INTRODUCTION TO STOCK VALUATION

11/16/2018

2018 CFM Hackathon

UNIVERSITY OF WATERLOO

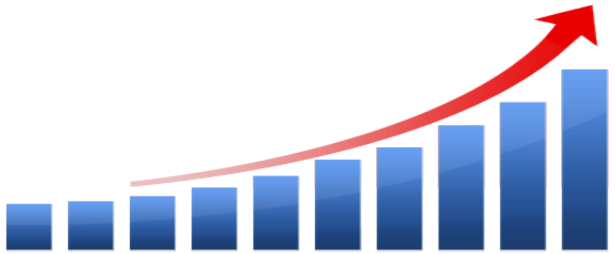
RECAP OF BASICS

Shares, Stock Exchanges, Reading Quotes

STOCKS & STOCK EXCHANGES

Stocks

- The stock of a corporation represents all the shares in which a corporation is divided
- Owning a share of a corporation represents fractional ownership
  - Associated benefits may include dividends, voting rights, and capitals gains



Stock Exchanges

- A space in which the buying and selling of stocks is facilitated
- Stock exchanges include the NYSE, Nasdaq, TSX, and SEHK
- Companies traded on stock exchanges are referred to as public companies

TMX Toronto Stock Exchange

NYSE

READING A SUMMARY QUOTE

- Open/High/Low
  - Current trading day's opening price, highest price, and lowest
- Mkt cap
  - Total market value of company
- P/E ratio
  - Price/earnings ratio
- Div yield
  - Dividend yield
- 52-wk high/low
  - Highest price, and lowest, for the preceding 52wks

CALCULATING THE FUNDAMENTALS

Returns, Moving Averages, Sharpe Ratio, etc.

DAILY RETURN

Formula:

$$= \frac{Price_{i+1} - Pricei}{Price_i}$$

Daily return of FMAGX on Nov. 13, 2018 is

$$= \frac{10.21 - 10.22}{10.22} = -0.1\%$$

Fidelity Magellan Fund

Date	Open	High	Low	Close*	Adj Close**	Daily Return
13-Nov-18	10.21	10.21	10.21	10.21	10.21	-0.1%
12-Nov-18	10.22	10.22	10.22	10.22	10.22	-2.5%
09-Nov-18	10.48	10.48	10.48	10.48	10.48	-1.2%
08-Nov-18	10.61	10.61	10.61	10.61	10.61	

AVERAGE DAILY RETURN

Formula:

$$ADR = \frac{\sum_1^n r_i}{n}$$

Average Daily return of FMAGX from Nov. 8 to Nov. 13 is

$= (-0.1\% + -2.5\% + -1.2\%) / 3$

$= -1.27\%$

Fidelity Magellan Fund

Date	Open	High	Low	Close*	Adj Close**	Daily Return
13-Nov-18	10.21	10.21	10.21	10.21	10.21	-0.1%
12-Nov-18	10.22	10.22	10.22	10.22	10.22	-2.5%
09-Nov-18	10.48	10.48	10.48	10.48	10.48	-1.2%
08-Nov-18	10.61	10.61	10.61	10.61	10.61	

AVERAGE ANNUAL RETURN

To annualize an average daily return, just simply multiply 365 to daily return

= Average Daily return * Days in one year (assume to be 365 days)

Fidelity Magellan Fund

Date	Open	High	Low	Close*	Adj Close**	Daily Return
13-Nov-18	10.21	10.21	10.21	10.21	10.21	-0.1%
12-Nov-18	10.22	10.22	10.22	10.22	10.22	-2.5%
09-Nov-18	10.48	10.48	10.48	10.48	10.48	-1.2%
08-Nov-18	10.61	10.61	10.61	10.61	10.61	

COMPOUND RETURN

Formula:

$$= \left(\frac{\textit{Ending Balance}}{\textit{Beginning Balance}}\right)^{\frac{1}{\#\textit{Time Periods}}} - 1$$

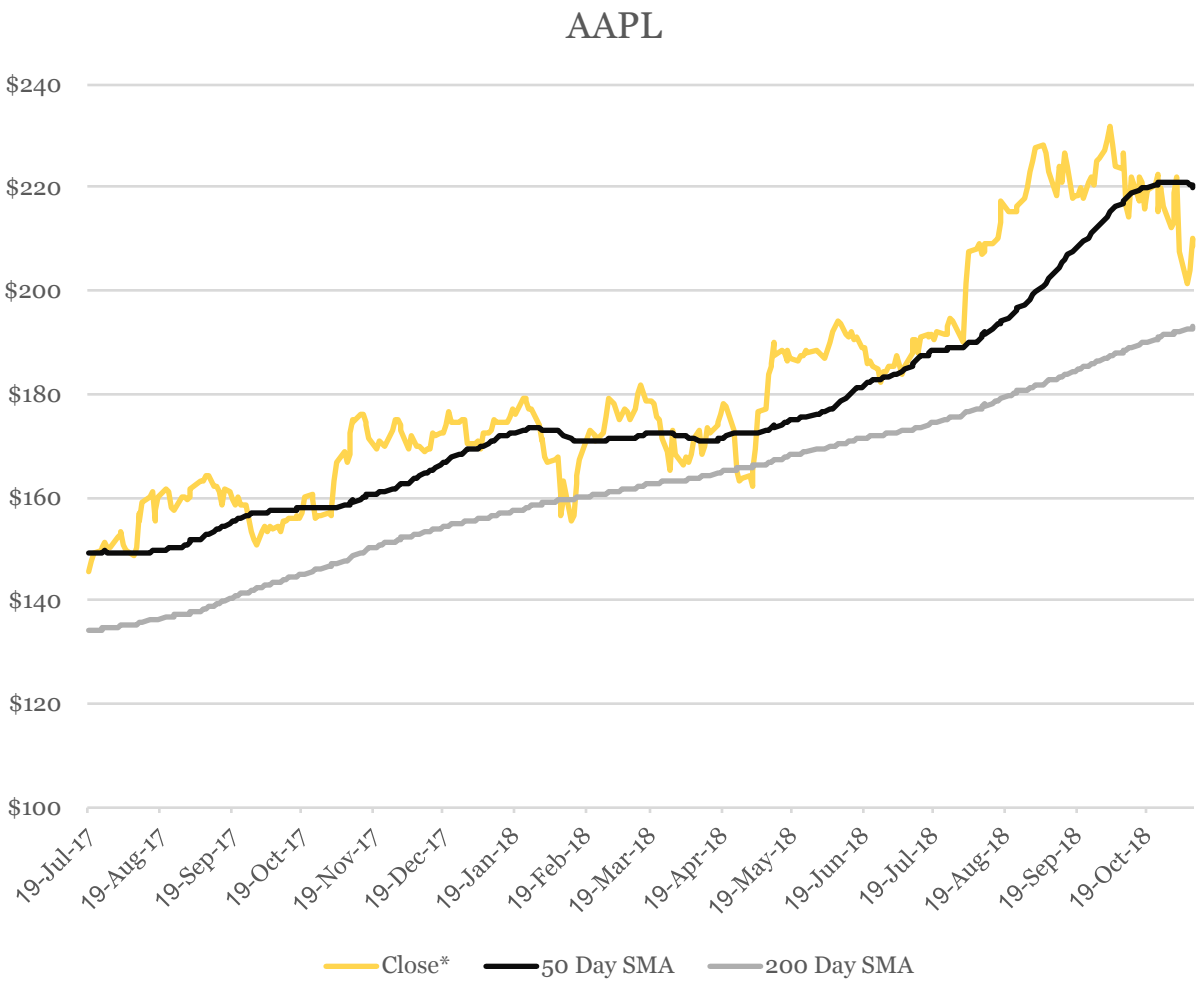
Compound daily return of FMAGX:

$$= \left(\frac{10.21}{10.61}\right)^{\frac{1}{3}} - 1 = -1.3\%$$

Fidelity Magellan Fund

Date	Open	High	Low	Close*	Adj Close**	Daily Return
13-Nov-18	10.21	10.21	10.21	10.21	10.21	-0.1%
12-Nov-18	10.22	10.22	10.22	10.22	10.22	-2.5%
09-Nov-18	10.48	10.48	10.48	10.48	10.48	-1.2%
08-Nov-18	10.61	10.61	10.61	10.61	10.61	

MOVING AVERAGES



- Simple moving average
  - The average close price of a stock over the preceding # of days
- Exponential moving average
  - Recent price history has a stronger weight in the calculation
- Smooths out the price history
- Used by investors to identify trends and supports/resistance levels

SHARPE RATIO & TREYNOR RATIO

- Used to determine a risk-adjusted return on an investment – the higher, the better
- Risk free rate is the lowest an investor may expect to earn while incurring no risk
  - Typically denoted by the return on government debt
- Beta refers to volatility relative to the market

Formulas:

$$Sharpe\ Ratio = \frac{Rate\ of\ Return\ - Risk\ Free\ Rate}{Standard\ Deviation}$$

$$Treynor\ Ratio = \frac{Rate\ of\ Return\ - Risk\ Free\ Rate}{Portfolio\ Beta}$$

William F. Sharpe

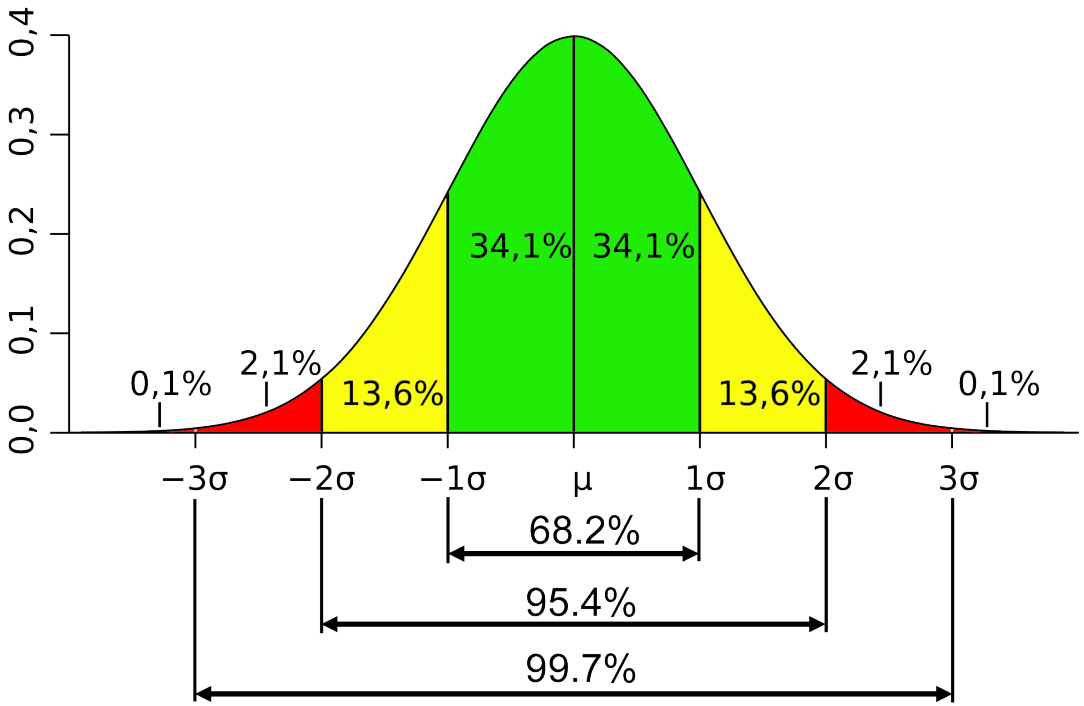
William F. Sharpe, a Nobel Prize winning economist and the term's namestake

STANDARD DEVIATION

- Represented by lower case sigma
- Used to quantify the amount of variation of the values from a set of data
- A low standard deviation means more data points are clustered around the mean
- A higher standard deviation indicates more extreme values from the mean

Formula:

$$Standard\ Deviation = \sqrt{\frac{\sum|x - \bar{x}|^2}{n - 1}}$$



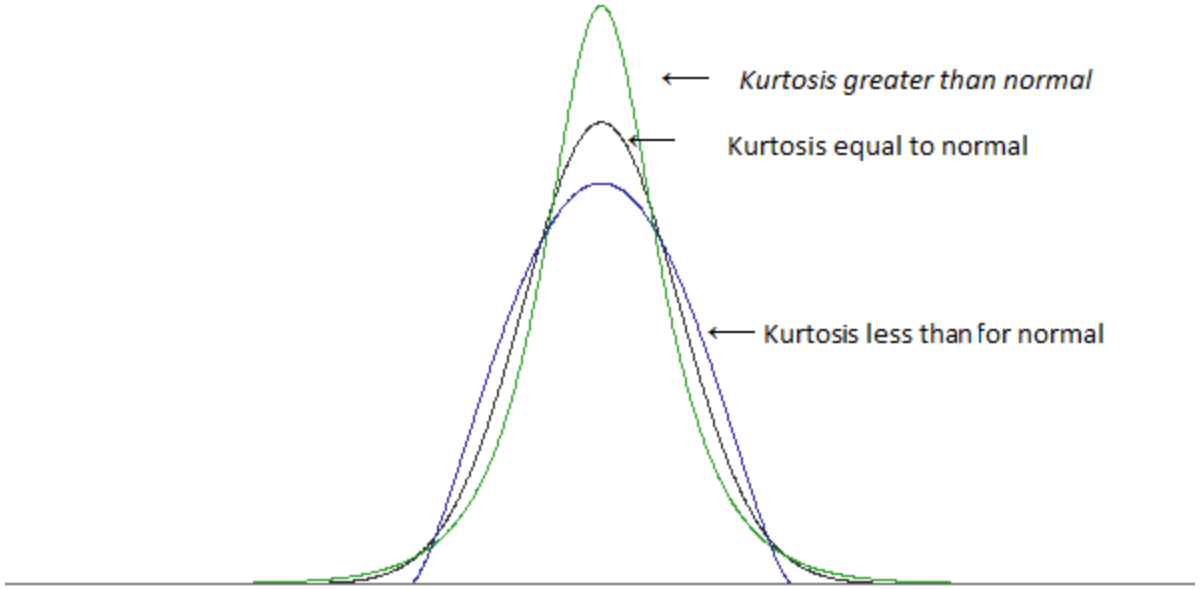
Standard deviations of a normal distribution

UNIVERSITY OF WATERLOO

KURTOSIS

$$Kurtosis = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{x_i - \bar{x}}{SD(x)}\right)^4$$

- May also be calculated in Excel using the function Kurt() and highlighting your series of data



Overview

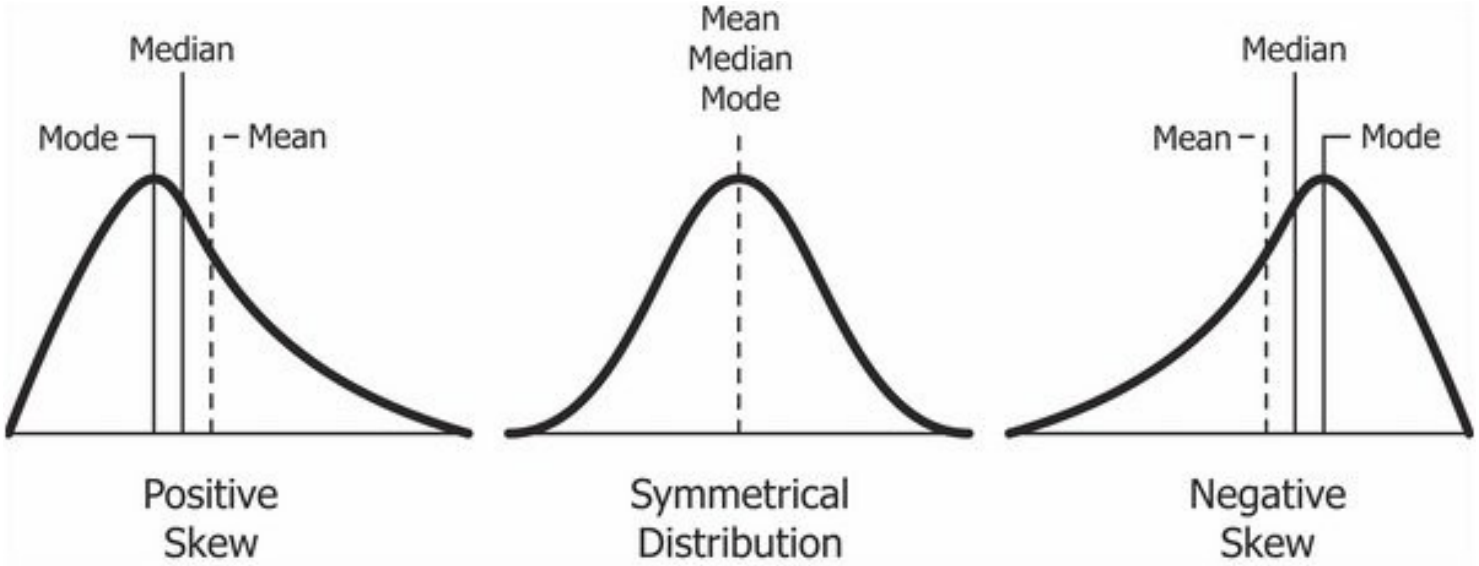
- The weight of the tails in a distribution relative to the centre
- Kurtosis of a normal distribution is 3; higher kurtosis implies more pointedness, and lower kurtosis implies shallower distribution
- With regards to investments:
  - High kurtosis imply occasional extreme returns (known as kurtosis risk)
  - Lower kurtosis implies lower likelihood of extreme outcomes

UNIVERSITY OF WATERLOO

Skewness

$$Pearson's\ Second\ Coefficient\ of\ Skewness = \frac{3(\text{mean} - \text{median})}{standard\ deviation}$$

- May also be calculated in Excel using the function Skew() and highlighting your series of data



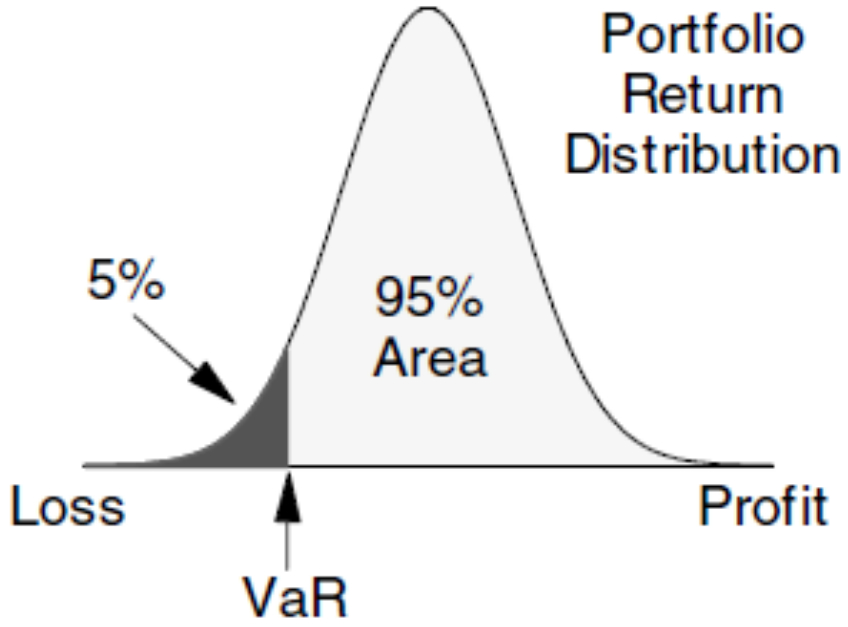
Overview

- The symmetry of a distribution (i.e. the shape of the data)
- Perfectly symmetrical data has skewness of 0
  - Positive skewness indicates longer right-handed tail than left tail and vice versa
  - Can be used to assess "skewness risk" if the distribution of returns is not a normal distribution

UNIVERSITY OF WATERLOO

VALUE AT RISK (VaR)

$$VaR = [expected\ weighted\ return - (z\ score\ of\ portfolio * standard\ deviation)] * \text{portfolio value}$$



- Calculates the worst case scenario, over a period of time (e.g. 1 year) for an investment with a given degree of confidence
- Example: VaR = $1 million

  Confidence = 90%

  Timeframe = 1 year

This means that on average, you can expect to lose over $1 million every 1 in 10 days, or 90% of the time; and lose less than $1 million 90% of the time

UNIVERSITY OF WATERLOO

A WORD OF WISDOM

"Rule number one: Don't lose money. Rule number two: Don't forget rule number one."

WARREN BUFFETT


UNIVERSITY OF
WATERLOO
HAPPY HACKING!

FURTHER READING

Examples, Valuation Techniques, and More

FUNDAMENTAL ANALYSIS

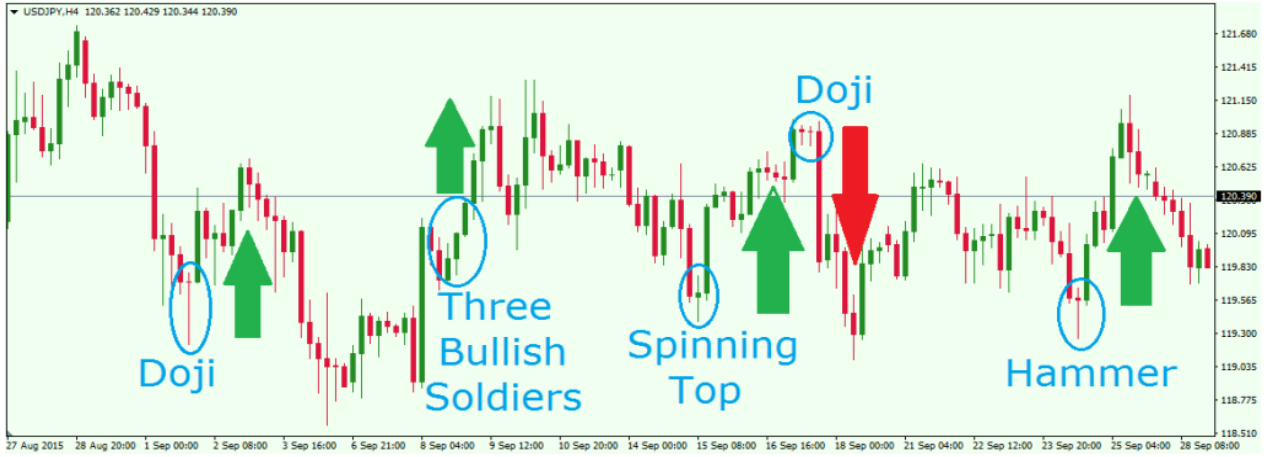
- Valuation based on fundamentals aims to determine the intrinsic value of a stock based on cash flows
- Considerations used in fundamental analysis include, but are not limited to:
  - Analysis of financial statements
  - Macroeconomic and industry analysis
  - Review of company strategy, strengths, weaknesses, and management structure
- Employed by Warren Buffett

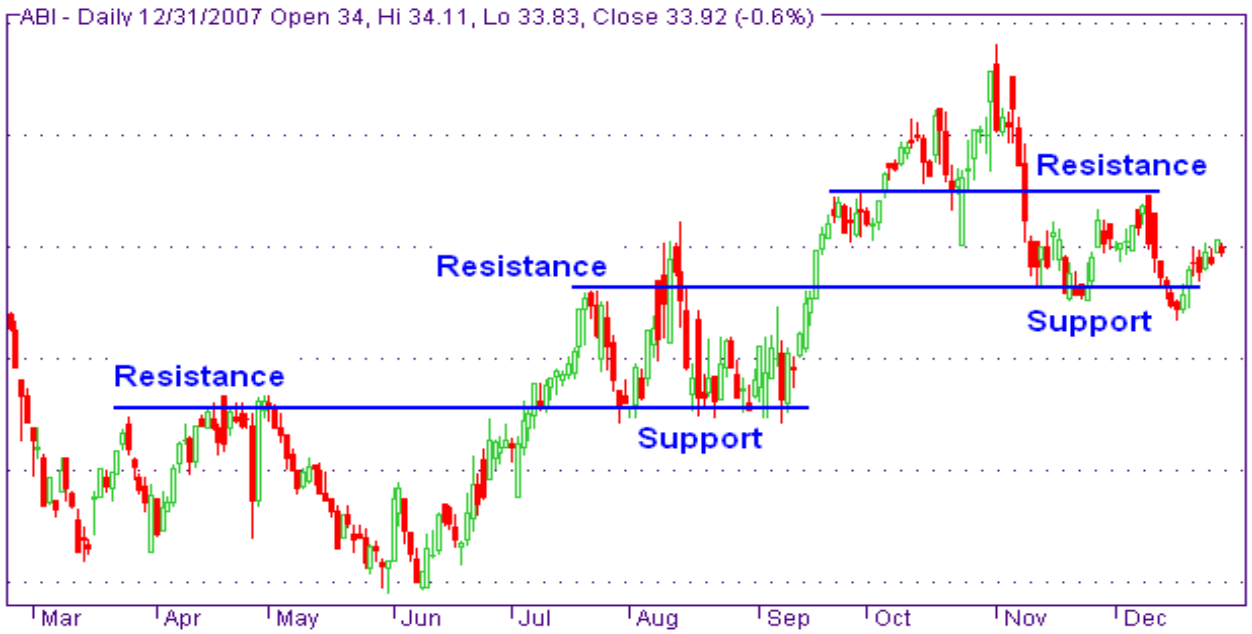
Kraft Heinz Misses Earnings Report

Shares of Kraft Heinz drop after missing EPS estimates on an earnings report, since the intrinsic value determined by investors using this new information, is less than it was previously

TECHNICAL ANALYSIS

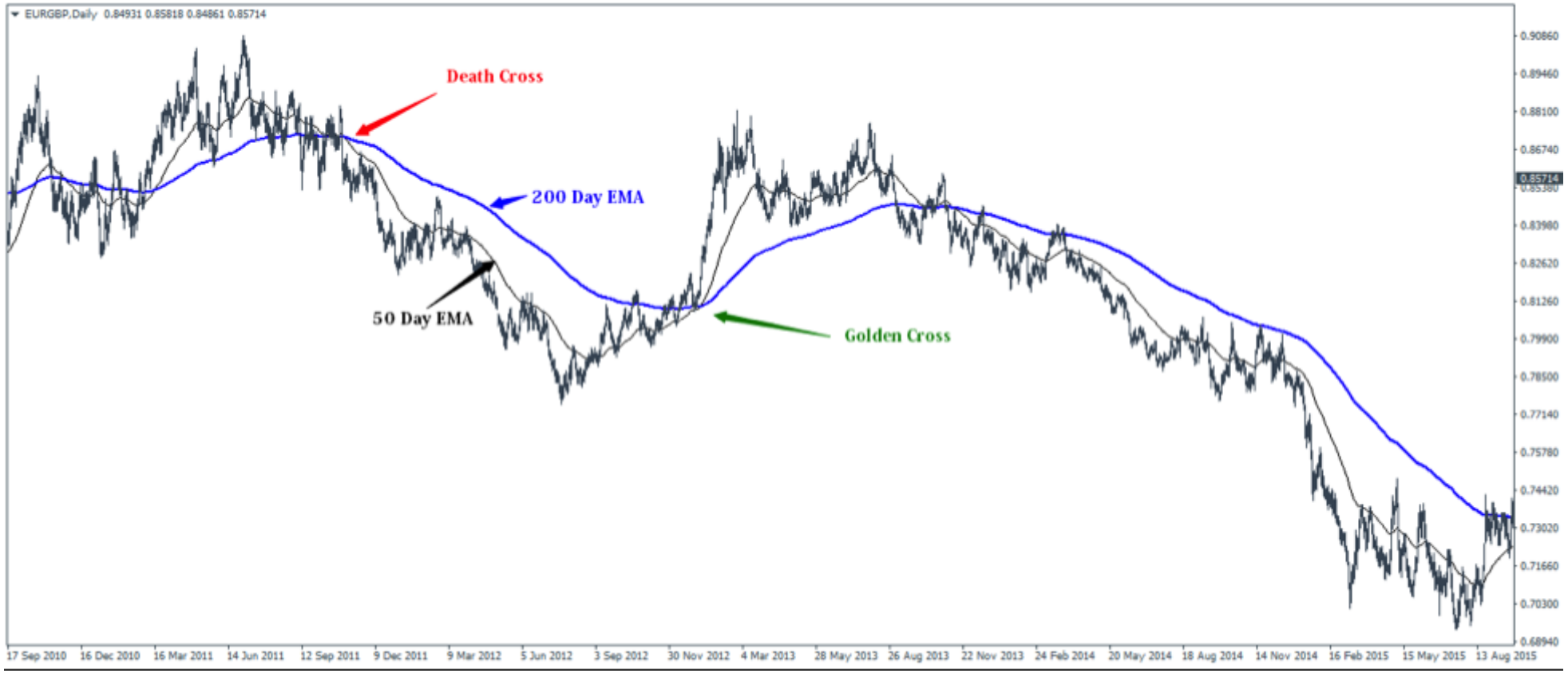
- Predicting the price of a stock based on historical market data
- Disregards fundamental analysis, and focuses on supply and demand for a stock
- Assumptions:
  - Prices move in trends
  - History repeats itself
  - Fundamentals are already priced into a stock
- Includes seeking patterns/trends from candlesticks, Bollinger bands, stochastics, supports/resistances, etc.





MOVING AVERAGES – CROSSOVERS

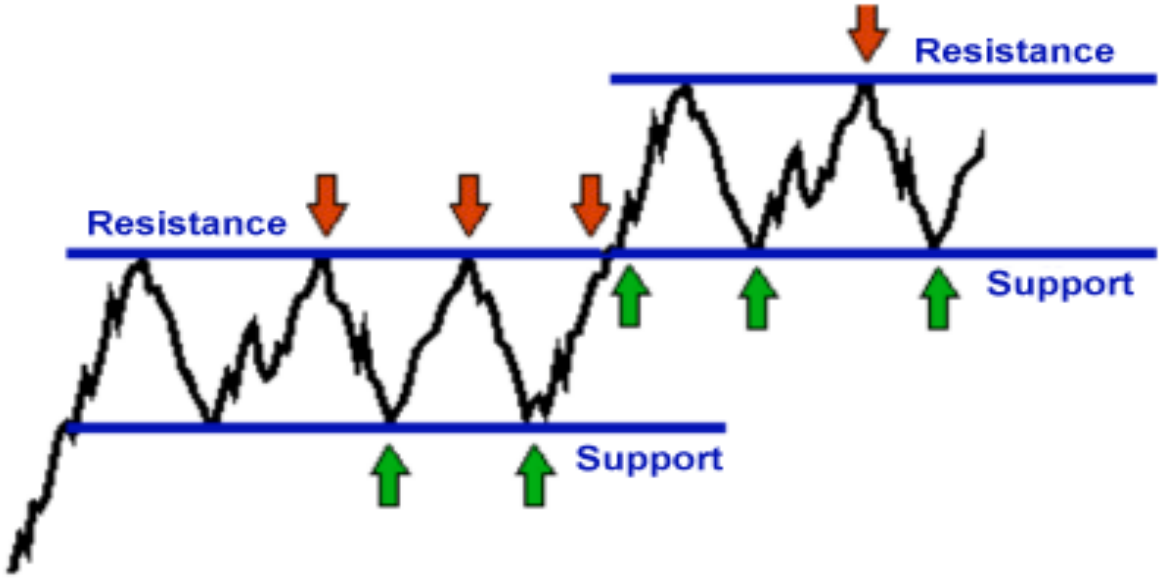
- Some technicians believe that when a short term average crosses over a long term average, it indicates the beginning of a trend – a “death cross” for a downtrend, and “golden cross” for indicating an uptrend



UNIVERSITY OF WATERLOO

MOVING AVERAGES – SUPPORTS & RESISTANCES

- Supports & resistance levels are some of the most prevalent tools for technical analysis
  - Support: a price level at which there is enough demand to stop a potential downtrend
  - Resistance: a price level at which a sell-off may occur, causing an uptrend to stagnate



UNIVERSITY OF WATERLOO

VaR CALCULATION IN DETAIL

INVESTOPEDIA ACADEMY: Understanding and Calculating VaR

	ABC	XYZ	Combined Portfolio	Formula Used:
Percentage of Portfolio Invested	50%	50%	100%	=SUM(F5:G5)
Expected Annual Return	15%	7%	*11.0%*	=(F5*F6)+(G5*G6)
Portfolio Standard Deviation	*18.03%*	*10.48%*	*12.0%*	=((F5^2)*(F6^2)+(G5^2)*(G6^2)+(2*F8*F5*G5*F7*G7))^0.5
Portfolio Correlation	*78.86%*		=STDEV.S(D12:D31)	

=STDEV.S(C12:C31)

=CORREL(C12:C31,D12:D31)

*historical annual returns

	ABC	XYZ
1	*25.66%*	*12.17%*
2	*1.47%*	*(11.44%)*
3	*(1.46%)*	*(2.29%)*
4	*(3.59%)*	*8.04%*
5	*(11.64%)*	*(13.37%)*
6	*5.68%*	*1.56%*
7	*10.59%*	*(3.06%)*
8	*4.07%*	*7.10%*
9	*11.09%*	*7.02%*
10	*20.10%*	*15.46%*
11	*26.28%*	*9.46%*
12	*(0.84%)*	*1.62%*
13	*23.58%*	*9.84%*
14	*8.25%*	*(1.37%)*
15	*(12.65%)*	*(0.70%)*
16	*53.70%*	*16.46%*
17	*(1.66%)*	*(9.66%)*
18	*(2.55%)*	*2.98%*
19	*(9.98%)*	*(0.63%)*
20	*45.17%*	*31.09%*

95% Percentile

Z-Score	1.65	Z-Score for 95% percentile one-sided confidence interval
Portfolio Value	$1,000,000	
Timeframe	Yearly	All numbers in the table are yearly, no adjustment is needed

VaR	Explanation: 5% of the time, the portfolio will lose at least $197k in a year
($197,330.65)	=IFS(G15="Yearly",H6-(G13*H7)*G14,G15="Weekly", (H6/52)-(G13*(H7/SQRT(52)))*G14,G15="Daily",(H6/252)-(G13*(H7/SQRT(252)))*G14)

99% Percentile

Z-Score	2.33	Z-Score for 99% percentile one-sided confidence interval
Portfolio Value	$1,000,000	
Timeframe	Weekly	MUST USE FORMULA THAT ADJUSTS FOR ANY NON-ANNUAL INTERVAL

VaR	Explanation: 1% of the time, the portfolio will lose at least $38.6k in a week
($38,642.49)	=IFS(G24="Yearly",H6-(G22*H7)*G23,G24="Weekly", (H6/52)-(G22*(H7/SQRT(52)))*G23,G24="Daily",(H6/252)-(G22*(H7/SQRT(252)))*G23)

UNIVERSITY OF WATERLOO

DIVIDENT DISCOUNT MODEL

- The belief that a stock is worth the sum of all future dividends discounted to the present
- Dividends are used, since investors a varying portion of earnings from a company (or none)

$$Price = \frac{Next\ year's\ dividend}{Cost\ of\ equity\ -\ Growth\ rate\ of\ dividend}$$

- Limitations:
  - Growth rate of dividends might not be constant
  - Many companies don't pay out dividends
  - Does not take in to account other factors

DISCOUNTED CASH FLOW

- One of the most common pricing models currently in use
- Future cash flows are discounted to their present value using a specified discount rate

Formula:

$$DCF = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \ldots + \overbrace{\frac{CF_n}{(1+r)^n}}^{\text{Terminal Value}}$$

CF = Cash Flow

r = Discount Rate (WACC)

- Discount rate can be:
  - Rate of return required by investor
  - Cost of capital
- Future cash flows may be calculated using:
  - Earnings forecasts
  - Assumptions stated by investor, which may affect future cash flows

PRICE EARNINGS (P/E) MODEL

- This approach values companies based on earnings relative to current share price
- The expected price-to-earnings ratio varies by company based on:
  - Growth
  - Industry
  - Assets
  - Many other factors
- Limitations exist, other factors to account for include: assets/liabilities, growth projections, and cyclicality of business

Example:

Scotiabank (TSE: BNS) has a P/E of 10, meaning its share price is 10x annual earnings

An investor is satisfied with this, as it'll take 10 years to recoup his/her investment through earnings, so a purchase is made

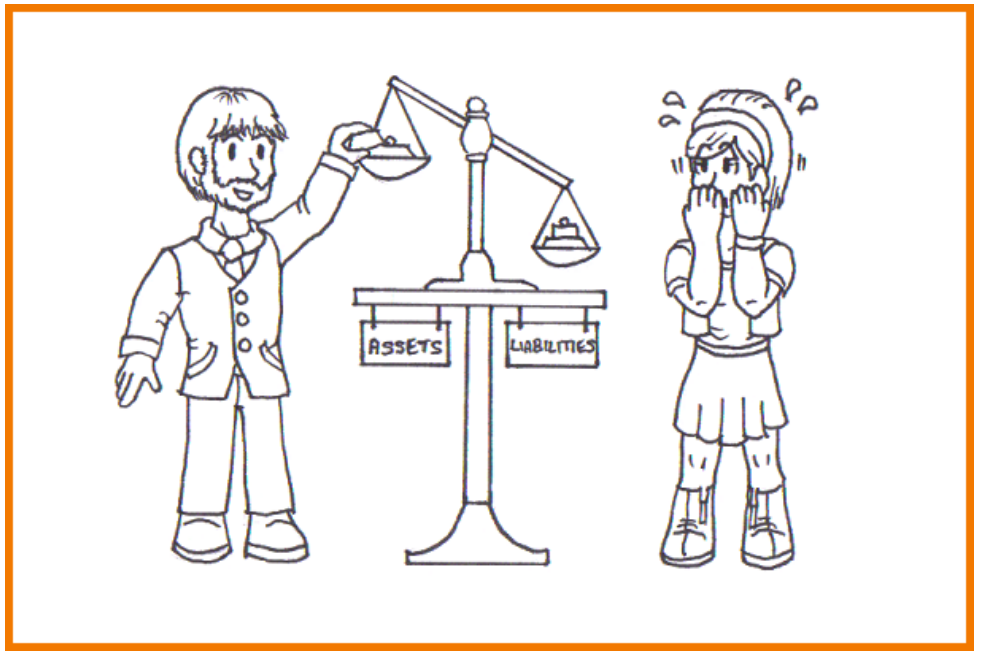
- Price Earnings Growth
  - P/E divided by growth rate, which accounts for future earnings growth for more context

BALANCE SHEET VALUATION

- Gives a good indication of the minimum value of a company
  - i.e. if company ABC were to cease operating tomorrow, you'll have a good sense of the minimum of what you'll be left with
- Does not take in to account other factors such as revenues, performance projections, etc.

$$Book\ Value = Assets - Liabilities$$

- **Assets:** anything of value (e.g. equipment, inventory, intellectual property, accounts receivable)
- **Liabilities:** any debts owed to outside stakeholders (e.g. accounts payable, wages payable, long-term debt, etc)



UNIVERSITY OF WATERLOO

Comparables Analysis (Comps)

- Derive the value of a company based on comparisons with similar a company
- Useful for valuing companies with several competitors

- There are many points for comparison, which vary with industry, some include:
  - Financial statements
  - Ratios (e.g. EV/S, P/E, P/B, P/S, et cetera)
  - Growth forecasts
  - Units of product (e.g. number of cars sold)
  - Intellectual property
  - Corporate strategy