Here, the slope is referred as beta.
- With its peers, the data is given in the table below:
- We observe that it is highly correlated with FOXA and not so correlated with VIAB.

DIS US \$ <span style="color: green;">↑ 98.72</span> -0.40  N98.71/98.72N 5x7										
At 13:14 d Vol 5,238,311 0 99.13Z H 99.75B L 98.62B Val 519.337M										
DIS US Equity 1) Edit 2) Save to CORF.launch Chart G 4) Settings Peer Correlation										
12/02/2011	-	12/01/2011	Daily	Calculation	Correlation	Local CCY				
Peer Source	Bloomberg Peers		Global	Closet	15	By	Market Cap			
<b>&lt;Filter&gt;</b> Correlation Matrix (6 Rows x 10 Columns)										
Security	DIS	SPX	S5COND	INDU	RAY	RIY	OEX	RLG	SPR	SGX
1) DIS	1.000	0.682	0.708	0.705	0.680	0.681	0.684	0.669	0.681	0.659
2) FOXA	0.617	0.649	0.652	0.631	0.652	0.653	0.638	0.643	0.650	0.633
3) CBS	0.567	0.597	0.625	0.568	0.606	0.606	0.574	0.599	0.601	0.578
4) DISCA	0.527	0.605	0.559	0.581	0.620	0.616	0.575	0.577	0.613	0.548
5) TWX	0.505	0.444	0.494	0.410	0.454	0.451	0.421	0.447	0.448	0.427
6) VIAB	0.443	0.445	0.482	0.441	0.456	0.453	0.432	0.431	0.450	0.411

( Color Bands Based on Statistical Significance: Most Significant , Significant , Less Significant , Least Significant )  
Click on a security to view more options, or on a matrix value to view correlation and scatter charts.

#### 4. Portfolio with stocks making up the S&P 500 with a market cap greater than \$15 billion.

1 <GO> for Results, 89 <GO> to see last unsaved screen

97) Formula 98) Actions - 99) Backtest **Equity Screening**  
As Of 12/05/201

My Recent Screens  
11) EQS  
20) All Saved Screens

Popular Screens  
21) ETFs 52 Week High  
22) High CDS Spreads  
23) Insider Buyers  
24) Quality Screen  
25) SZSE SEHK Northbound  
26) Value Screen  
30) More Screens

Screening Criteria  
31) Exchanges 32) Sectors 33) Country of Domicile  
34) Indices 35) Portfolios/Monitors 45) More Categories  
Add Criteria  
Market Cap Current 6) Growth 3) Info  
Greater than ▾ 7) Bmrk 4) Info  
M 15000 Criteria Currency LCL ▾  
Selected Screening Criteria  
Security Universe Matches  
51) Trading Status: Active 879752  
52) Indices: S&P 500 Index 248705   
53) Current Market Cap > 15000M 505  298   
54) Add screening criteria

1) Results



## a. Historical Performance of the Portfolio



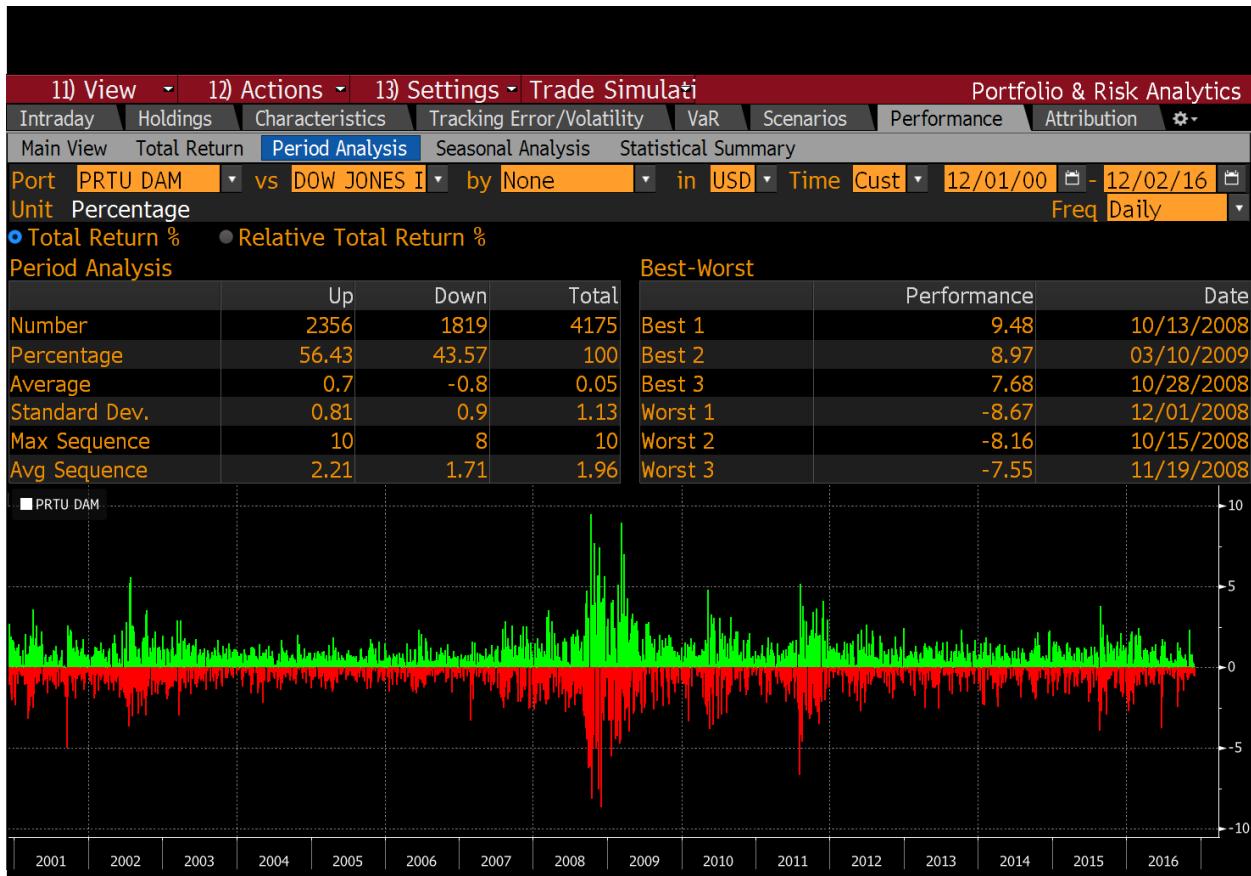
We performed the historical analysis on the portfolio. We observed the data from 2000 to 2016. The total Return has been on a rise ever since 2000.

## b. Historical Performance of the fund relative to an index (INDU)



We observe that the fund over performs the index (INDU). For the same duration, its Total Return is well over 500% while the Total return of the index (INDU) is just about 100%.

### c. Historical performance of portfolio for different periods relative to index



11) View 12) Actions 13) Settings Trade Simulation Portfolio & Risk Analytics

Intraday Holdings Characteristics Tracking Error/Volatility VaR Scenarios Performance Attribution

Main View Total Return Period Analysis Seasonal Analysis Statistical Summary

Port PRTU DAM vs DOW JONES I by None in USD As Of 12/02/16

Unit Percentage

PRTU DAM

	3 Months		6 Months		Year To Date		1 Year	
	Port	Bench	Port	Bench	Port	Bench	Port	Bench
Portfolio Statistics								
2. Return								
Total Return	0.52	4.35	4.42	8.90	8.70	12.90	7.68	11.06
Maximum Return	2.35	2.08	2.35	2.08	2.42	2.47	2.42	2.47
Minimum Return	-2.46	-2.13	-3.78	-3.39	-3.78	-3.39	-3.78	-3.39
Mean Return (Annualized)	3.88	28.00	13.92	27.87	15.00	21.58	12.43	17.19
Mean Excess Return (Annualized)	-18.85	-10.91			-5.42		-4.06	
3. Risk								
Standard Deviation (Annualized)	11.50	10.55	11.92	10.93	13.88	12.91	14.18	13.38
Downside Risk (Annualized)	8.08	7.48	8.91	8.05	10.19	9.46	10.39	9.81
Skewness	-0.07	-0.12	-0.93	-0.82	-0.44	-0.41	-0.38	-0.37
VaR 95% (ex-post)	-0.78	-1.04	-0.78	-0.81	-1.46	-1.38	-1.49	-1.42
Tracking Error (Annualized)	4.73		4.01		4.69		4.63	
4. Risk/Return								
Sharpe Ratio	0.21	1.80	0.79	1.73	0.74	1.14	0.60	0.88
Jensen Alpha	-16.43		-9.96		-4.67		-3.29	
Information Ratio	-2.93		-1.98		-0.83		-0.63	
Treynor Measure	0.02		0.09		0.10		0.08	
Beta (ex-post)	0.99		1.03		1.01		1.00	
Correlation	0.9113		0.9421		0.9413		0.9453	
Capture Ratio	0.82		0.84		0.80		0.81	

#### d. Returns for different periods of each sector

Portfolio & Risk Analytics											
Intraday	Holdings	Characteristics	Tracking Error/Volatility	VaR	Scenarios	Performance	Attribution				
Main View	Total Return	Period Analysis	Seasonal Analysis	Statistical Summary							
Port	PRTU DAM	vs DOW JONES I	by GICS Sector	in USD				As Of	12/02/16		
Unit	Percentage										
Name	% End Wgt			Tot Rtn 1D			Tot Rtn MTD			Tot Rtn YTD	
	Port	Bmrk	+/-	Port	Bmrk	+/-	Port	Bmrk	+/-	Port	Bmrk
PRTU DAM	100.00	100.00	0.00	0.06	-0.11	0.17	-0.51	0.25	-0.76	8.70	12.90
Consume...	19.46	14.18	5.27	-0.35	-0.12	-0.24	-1.02	-0.15	-0.87	9.59	-3.16
Consume...	7.08	6.92	0.17	0.64	0.49	0.15	-0.35	0.21	-0.56	0.83	8.47
Energy	5.07	7.15	-2.08	0.22	-0.24	0.46	0.19	0.59	-0.41	30.10	23.93
Financials	12.22	17.59	-5.38	-0.91	-0.78	-0.13	0.29	1.57	-1.28	16.46	17.05
Health C...	16.60	13.06	3.54	0.18	0.25	-0.07	-0.66	0.69	-1.35	-6.98	22.54
Industrials	12.37	19.98	-7.61	0.06	-0.13	0.20	0.66	0.55	0.12	25.77	17.56
Informati...	13.76	16.73	-2.97	0.46	0.25	0.21	-1.93	-1.38	-0.56	8.92	9.94
Materials	4.45	2.61	1.83	-0.04	-0.67	0.63	-0.07	-0.65	0.58	15.02	12.39
Real Est...	5.20	5.20	1.01			1.01	-0.61	-0.61	-0.93		-0.93
Telecom...	0.47	1.78	-1.31	0.21	-0.12	0.33	0.45	-0.18	0.63	10.08	12.64
Utilities	3.33	3.33	0.95			0.95	0.18	0.18	11.39		11.39
AMERICAN E	0.19	0.19	0.93			0.93	-0.59	-0.59	4.34		4.34
CONSOLIDA	0.23	0.23	0.32			0.32	-0.11	-0.11	12.50		12.50
DOMINION	0.24	0.24	1.42			1.42	0.67	0.67	13.39		13.39
DTE ENERGY	0.31	0.31	1.62			1.62	2.19	2.19	21.53		21.53
DUKE ENER	0.24	0.24	0.92			0.92	-0.47	-0.47	7.35		7.35
EDISON INT	0.23	0.23	1.23			1.23	0.92	0.92	19.51		19.51
EVERSOURC	0.17	0.17	1.14			1.14	0.12	0.12	3.70		3.70
EXELON COR	0.11	0.11	2.61			2.61	1.54	1.54	23.53		23.53

Holdings as of: Varies by field

Submitted at: 18:54:31



▲ Zoom



+100%

e. Returns and Standard Deviations for different periods for each stock

Portfolio & Risk Analytics												
Intraday	Holdings	Characteristics	Tracking Error/Volatility	VaR	Scenarios	Performance	Attribution					
Main View	Total Return	Period Analysis	Seasonal Analysis	Statistical Summary								
Port	PRTU DAM	vs DOW JONES I	by GICS Sector	in	USD	As Of	12/02/16					
Unit	Percentage											
Name	% End Wgt			Tot Rtn 1D		Tot Rtn MTD		Tot Rtn YTD				
	Port	Bmrk	+/-	Port	Bmrk	+/-	Port	Bmrk	+/-	Port	Bmrk	+/-
■ PRTU DAM	100.00	100.00	0.00	0.06	-0.11	0.17	-0.51	0.25	-0.76	8.70	12.90	-4.20
■ + Consume...	19.46	14.18	5.27	-0.35	-0.12	-0.24	-1.02	-0.15	-0.87	9.59	-3.16	12.75
■ + Consume...	7.08	6.92	0.17	0.64	0.49	0.15	-0.35	0.21	-0.56	0.83	8.47	-7.64
■ + Energy	5.07	7.15	-2.08	0.22	-0.24	0.46	0.19	0.59	-0.41	30.10	23.93	6.17
■ + Financials	12.22	17.59	-5.38	-0.91	-0.78	-0.13	0.29	1.57	-1.28	16.46	17.05	-0.59
■ + Health C...	16.60	13.06	3.54	0.18	0.25	-0.07	-0.66	0.69	-1.35	-6.98	22.54	-29.52
■ + Industrials	12.37	19.98	-7.61	0.06	-0.13	0.20	0.66	0.55	0.12	25.77	17.56	8.21
■ + Informat...	13.76	16.73	-2.97	0.46	0.25	0.21	-1.93	-1.38	-0.56	8.92	9.94	-1.03
■ + Materials	4.45	2.61	1.83	-0.04	-0.67	0.63	-0.07	-0.65	0.58	15.02	12.39	2.63
■ + Real Est...	5.20		5.20	1.01		1.01	-0.61		-0.61	-0.93		-0.93
■ + Telecom...	0.47	1.78	-1.31	0.21	-0.12	0.33	0.45	-0.18	0.63	10.08	12.64	-2.56
■ Utilities	3.33		3.33	0.95		0.95	0.18	0.18	11.39		11.39	
AMERICAN E	0.19		0.19	0.93		0.93	-0.59		-0.59	4.34		4.34
CONSOLIDA	0.23		0.23	0.32		0.32	-0.11		-0.11	12.50		12.50
DOMINION	0.24		0.24	1.42		1.42	0.67		0.67	13.39		13.39
DTE ENERGY	0.31		0.31	1.62		1.62	2.19		2.19	21.53		21.53
DUKE ENER	0.24		0.24	0.92		0.92	-0.47		-0.47	7.35		7.35
EDISON INT	0.23		0.23	1.23		1.23	0.92		0.92	19.51		19.51
EVERSOURC	0.17		0.17	1.14		1.14	0.12		0.12	3.70		3.70
EXELON COR	0.11		0.11	2.61		2.61	1.54		1.54	23.53		23.53

Holdings as of: Varies by field

Submitted at: 18:54:31



Zoom



+100%



f. Correlation of the stocks in the portfolio.

AMZN US \$ ↓ 759.36 +19.02 P 759.36 / 759.78Q 1x6										
At 17:20 d Vol 4,310,871 0 745.00K H 761.49P L 742.00D Val 3.26B										
AMZN US Equity 1) Edit 2) Save to CORFaunch Chart G 4) Settings Peer Correlation										
12/06/2011	-	12/05/2011	Daily	Calculation	Correlation	Local CCY				
Peer Source	Portfolio	PRTU DAM	Closet	15	By	Market Cap				
<Filter> Correlation Matrix (15 Rows x 10 Columns)										
Security	AMZN↑	SPX	S5COND	CCMP	NDX	RAY	RIY	OEX	RLG	SPR
11) AMZN	1.000	0.502	0.638	0.599	0.653	0.490	0.496	0.534	0.571	0.492
12) FB	0.603	0.518	0.560	0.592	0.643	0.501	0.509	0.549	0.579	0.506
13) MSFT	0.509	0.719	0.687	0.779	0.815	0.707	0.713	0.740	0.765	0.711
14) JNJ	0.298	0.586	0.483	0.517	0.517	0.571	0.578	0.614	0.558	0.579
15) GE	0.298	0.759	0.685	0.665	0.628	0.754	0.757	0.758	0.709	0.757
16) PG	0.292	0.533	0.442	0.450	0.473	0.509	0.520	0.556	0.503	0.523
17) CVX	0.285	0.643	0.504	0.531	0.503	0.636	0.640	0.646	0.547	0.640
18) JPM	0.271	0.785	0.653	0.692	0.625	0.786	0.785	0.780	0.696	0.787
19) BRK/B	0.256	0.794	0.675	0.669	0.625	0.786	0.788	0.798	0.714	0.795
20) BAC	0.255	0.728	0.618	0.653	0.576	0.738	0.734	0.714	0.641	0.733
21) WFC	0.250	0.691	0.599	0.595	0.523	0.694	0.691	0.691	0.599	0.694
22) XOM	0.239	0.585	0.411	0.445	0.414	0.573	0.579	0.594	0.474	0.581
23) VZ	0.229	0.491	0.422	0.391	0.398	0.477	0.484	0.493	0.466	0.486
24) T	0.215	0.463	0.400	0.351	0.365	0.444	0.454	0.473	0.431	0.457
25) WMT	0.114	0.348	0.342	0.290	0.303	0.332	0.339	0.357	0.336	0.341

( Color Bands Based on Statistical Significance: Most Significant, Significant, Less Significant, Least Significant )  
Click on a security to view more options, or on a matrix value to view correlation and scatter charts.

## Part 2.2 - Backtesting Trading Strategy

Our Backtesting Trading strategy is based on the Exponential Moving Average (EMA) of S&P 500 Index. The data is weekly and we are only working with the close price. The duration of the backtesting is from 01/01/1950 - Present day.

### Assumptions:

- We have selected PERIODS of 20 i.e. we are taking the Simple Average of first 19 weeks and then using this result to compute the Moving Average of the remaining weeks
- The MULTIPLIER function is  $2/(PERIODS+1)$ . For simplicity value of multiplier is rounded to 2 decimal points. In our case the Multiplier will be 0.10 ( $= 2/(20+1)$ )

### Algorithm:

1. We compute the SIMPLE AVERAGE of FIRST 19 weeks.
2. Calculate EMA for all weeks using the function =  $((Current\ CLOSE - Previous\ Moving\ Average) * MULTIPLIER) + Previous\ Moving\ Average$
3. Compare Trading Strategy:  
We are comparing our Trading Strategy with the Profit Gained by buying the stock at the first day and Holding it till the current day.
  - a. Let's call the Profit Gained by buying the stock at the first day and Holding it till the current day as "BUY INDEX"
  - b. We are starting the trading account with \$1000 and considering 1950-07-31 as the first BUY date, so we have \$1000 on 1950-07-31
  - c. For all other weeks we calculate BUY INDEX as  $(Current\ CLOSE / Previous\ CLOSE) * Previous\ BUY\ INDEX$ .
4. Testing our Trading Strategy  
For this we will use, BUY INDEX when the price CLOSE above the EMA in the previous week. We will call this "BUY above EMA".
  - a. We are starting the trading account with \$1000 and considering 1950-07-31 as the first BUY date, so we have \$1000 on 1950-07-31
  - b. For all other weeks we calculate BUY Above EMA using formula  $if(Previous\ CLOSE > Previous\ EMA, (Current\ CLOSE / Previous\ CLOSE) * Previous\ BUY\ STOCK, Previous\ BUY\ above\ EMA)$
  - c. Comparing the values for the last record we conclude that BUY INDEX is almost similar to BUY above EMA

### Results

We can find the Backtesting Strategy Analysis of S&P 500 Index using Bloomberg Terminal's BTST<GO> command. We have calculated and displayed the results using Bloomberg's Excel and python API. The duration of the backtesting data is from 01/01/1950 - Present day.

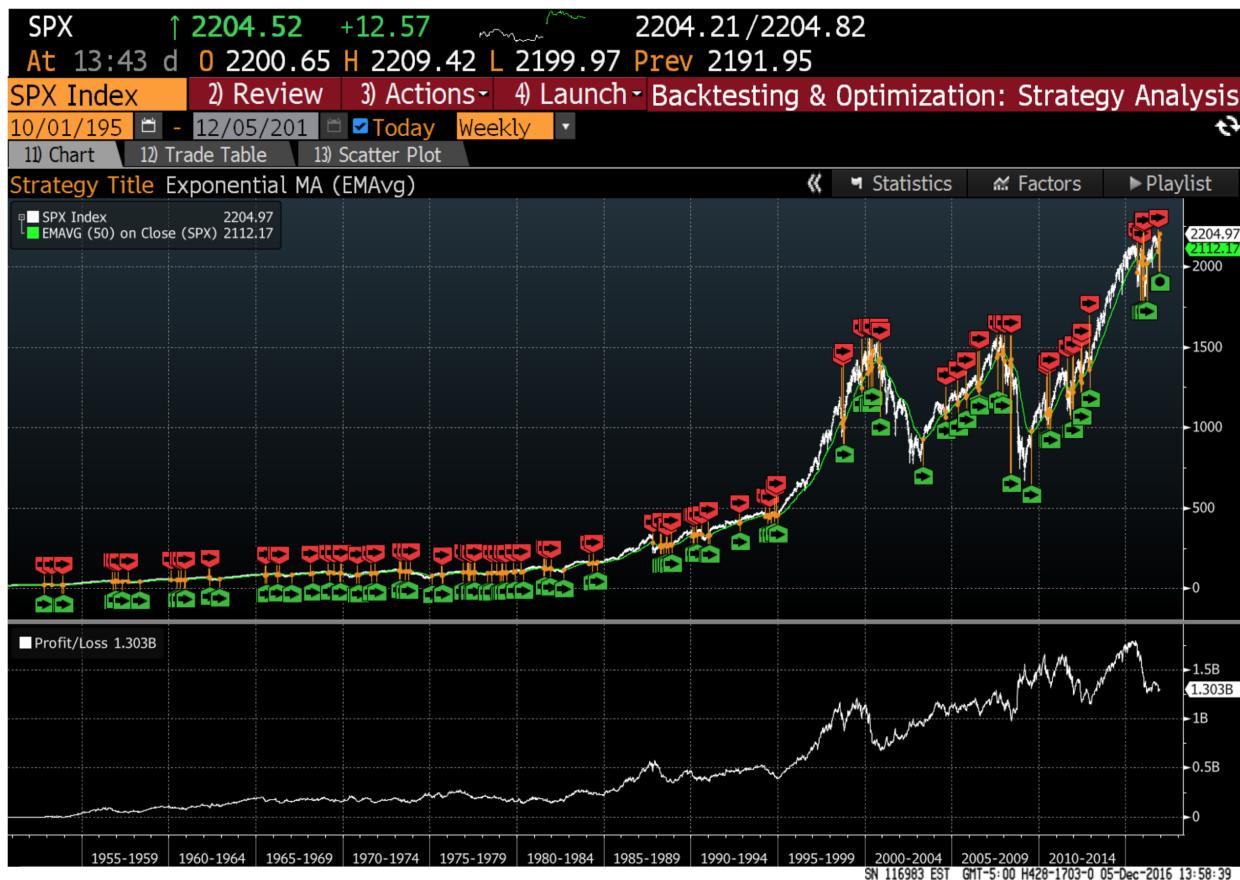
## Strategy Analysis

To Backtest the Index on Bloomberg terminal follow the steps:

Navigate to Bloomberg terminal Main Screen and type SPX INDEX <GO> in the coming line.

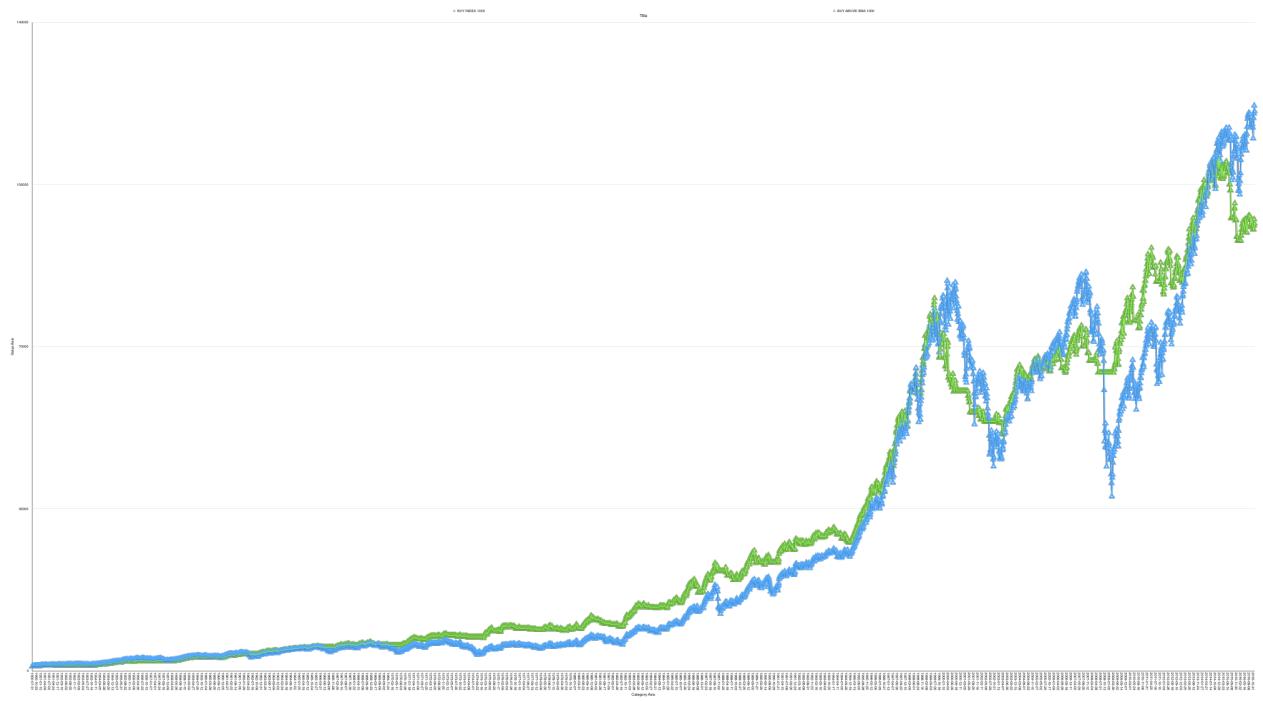
Then type BTST<GO> command to backtest it. Select “EMA” as indicator.

The output of Exponential Moving Average (EMA) indicator using Bloomberg terminal can be seen in the below image. White line is the Profit gained by buying the stock at first available date and holding it till the current day and the Green line is the buy corresponding to EMA values.



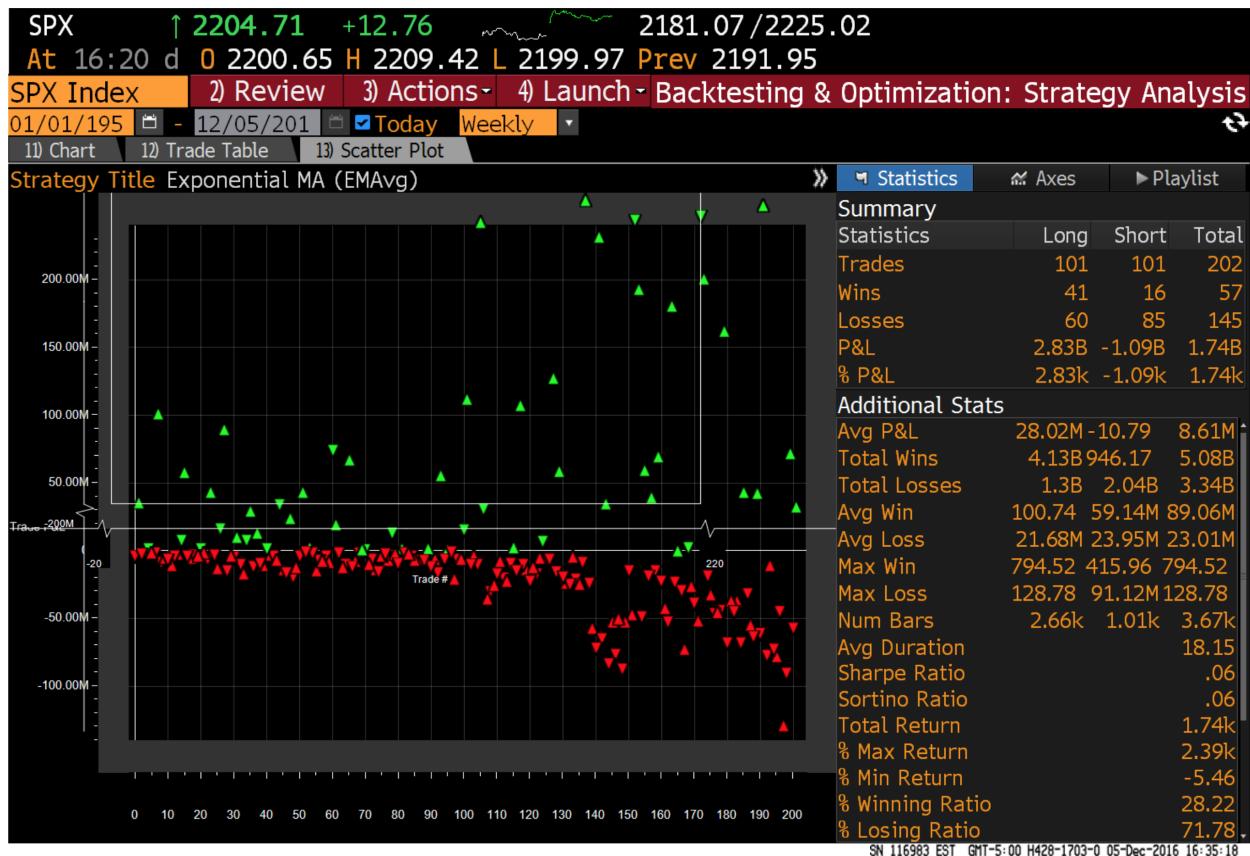
To backtest the index using our implementation run the code (“Main.py”) using “SPYDER” IDE and/or open the Excel document.

Our implementation of the EMA indicator for backtesting S&P 500 index using Bloomberg API for Excel and Python gives near similar result, which can be seen in the following image. Blue line is the Profit gained by buying the stock at first available date and holding it till the current day and the Green line is the buying above EMA.

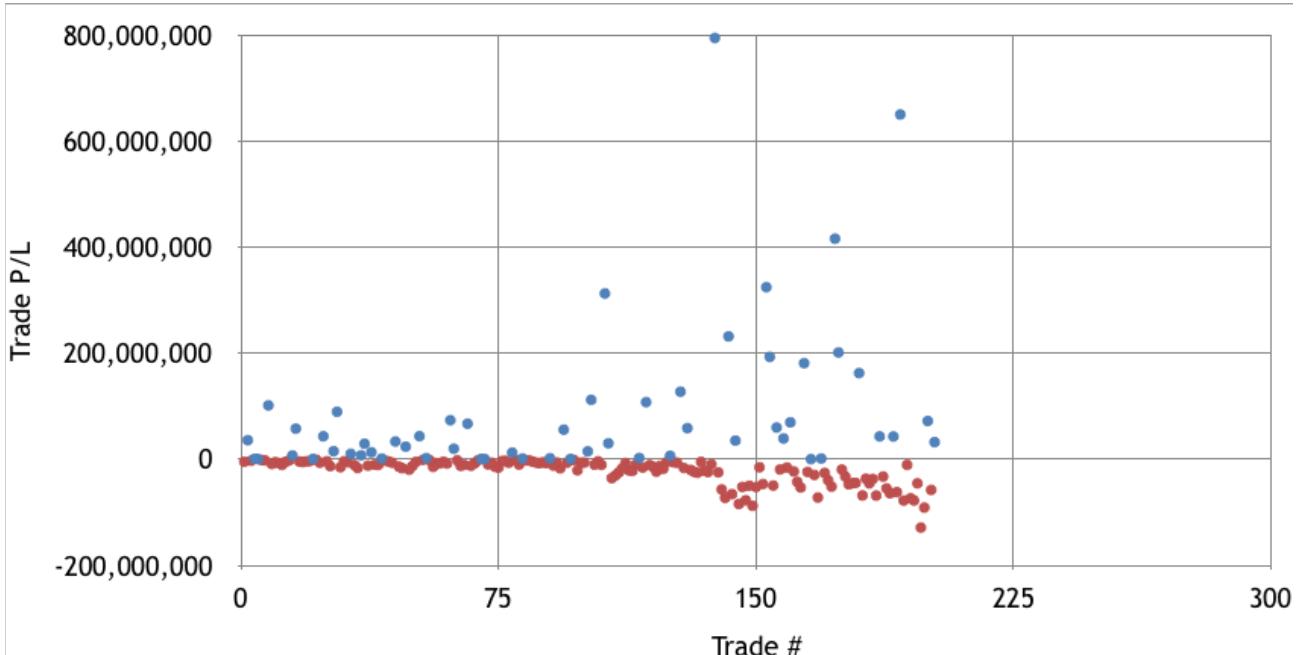


## P/L Comparison

The Total P/L using Bloomberg terminal is 1.74B as seen in the below scatter plot chart. The total P/L obtained using our implementation is 1.65B which is nearly equal to the value obtained by using the BTST command in Bloomberg terminal. The scatter plot chart for based on our implementation of backtesting function is given below:



While comparing both the scatter plot chart, we can observe that they are nearly identical.



## Code & Data

### 1. Excel Implementation

Open spreadsheet titled 'BTS-EMA-SPN500.xlsx' located in the 'Code/Excel' folder to view the results.

### 2. Python Implementation

Run the 'Main.py' python script located in the 'Code/Python' folder in Spyder or any other IDE. On successful execution of the script you can see the graph

### 3. Data

The data used can be found under 'Data/data.xlsx' file.