SFM-03 Summary Document

Weighted Portfolio: Weighted Portfolio is the method to minimise portfolio risk by allocating funds in different assets and asset classes.

Variance: The variance of a set of values is the average of the squared differences from the mean.

Standard Deviation: Standard Deviation is the square root of the variance. Standard deviation is also considered as historical volatility. Volatility is one of the most critical features in finance. It is considered as a measure to assess the risk of financial assets. It is also used in various Value-at-risk models for measuring market risk.

For example, if you have to invest in either of two technology stocks Apple or Amazon, for a month, then which one would you choose based on monthly returns

Date	APPL	AMZN
2016-02-01	-0.67	-5.87
2016-03-01	13.33	7.44
2016-04-01	-13.99	11.11
2016-05-01	6.53	9.58
2016-06-01	-3.68	-0.99

2016-07-01	9.01	6.04
2016-08-01	1.81	1.36
2016-09-01	7.13	8.86
2016-10-01	0.43	-5.67
2016-11-01	-2.66	-4.97
2016-12-01	5.33	2.41
2017-01-01	4.77	7.13
2017-02-01	12.89	2.62

The average return of Apple is 3.1 %, and it ranges from -13.99 to 13.33% in the given duration.
The average return of Amazon 3.0% is, and it ranges from -5.87 to 11.11% in the given duration.

It is quite visible the range of Apple Returns is much bigger than the range of Amazon percentage returns over the same period of time. However, there is very little difference between the monthly average returns of both stocks.

Statistically standard derivation of Apple is 7.15%, whereas the standard deviation of Amazon 6.22%

To derive the probable range for next month, calculate mean minus standard deviation and mean plus standard deviation for both the stocks and that would be a decisive factor about which stock is safer for investment.

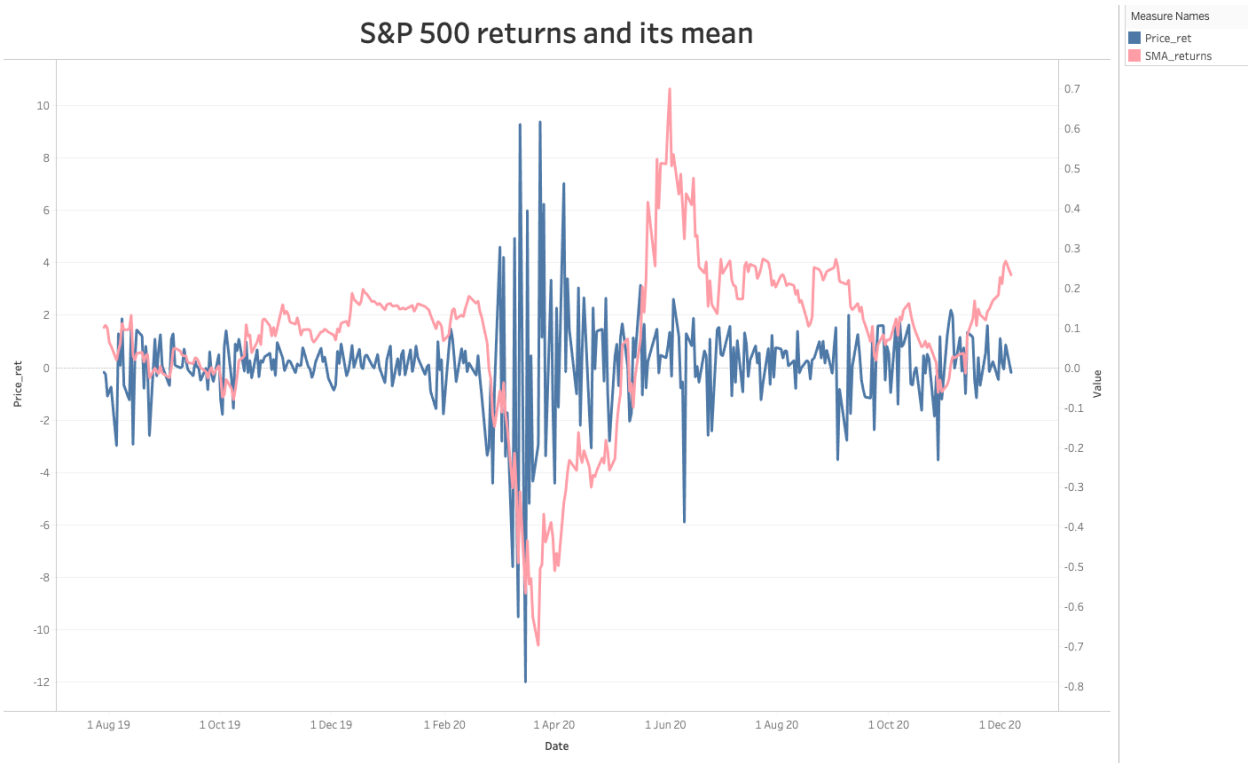
In this scenario, the mean of monthly returns of Apple and Amazon is almost the same. In contrast, there is a significant difference of 0.93% between the standard

deviation of the two. Since the standard deviation of Amazon is much lesser than that of Apple, Amazon will be the safer choice to invest in.

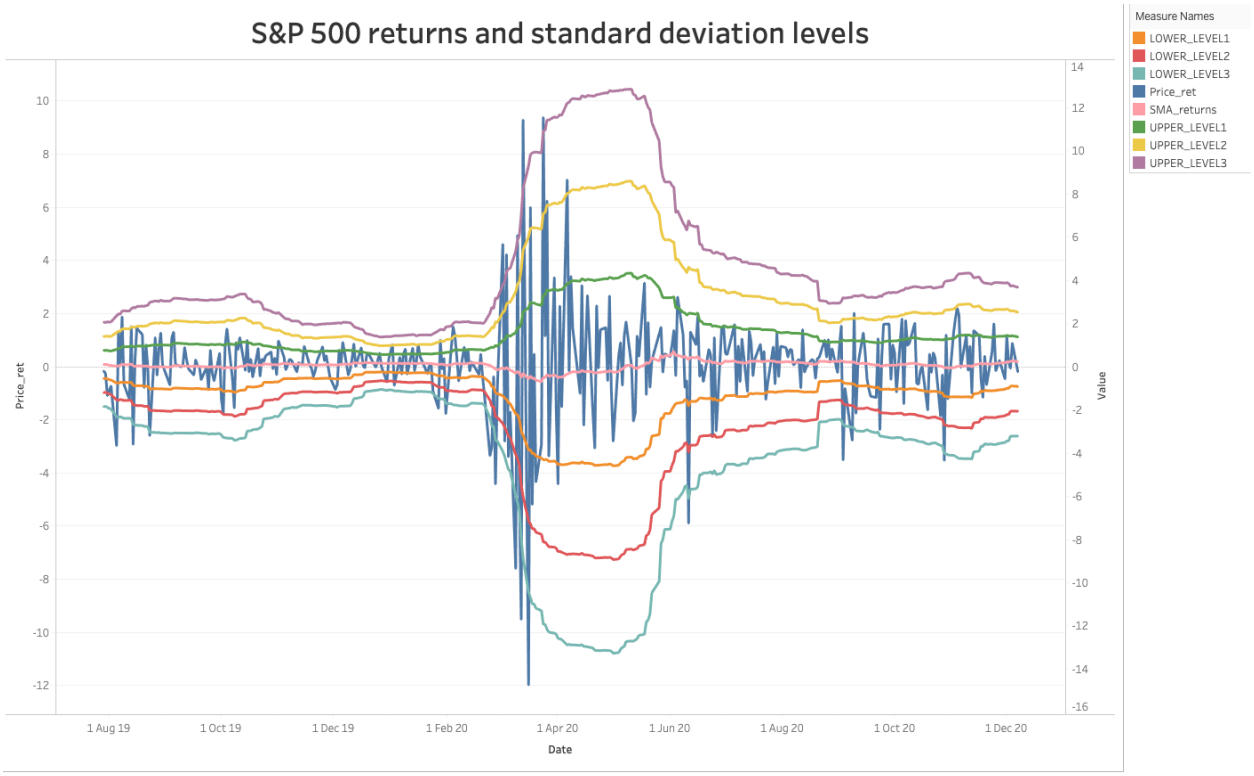
Higher volatility will make the returns of the instrument more unstable and hence riskier. And lower volatility means the returns are stable, and therefore, the stock is safe to invest in.

To check if the stock has high volatility or not, the same can be verified by checking how much the instrument deviates from its mean in the given period.

The plot displays the S&P 500 with its mean.



After adding +1,+2,+3 and -1,-2,-3 times standard deviation in the plot, it gives the upper and lower levels of the underlying returns. And the probability % to reach those levels from the mean is 34.13%,47.73% and 49.86%, respectively. And in other words, it is nothing but a way of measuring volatility.



Random Walk Model: Random walk model is the popular model being used in the domain of Finance in Time series analysis and prediction. It states that today's price is a function of the previous day price and factors that cause a change in the price. Mathematically it can be defined as follows:

P1=P0+kP0
P1=Current day instrument price
P0=Previous day instrument price
k=factors involving a change in the price of the instrument

Monte Carlo Simulation: Monte Carlo simulation is used to model possible paths of asset prices in which the formula for predicting the next day's price is given by:

next day's price = today's price * e ^ (drift + random value)

There are two components to an asset's price movements:

- ➔ Drift, which is a constant directional movement, and
- ➔ Random input, representing market volatility.

By analysing historical price data, you can determine the drift, standard deviation, variance and average price movement for security. These are the building blocks of a Monte Carlo simulation.

Bollinger Band: Bollinger band is a technical indicator widely used as the momentum indicator and support and resistance tool. It can be defined mathematically as:

lower_band=sma-lower_level*std
upper_band=sma+upper_level*std

Referring to the example in the lecture:

sma=20 days of moving average

std= 20 days of moving standard deviation
lower_band=sma-2*std
upper_band=sma+2*std

The strategy discussed in the lecture was :

- every time the price crosses below lower_band, then buy
- every time the price crosses above upper_band, then sell