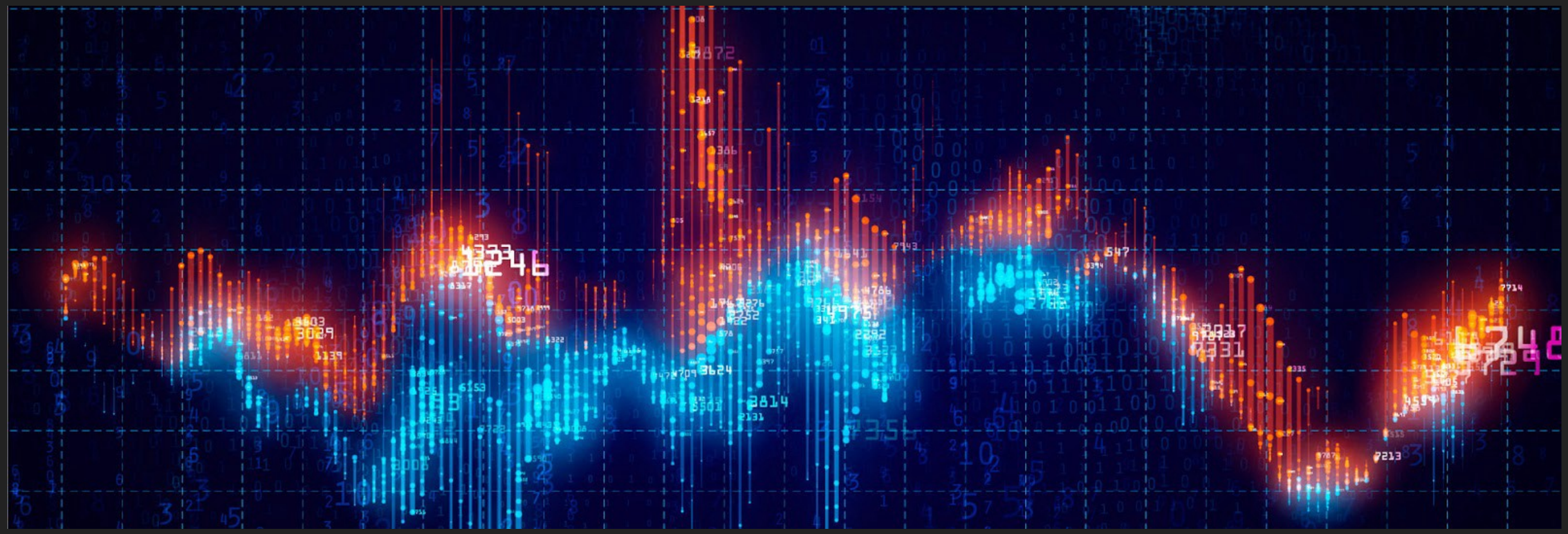


Image © GarryKillian, Shutterstock.

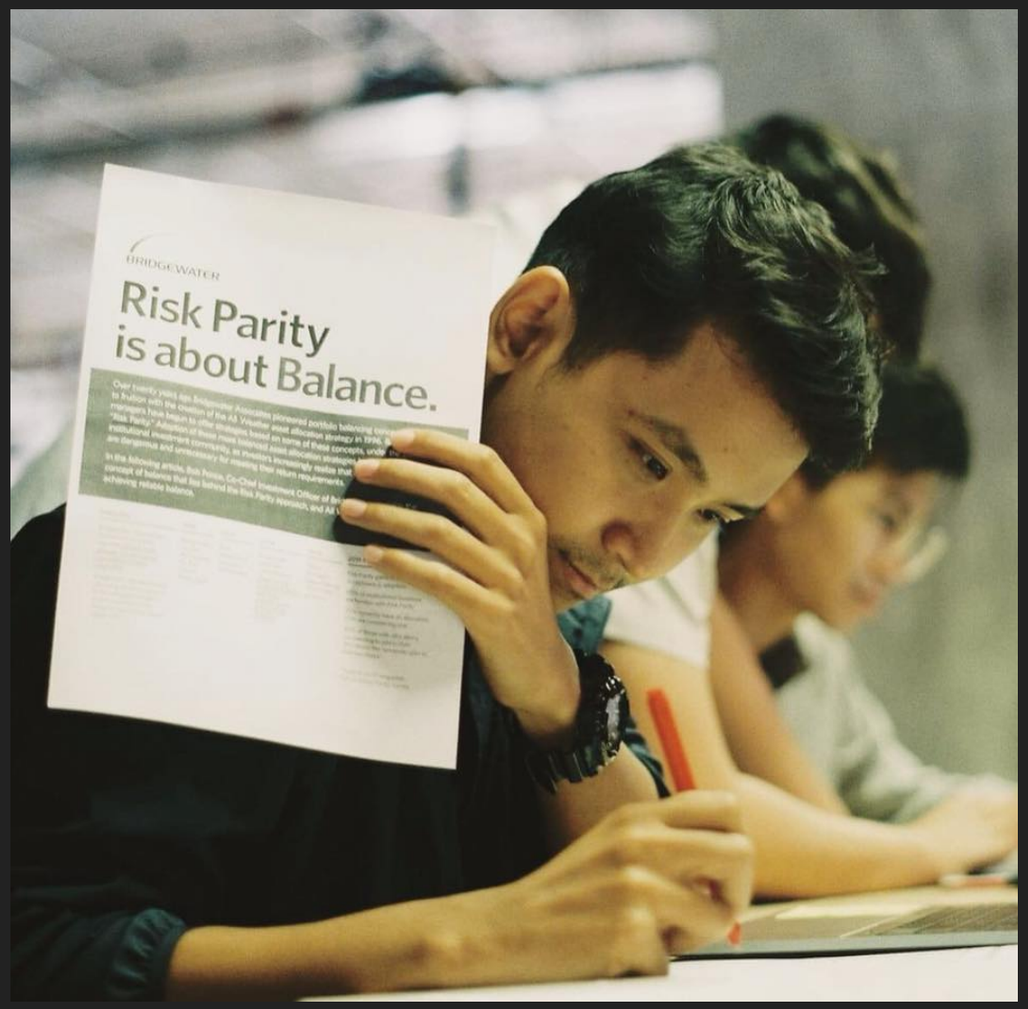
FINDING ALPHA

PYTHON & TALIB

TANAPAT KAMSAIIN Data Scientist @AVA Alpha

PROFILE

- Big data engineering @DPU
- Investment consultant @FNSYRUS
- Proprietary trader 2 years
- Data Scientist @AVA Alpha Team (present)
- Founder @PopQuants



PROFILE LINKEDIN.COM

Add profile section More...

Tanapat Kamsaiin

Data Scientist at MarketAnyware, Former : Quantitative Consultant at WorldQuant Bangkok.

Bangkok Metropolitan Area, Thailand · 471 connections ·

Contact info

MarketAnyware

Dhurakij Pundit University

WHY ALGORITHMIC TRADING

- Expert Advisors (EA)
- AI Trading
- Robot trading
- High frequency Trading (HFT)
- Copy Trading

WHY ALGORITHMIC TRADING

- **Pros:**
- Minimize emotional trading
- Allows for backtesting
- Preserves the trader’s discipline
- Improve your order speed
- Allows multiple accounts
- 24/7 Trading hour

- **Cons:**
- Mechanical failures can happen
- Requires the monitoring of functionality
- Requires more data
- Can perform poorly
- Overfitting

ALGORITHMIC TRADING STRATEGIES

- Trend-following Strategies
- Arbitrage Opportunities
- Index Fund Rebalancing
- Mathematical Model-Based Strategies
- Trading Range (Mean Reversion)
- Volume-weighted Average Price (VWAP)
- Percentage of Volume
- High Frequency Trading (HFT)
- Etc.

ALGORITHMIC TRADING STRATEGIES : EXAMPLES

- Trend-following Strategies
- Trading Range (Mean Reversion)
- Mathematical Model-Based Strategies
- Technical Analysis [Exercise]

RAY DALIO: BRIDGE WATER MOST SUCCESSFUL HEDGE FUND

- *Portfolio Return = Cash + Beta + Alpha*
- Risk parity & All weather Strategy

Ray Dalio : Bridge Water Association, Principle Author.

RISK PARITY

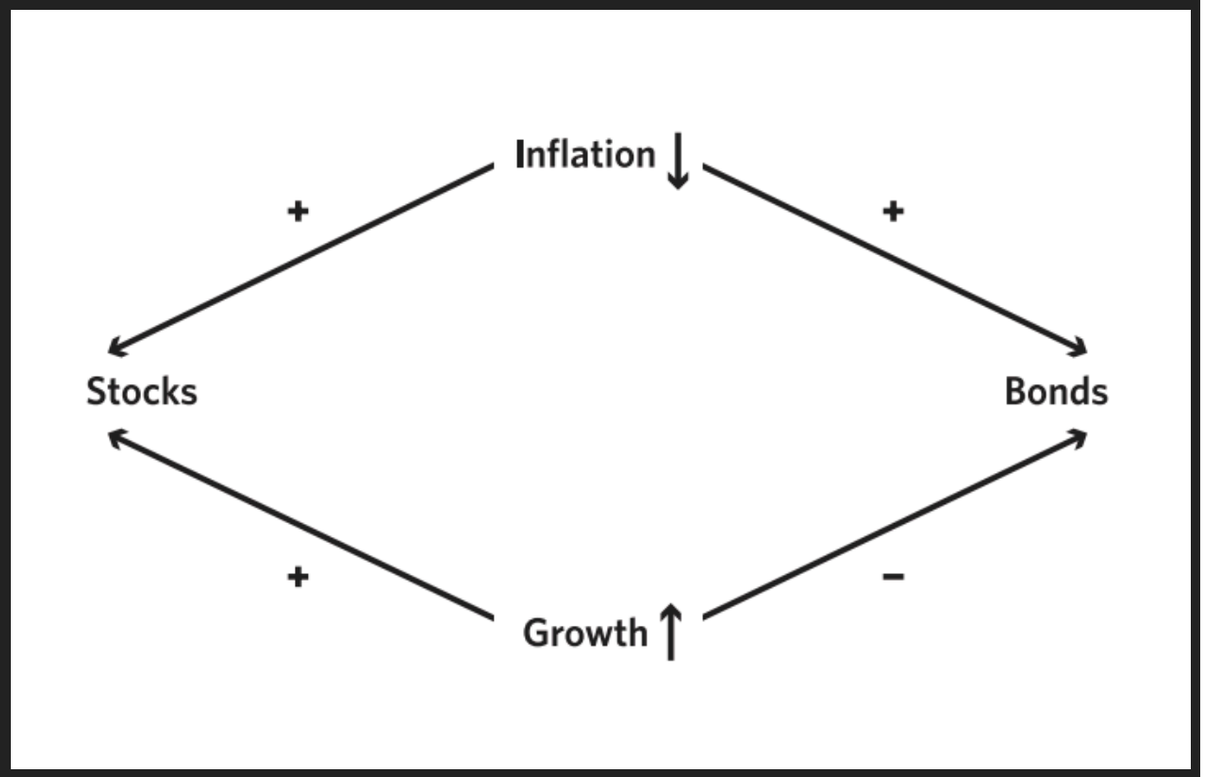
BRIDGEWATER

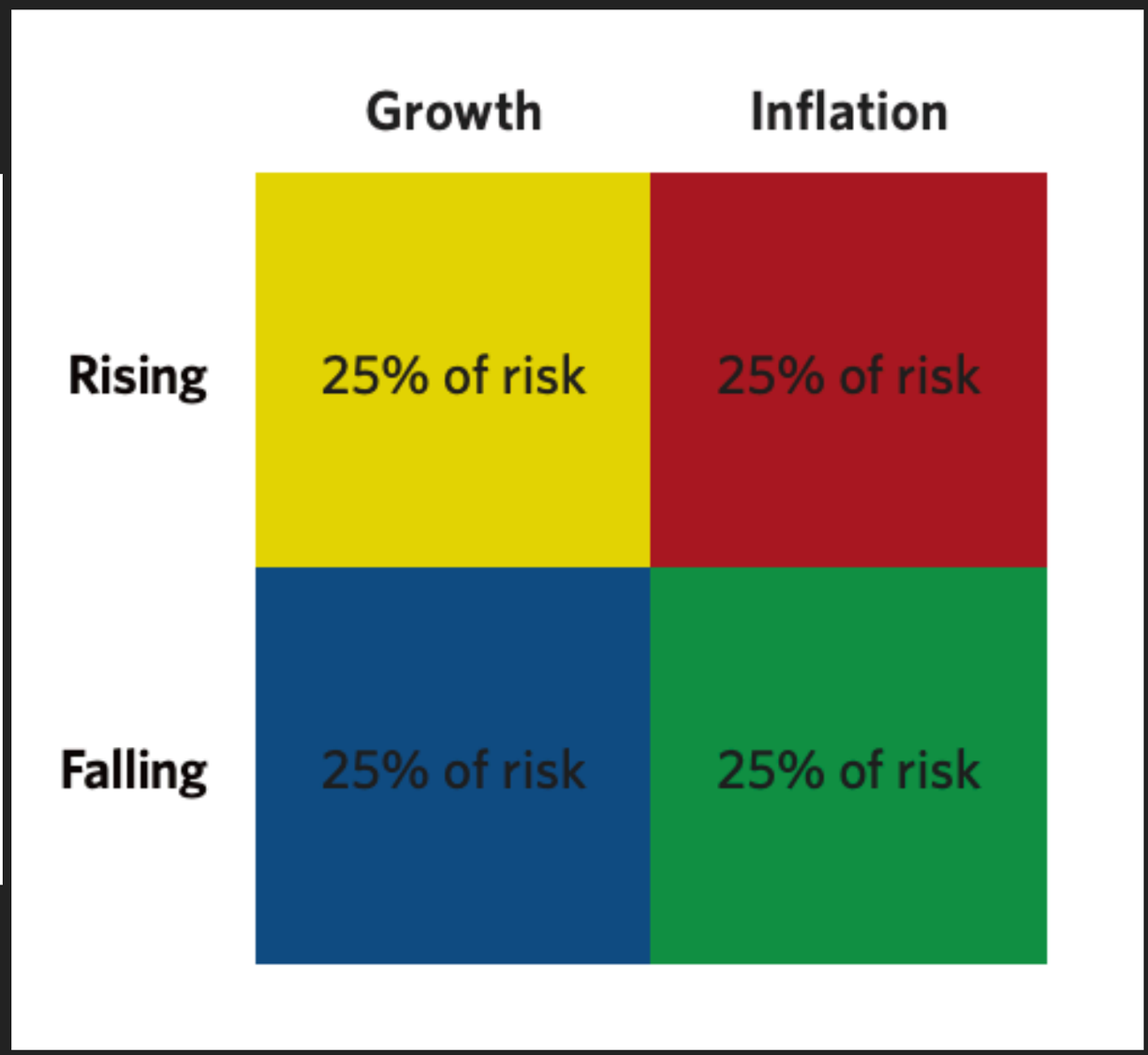
Risk Parity is about Balance.

Over twenty years ago Bridgewater Associates pioneered portfolio balancing concepts that came to fruition with the creation of the All Weather asset allocation strategy in 1996. Recently, several managers have begun to offer strategies based on some of these concepts, under the banner of "Risk Parity." Adoption of these more balanced asset allocation strategies has surged in the institutional investment community, as investors increasingly realize that concentrated portfolios are dangerous and unnecessary for meeting their return requirements.

https://www.bridgewater.com/resources/risk-parity-is-about-balance.pdf

RISK PARITY


Inflation
+
+
Stocks
Bonds
+
–
Growth


Growth
Inflation
Rising
25% of risk
25% of risk
Falling
25% of risk
25% of risk

WHAT IS BETA

- A stock that swings more than the market over time has a beta greater than 1.0 = **High Beta**
- A stock beta is less than 1.0 = **Low Beta**
- High-Beta tend to be Riskier but provide the potential for higher returns; Low-Beta stocks pose less risk but typically yield lower returns.
- A stock beta 1.0 = Mr. Market

BETA CALCULATE

```
: # Import statsmodels library
  import statsmodels.api as sm

  # Create a regression model
  reg = sm.OLS(data.daily_amazon_returns,
               data.daily_spy_returns)

  # Fit the model
  results = reg.fit()

  # Print the beta of Amazon
  print('Beta of Amazon: %.2f' %results.params[0])
```

```
Beta of Amazon: 1.87
```

$$\beta i = \frac{Covariance\ (Ri, Rm)}{Variance\ (Rm)}$$

where,

βi = Beta of the asset

Ri = Returns of the asset

Rm = Returns of the market

www.inveastopedia.com

Regression Method : Ordinary least square (OLS)

Syntax:

OLS(y,x)

In our case,

y = daily_amazon_returns

x = daily_spy_returns

```
In [26]: # Import the numpy library
         import numpy as np

         # Calculate the covariance of Amazon and S&P500.
         Covariance = np.cov(data.daily_amazon_returns,
                             data.daily_spy_returns)[0][1]


         # Calculate the variance of S&P500
         Variance = np.var(data.daily_spy_returns)

         # Print the beta of Amazon
         print('Beta of Amazon: %.2f' % (Covariance / Variance))
```

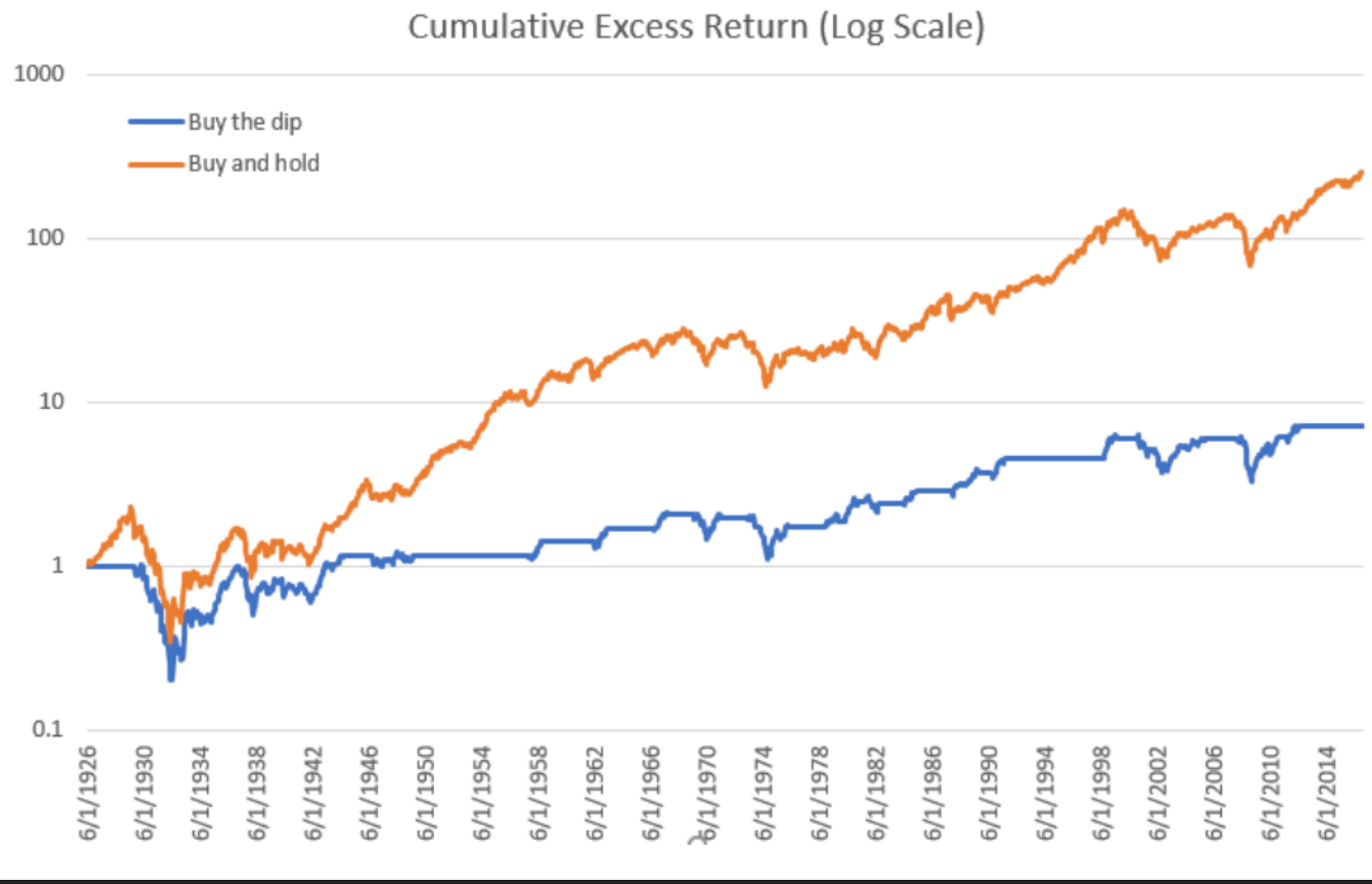
```
Beta of Amazon: 1.87
```

Variance-covariance Method

BUY AND HOLD STRATEGY

- Buy & Hold is a passive investment strategy in which an investor buys stocks and holds them for a long period.

DATASCIENCE MEETUP : SEEKING ALPHA



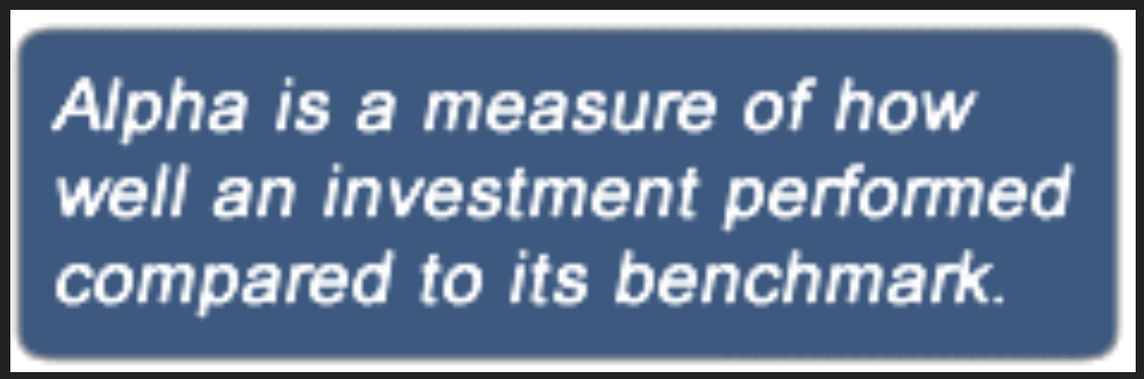
Buy and Hold strategy return

HOW TO CALCULATE BETA FOR A PORTFOLIO

- Ex. Portfolio has 3 stocks A, B and C with portfolio weights as 10%, 30%, and 60% respectively. The beta of these three stocks is 1.1, 1.3 and 0.8
- The portfolio beta will be:
- ***Portfolio beta = 1.1*10%+1.3*30%+0.8*60% = 0.98***

ALPHA

- Alpha, also known as “Excess return” or “Abnormal rate of return”
- Is one of the most widely used measures of risk-adjusted performance. The number shows how much better or worse a fund performed relative to a benchmark.



https://investinganswers.com/dictionary/a/alpha-43

ALPHA: HOW IT WORKS?

- Let’s assume you are a Portfolio manger who expects portfolio return 15% next year. And the portfolio actually returns 16%
- The Alpha of the Portfolio : actual - expect = Alpha
- Alpha :16% - 15% = 1%

ALPHA + CAPITAL ASSET PRICING MODEL (CAPM)

- *r= Rf + beta * (Rm - Rf) + Alpha*
- **Where:**
- r= security's portfolio's return
- Rf= Risk free rate of return (10 year Bond)
- beta= Security's or portfolio's price volatility relative to the overall market
- Rm= The market return

PERFORMANCE METRICS

- Sharpe ratio
- Maximum Drawdown

SHARPE RATIO

Formula and Calculation for Sharpe Ratio

$$Sharpe\ Ratio = \frac{R_p - R_f}{\sigma_p}$$

where:

R_p = return of portfolio

R_f = risk-free rate

σ_p = standard deviation of the portfolio's excess return

www.investopedia.com

SHARPE RATIO

- Sharpe ratio adjusts a portfolio's past performance or expected future performance for the excess risk that was taken by the investor.
- A high Sharpe ratio is good when compared to similar portfolios or funds with lower returns.
- The Sharpe ratio has several weakness including an assumption that investment returns are normally distributed.

MAXIMUM DRAWDOWN

$$MDD = \frac{Trough\ Value - Peak\ Value}{Peak\ Value}$$

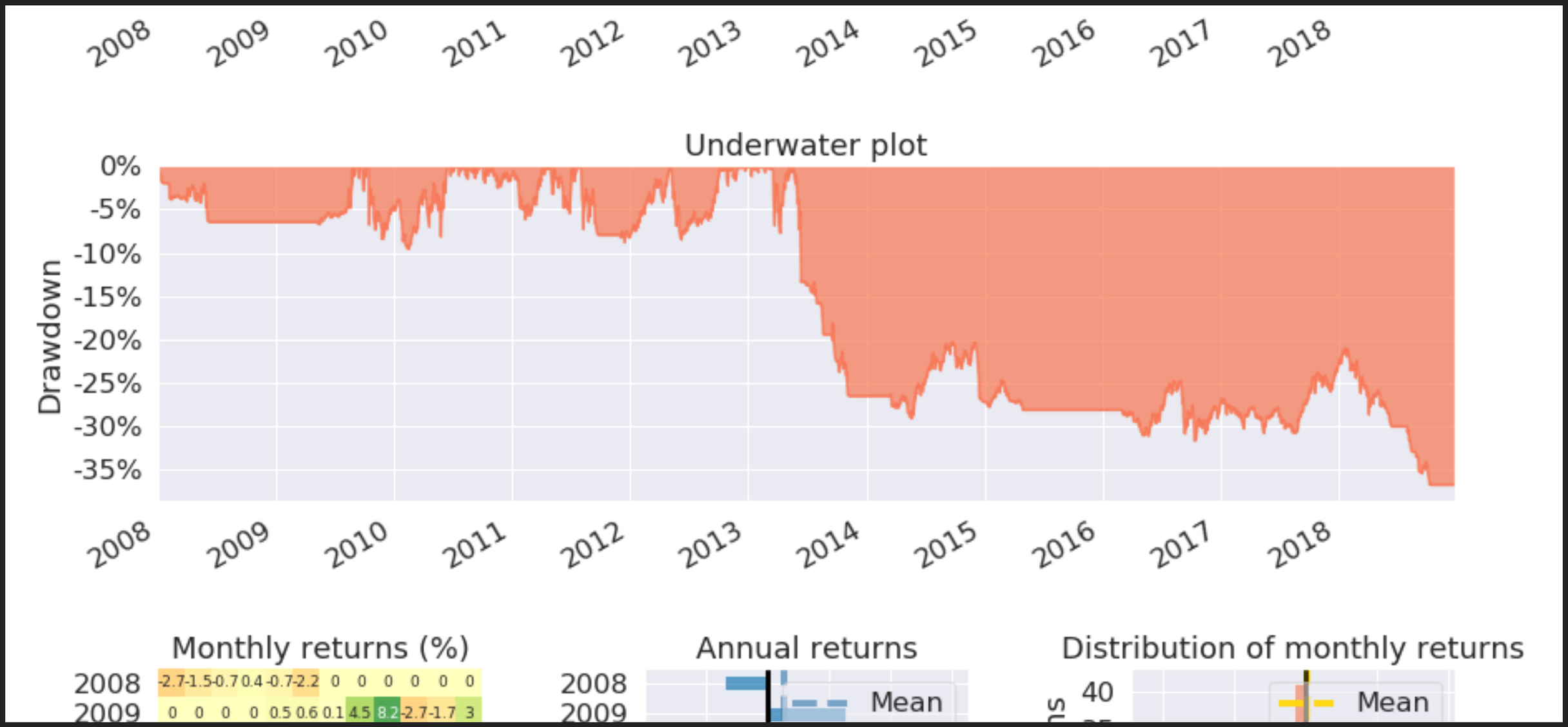
Maximum Drawdown Formula. Investopedia

www.investopedia.com

MAXIMUM DRAWDOWN

- A maximum drawdown is the maximum observed loss from a peak to a trough of a portfolio, before a new peak is attained.
- Maximum drawdown is an indicator of downside risk over a specified time period.

MAXIMUM DRAWDOWN



TRADING STRATEGIES OVERVIEW

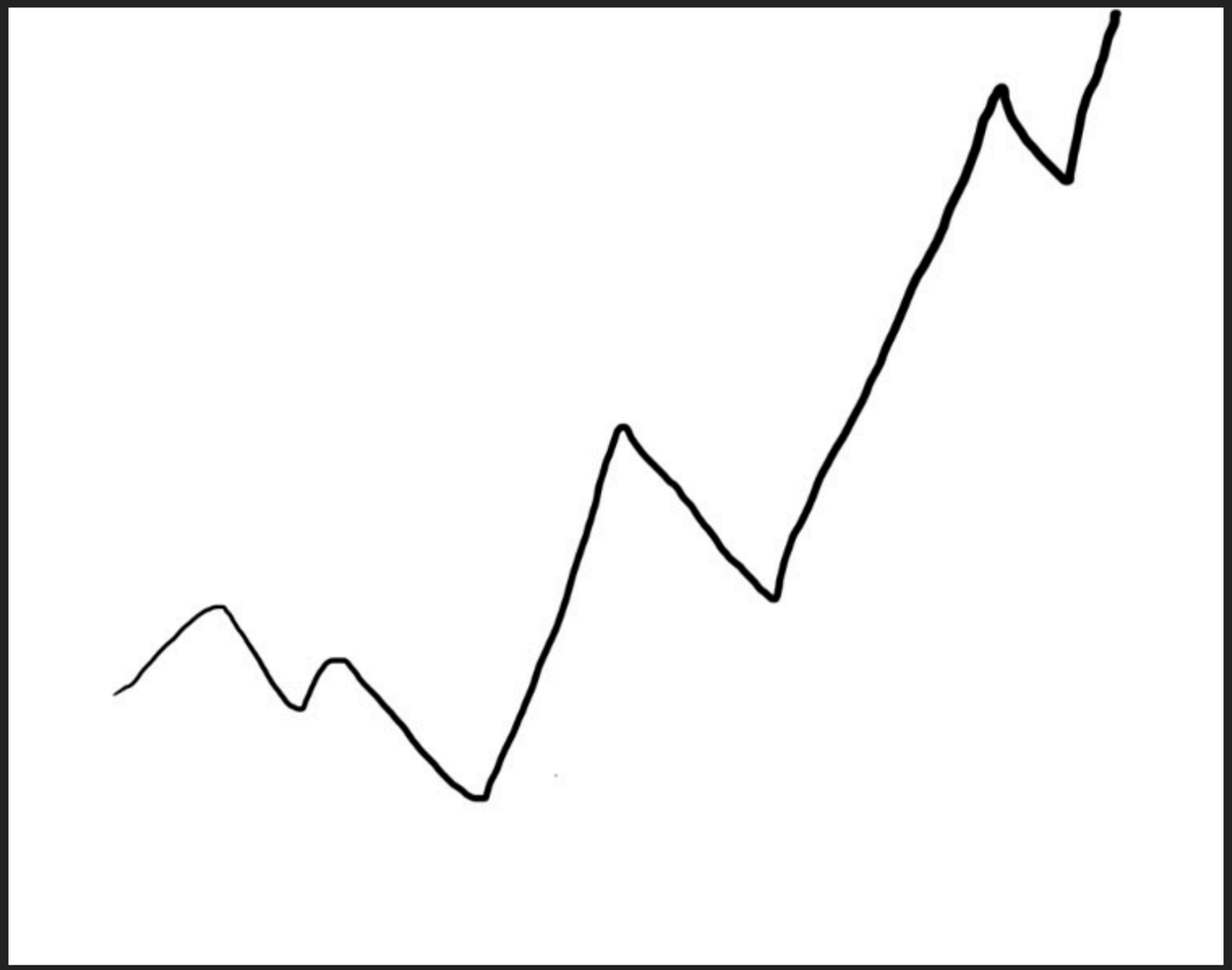
- Trend-following Strategies
- Trading Range (Mean Reversion)

TRADING STRATEGIES OVERVIEW

- Index Fund Rebalancing

TRADING STRATEGIES OVERVIEW

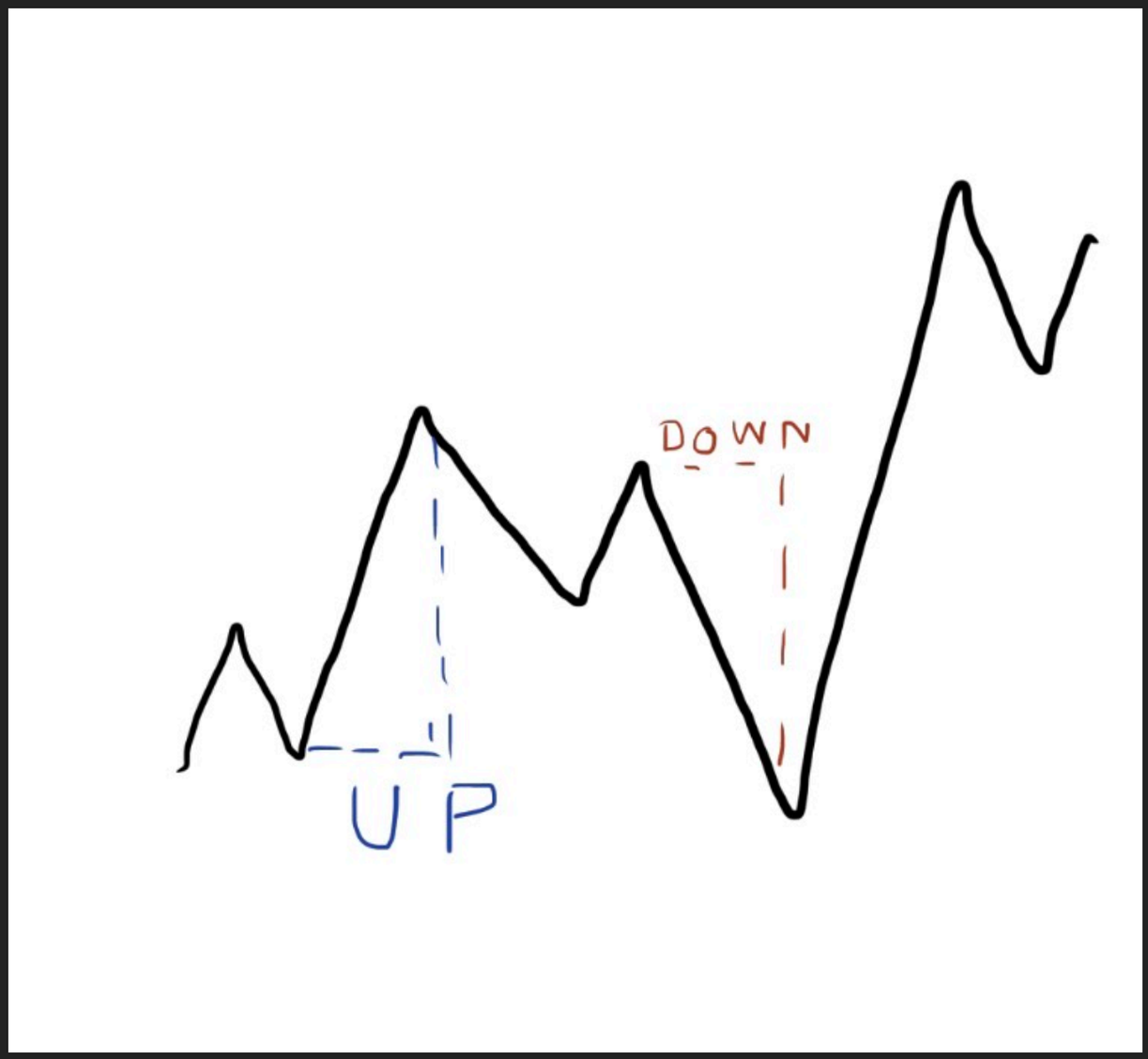
- Mathematical Model-Based Strategies



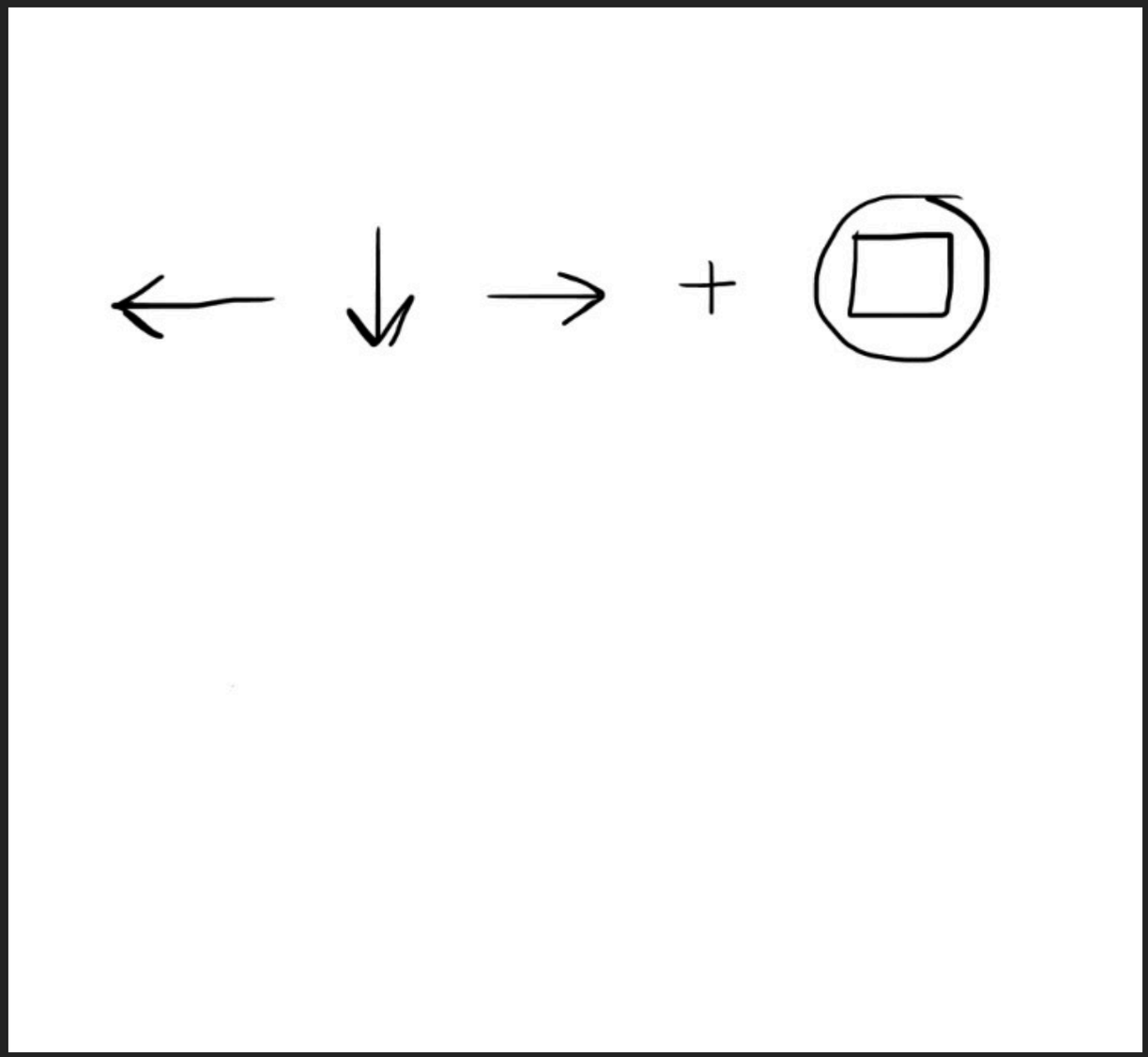
Differential

TRADING STRATEGIES OVERVIEW

TRADING STRATEGIES OVERVIEW



TRADING STRATEGIES OVERVIEW



TRADING STRATEGIES OVERVIEW

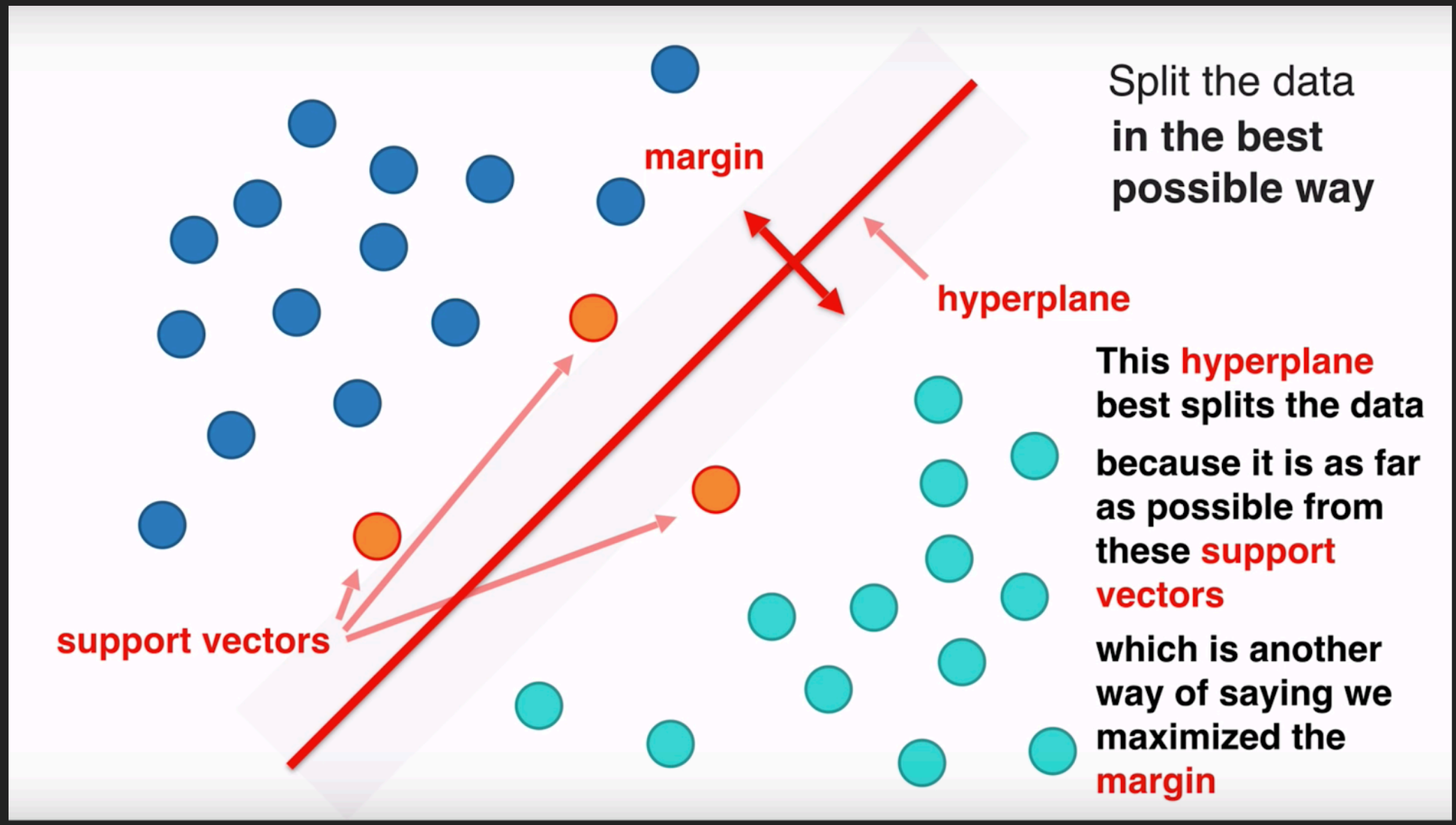
TRADING STRATEGIES OVERVIEW

- Technical Analysis [Exercise]

MACHINE LEARNING TRADING : SVM

- Predict signal trading =1, -1
- Where : 1 = Buy, -1 = Sell

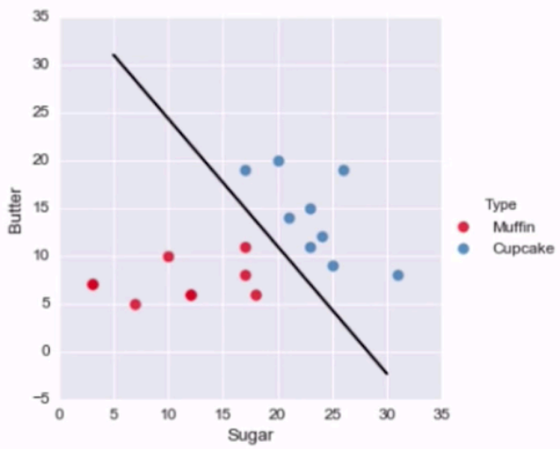
MACHINE LEARNING TRADING : SVM



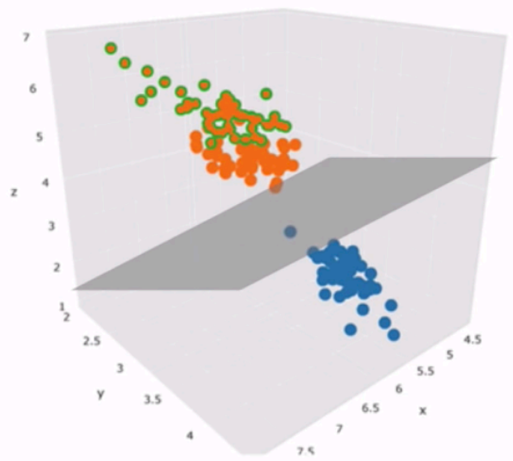
MACHINE LEARNING TRADING

Higher Dimensions: Visual

2D: Separate with Line



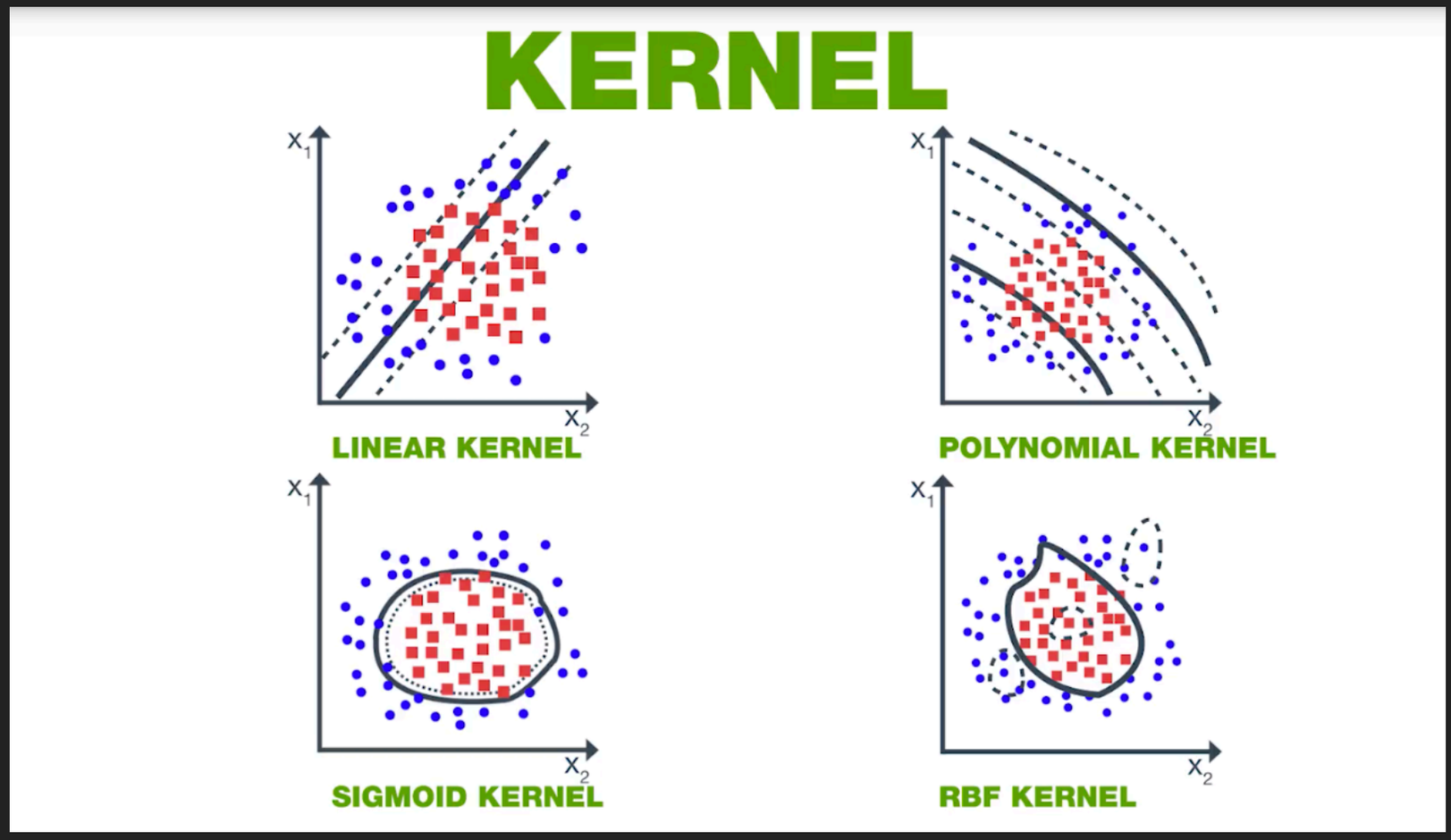
3D: Separate with Plane



4D+: Separate with Hyperplane

Hard to Visualize

MACHINE LEARNING TRADING : SVM



MACHINE LEARNING TRADING : SVM

KERNEL

Kernel	Inner Products	Parameters
Linear Kernel	$K(x_i,x_j) = x_i.x_j$	no parameters used
Polynomial Kernel	$K(x_i,x_j) = (1 + x_i.x_j)^d$	d is degree or power of the polynomial. Specified by the user
Sigmoid Kernel	$K(x_i,x_j) = \tanh(\beta_0 x_i.x_j + \beta_1)$	β_0 is slope and β_1 is intercept. Works only for some value of β_0 and β_1
RBF Kernel	$K(x_i,x_j) = \exp(-\gamma \|x_i - x_j\|^2)$	γ is a positive constant and is equal to $1/2\ \sigma^2$ where, σ is a free parameter

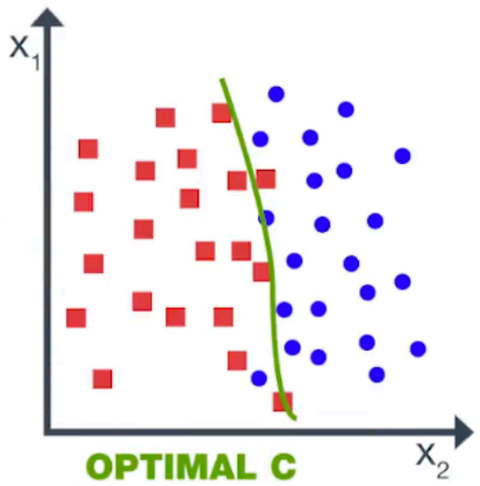
MACHINE LEARNING TRADING : SVM

C PARAMETER

TRADEOFF BETWEEN CLASSIFICATION OF TRAINING POINTS AND SMOOTH DECISION BOUNDARY

LARGE C - MORE SUPPORT VECTORS

SMALL C - LESS SUPPORT VECTORS



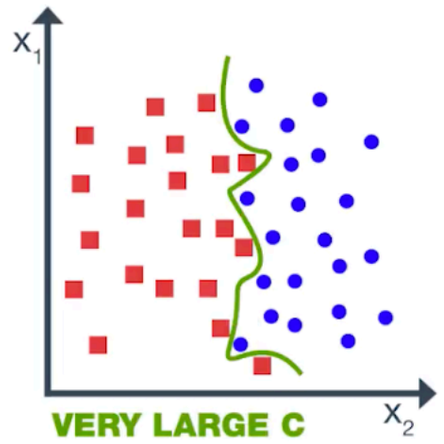
MACHINE LEARNING TRADING : SVM

C PARAMETER

TRADEOFF BETWEEN CLASSIFICATION OF TRAINING POINTS AND SMOOTH DECISION BOUNDARY

LARGE C - MORE SUPPORT VECTORS

SMALL C - LESS SUPPORT VECTORS



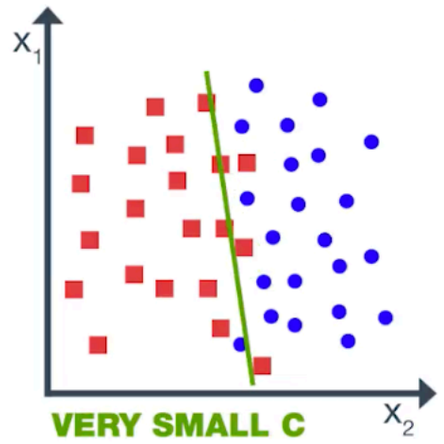
MACHINE LEARNING TRADING : SVM

C PARAMETER

TRADEOFF BETWEEN CLASSIFICATION OF TRAINING POINTS AND SMOOTH DECISION BOUNDARY

LARGE C - MORE SUPPORT VECTORS

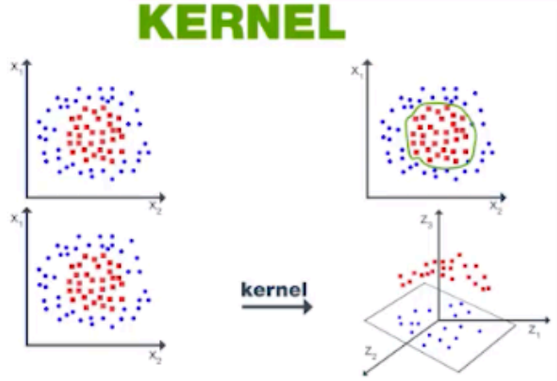
SMALL C - LESS SUPPORT VECTORS



VERY SMALL C

MACHINE LEARNING TRADING : SVM

KERNEL



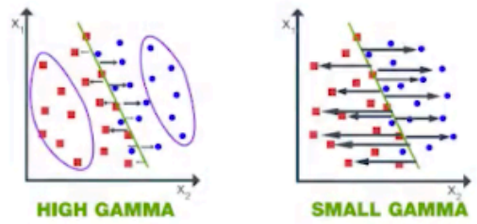
C PARAMETER

TRADEOFF BETWEEN CLASSIFICATION OF TRAINING POINTS AND SMOOTH DECISION BOUNDARY

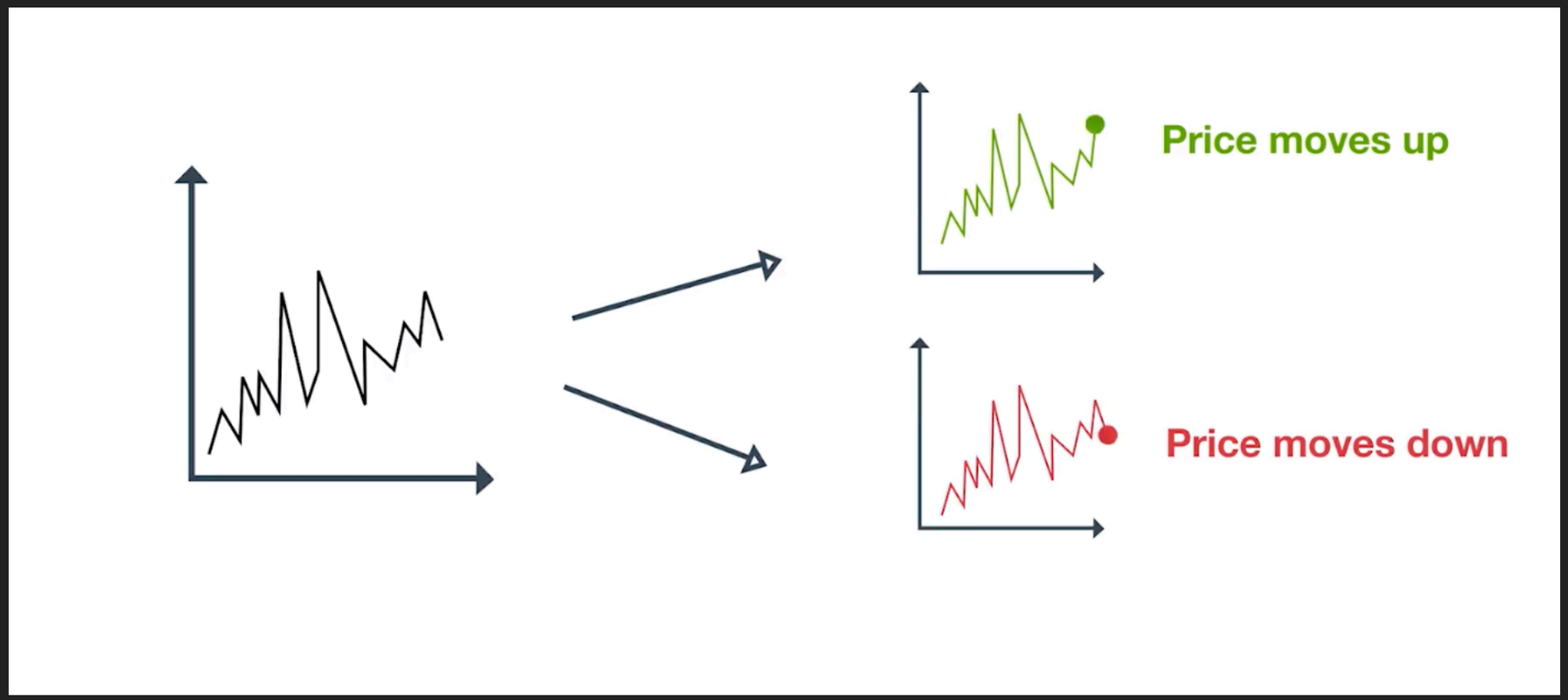
LARGE C - MORE SUPPORT VECTORS
SMALL C - LESS SUPPORT VECTORS

GAMMA

HOW FAR THE INFLUENCE OF A SINGLE TRAINING EXAMPLE REACHES



MACHINE LEARNING TRADING : SVM



MACHINE LEARNING TRADING : SVM

MACHINE LEARNING TRADING : SVM

MACHINE LEARNING TRADING : SVM

PLAY GROUND

- Quantopian
- Quanstart
- Quantconnect
- Quandl


ONE DOES NOT SIMPLY
SAY THANK YOU WITHOUT A MEME