Risk Management Fundamentals

Risk

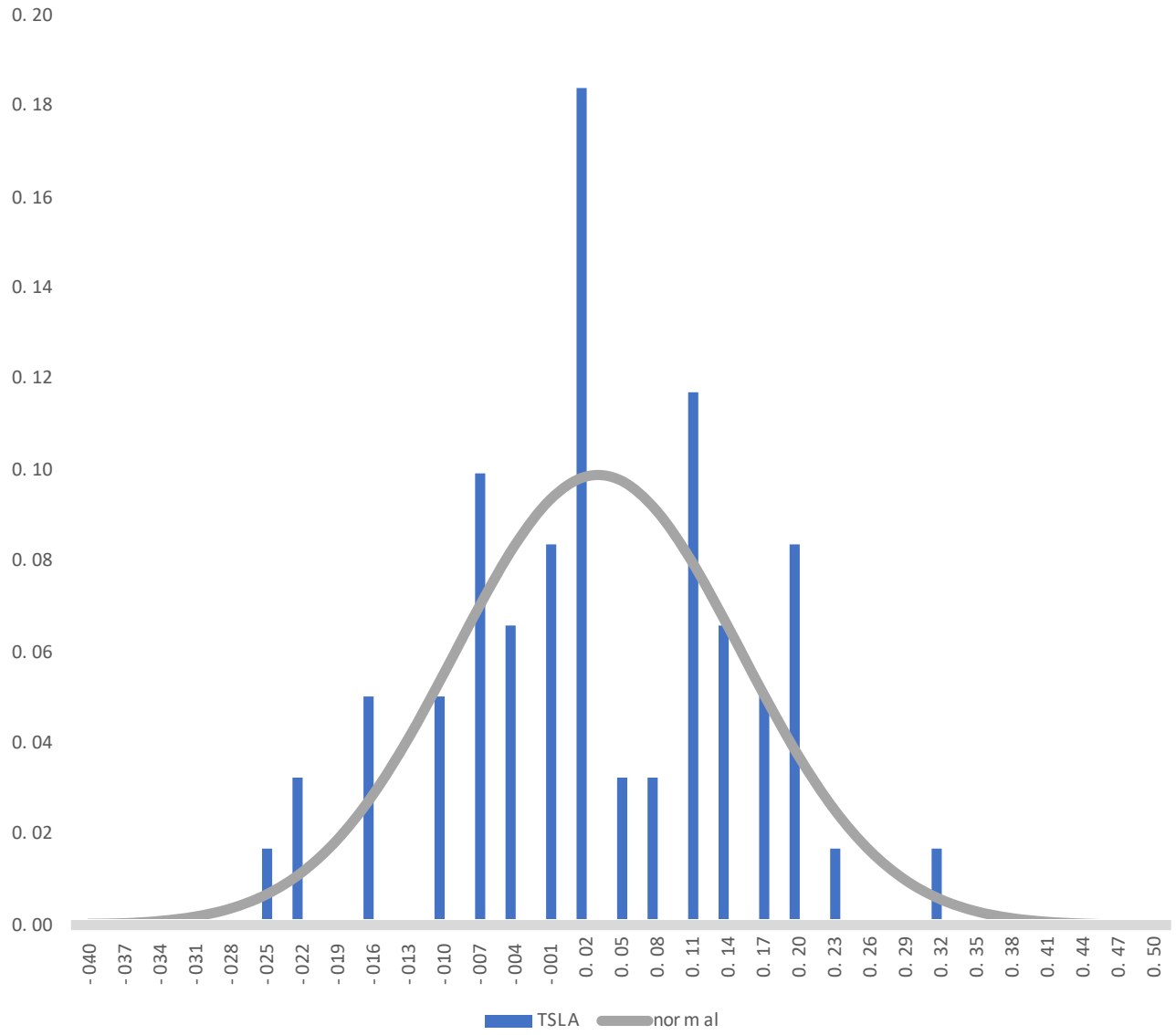
- Basic Concepts
  - Total Volatility or standard deviation
  - Systematic Risk, Beta (CAPM)
  - $ Loss per trade
  - Maximum loss per trade
  - Drawdown
  - Maximum drawdown

Volatility

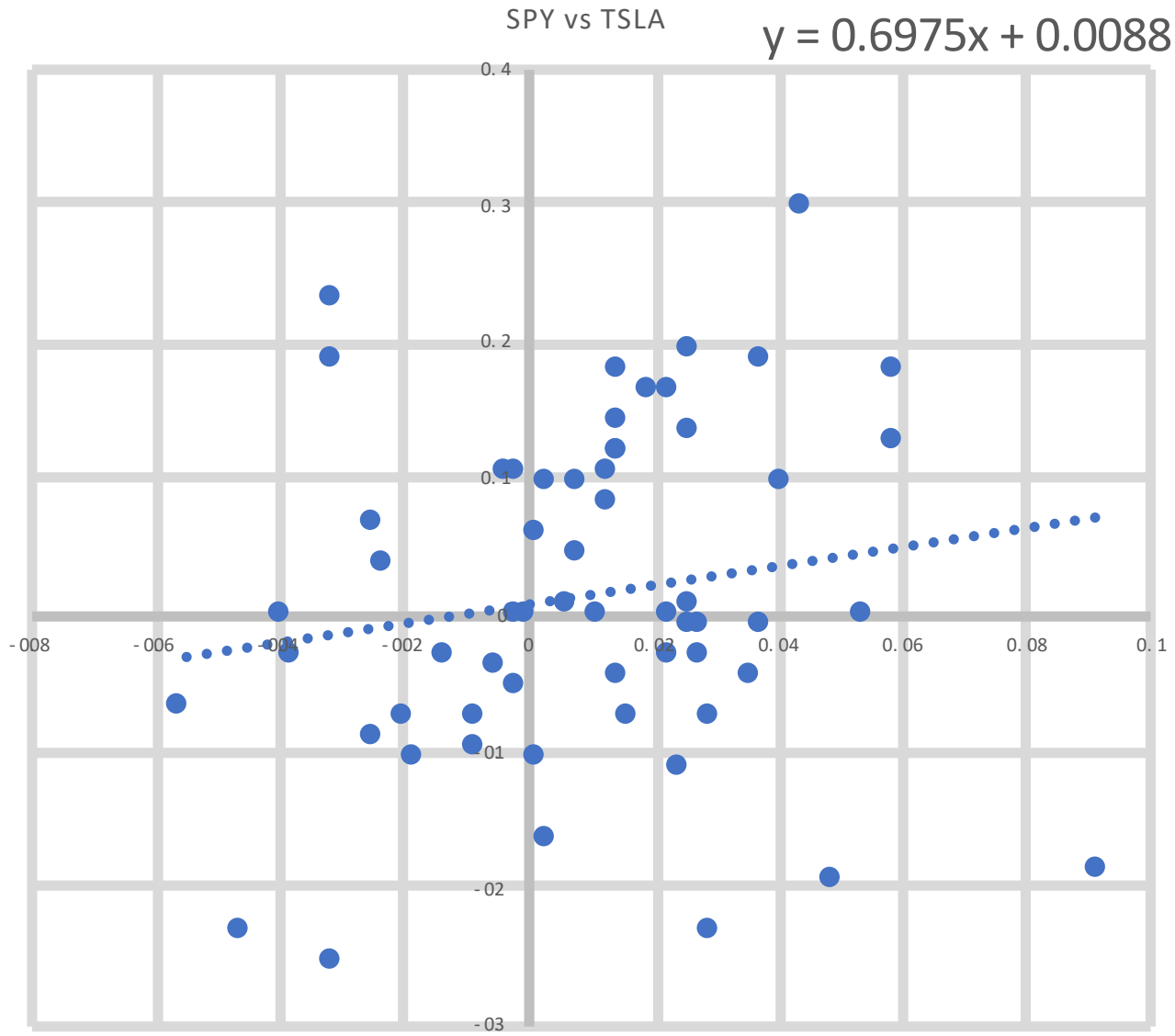
$$\sigma = \sqrt{\frac{1}{n}\sum_{i=1}^{N}(x_i - \mu)^2}$$

μ is the mean

Observed Returns vs Normal Distribution



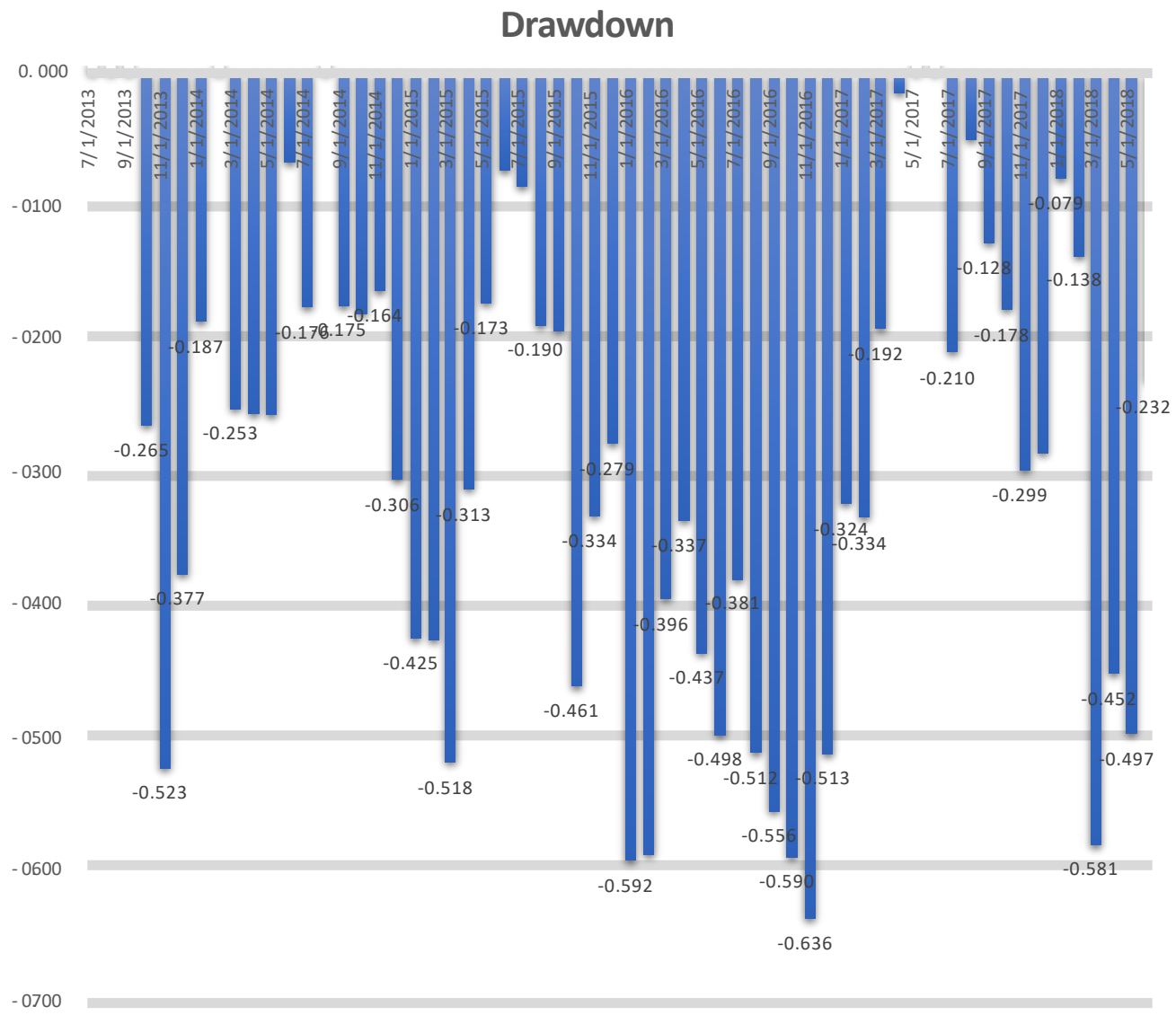
Systematic Risk, Beta



$ Loss per trade & Maximum loss per trade

	SPY	TSLA
Max	0.0916	0.2997
Min	-0.0551	-0.2539
Mean	0.0099	0.0157
SD	0.0282	0.1207

Drawdown and Maximum Drawdown



Theory of Ruins

- The probability of a series of independent events is the product of the probability of each event occurring
- E.g., Assumed a system with a probability of loss of 0.3. The odds of a run of three losses in a row are

$$\Pr(\text{loss}) = 0.3 \text{ x } 0.3 \text{ x } 0.3 = 0.027$$

- One can then combine this probability with position risked. Assume a risk position of 2% is taken for each position, that would translate to a 2.7% probability of losing 6% of the original capital.

Martingale Trading System

- Bet size can change but the odds are constant
- This method recommend doubling up on the next bet after a loss
- Return to normal size after a win
- Risk:
  - Run out of capital
  - Reach the max risk amount allowed

Position Sizing

- Volatility adjusted
- Equal weighted
- Fixed number of contracts / shares
- Risk Percent Method
  - 2%. Elder.
    - Max 2% of account equity on any single trade
  - 6%. Elder.
    - When the 6% loss is triggered, no new trades are allowed for rest of month

Kelly Criterion

- Wikipedia Reference
- Percentage of capital to risk per trade

$$f^* = \frac{bp - (1-p)}{b} = \frac{p(b+1) - 1}{b}$$

- f^*: How much to bet
- b: Net odds received after deducting risk capital
- p: Probability of winning

- Application to stock market:

$$f^* = \frac{\mu - r}{\sigma^2}$$

- f^*: The fraction that maximises the return
- μ: The percentage drift (expected rate of return)
- σ: The percentage volatility
- r: The risk free rate

Half-Kelly

Risk of Ruin

- Kaufman, 1998

$$ROR = \frac{1 - E}{(1 + E)^c}$$

- ROR: Risk of Ruins
- E: Edge. Percent wins – percent loss
- C: number of trading units

$$O_p = \frac{p_w(1 + A) - 1}{A}$$

- O_p, Percentage of capital to use
- A, average payoff ratio
- p_w, percentage win

Other Considerations

- Human psychology
- Strategy deterioration
- Protective stops