Strategy Building in Equity

Version 10.1.0

Topics of Discussions Summarized

- Discussion of Moving Average & various trends
  (Mathematical and Coding part already covered in Excel)
- P & L calculation(Doing back testing & calculating certain parameters for trading system)
- Excel sheet demonstration- Calculating CAGR (Optimizing for what value of SMA & LMA, we are getting the best value of CAGR using Data tables & back testing)
- Concepts Covered: Leverage, Difference between Gambling & Investing, Luck & Probability, Stop Loss(Risk of loss)
- Trending Strategies in perspective of various derivatives parameters
- Market patterns
- Decision matrix & Analysis
- Analysis & Methodology of Delivery Volume
- Expiry-Day Trading Strategy
- Expiry-Day Price Action
- Methods to identify the VWAP Stocks
- Trading Strategies

What is a complete Trading system

Entrance Point

- What to Buy
- When to Buy
- How much to Buy (Position Management)

Exit Point

- What price or what time to take profit
- Stop Loss

Understanding Moving Avg Crossover System

- Before moving ahead, what does moving average do???
- Hypothesis: A sustainable and profitable trend can be identified by using crossover of smaller moving average and large moving average.
- Back-testing: It should be in-sample and out-of-sample
- Testing Period should incorporate wide range of markets:
  - Bullishness
  - Bearishness
  - Consolidation
  - Distribution
- Primary Results
- Optimizing the Parameters
- Analyzing the Results on various Parameters
- Distribution of Losses
- Position Sizing
- Stop loss conditions and discussion

P&L Analysis for Trading System

- Total Profit: Simple summation of profits
- Hit Ratio-Success Ratio: Probability of a trade being profitable
- Average Profit/Loss Per Trade: $\frac{Sum\ of\ profit\ or\ loss}{Total\ No.of profitable\ or\ loss\ making\ trades}$
- Expectancy = $(P_{win} * Amt_{win}) - (P_{loss} * Amt_{loss})$
- Maximum Draw down: Maximum money lost in a losing streak
- Variability of returns: Sharpe ratio
- Distribution of profits/losses
- Total Number of Trades

Costs to be taken care of

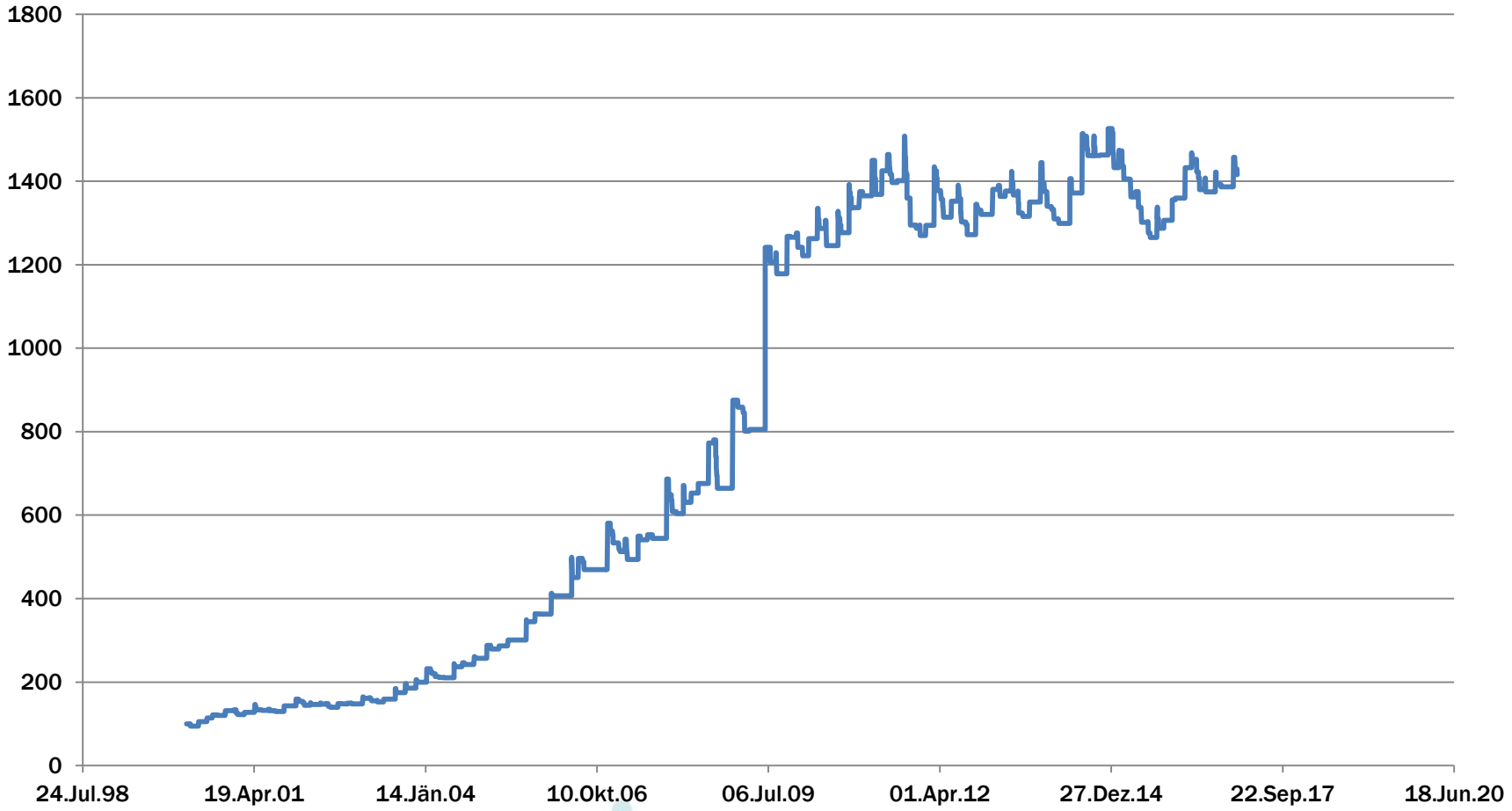
- Brokerage
- Slippages

Sample Results

Profit	313.09%
Positive Trades	97
Negative Trades	166
Hit Ratio	36.9%
Avg Positive Trade	6.61%
Avg Negative Trade	-2.0%
Avg. Profit/Avg Loss	3.35
Variation of Returns	6.38%

Year	Returns	BUY Trades Return	SELL Trades Return
2000	30.5%	3.2%	27.4%
2001	20.3%	3.8%	16.5%
2002	-7.0%	-8.2%	1.3%
2003	33.8%	43.2%	-9.4%
2004	28.2%	22.1%	6.1%
2005	36.7%	36.1%	0.6%
2006	50.2%	51.8%	-1.6%
2007	12.2%	28.8%	-16.5%
2008	42.7%	-9.9%	52.7%
2009	46.5%	57.5%	-11.0%
2010	11.2%	13.1%	-1.8%
2011	-6.9%	-12.2%	5.3%
2012	4.8%	10.3%	-5.4%
2013	2.1%	5.4%	-3.4%
2014	14.0%	22.2%	-8.2%
2015	-11.2%	-8.9%	-2.3%
2016	4.8%	5.3%	-0.5%

Sample Equity Curve



Further Research

Improving on Hypothesis:

- Using three moving average crossover/incorporating RSI
- Diversification

Money Management enhancement:

- Trailing Stop-Loss
- Averaging-In and Averaging-Out
- Fixed profit and stop-loss based on return distributions
- Position Sizing
- Volatility Based
- Martingale/Anti-Martingale: Betting Versus Trading/Investing

Martingale vs Anti Martingale

- Martingale : You increase your bet size as your account falls, decrease it after a win
- Anti-martingale : You increase your bet size as your account grows, decrease it after a loss

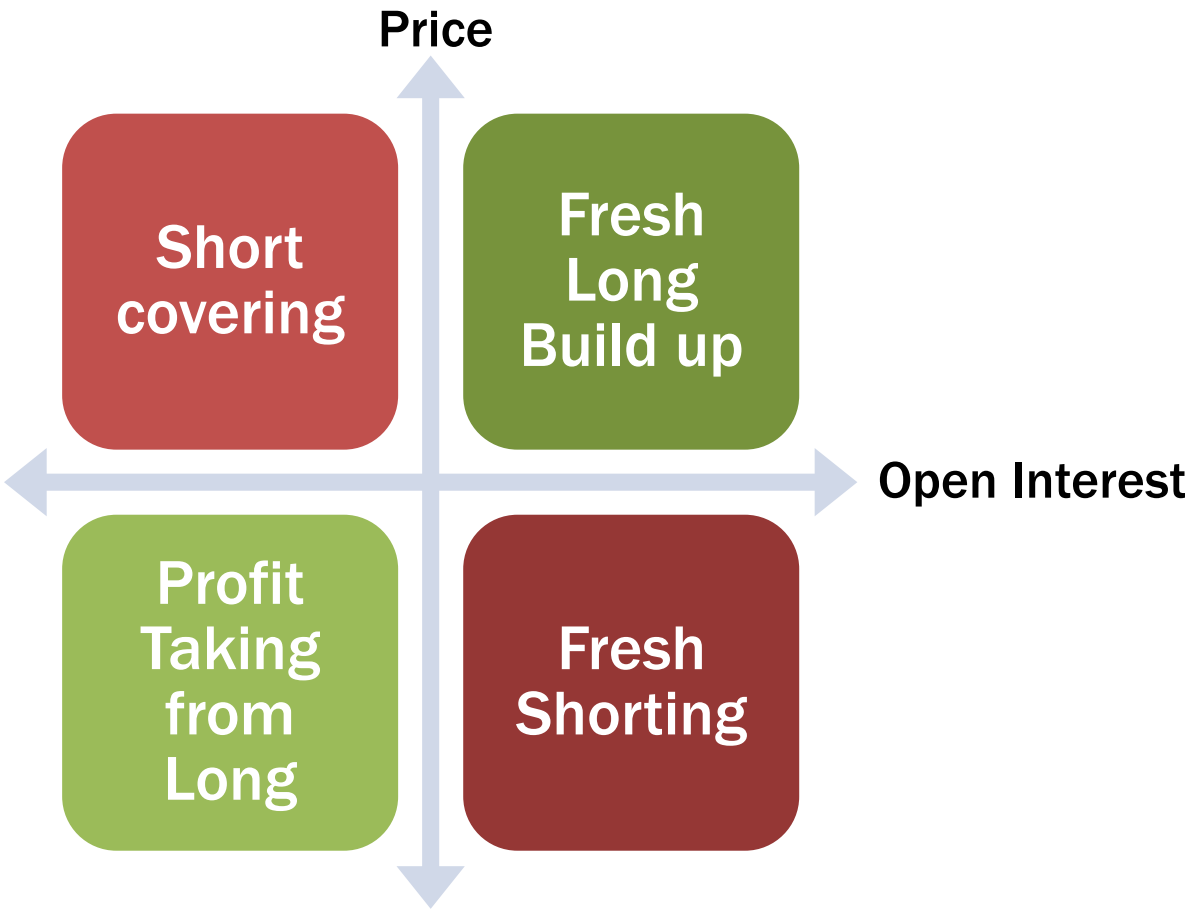
Why these rules might not work?

- These methods assume dependency between trades.
- In most cases, trades are independent of each other. The odds of the next trade being a win are not related to whether the last trade was a win or a loss.

Other trend following systems/parameters

- Estimation of trend using
  - OI : Outstanding Contracts of futures in the market
  - COC : Difference between Future and Cash Prices
  - Delivery Volume: Percentage volume of shares taken as delivery.
  - Volume Traded: Total volume (in number of shares) traded
- Basic assumption/hypothesis: There is smart money with better understanding of the market which will try to take big position before significant move.

Decision Matrix-OI vs Price



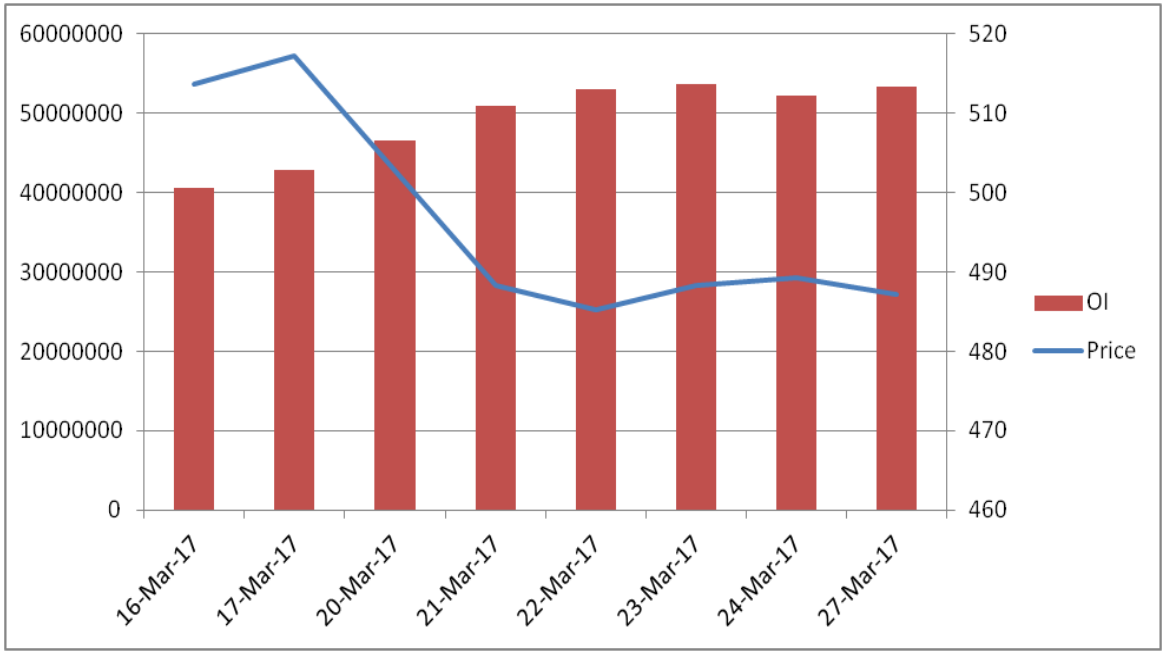
These patterns have to be looked at intra-day interval as well as over the period of the day.

Sample Analysis -1

- Mar 16 - Mar 17: Fresh Long Buildup
- Mar 20 - Mar 22 : Fresh Shorting
- Mar 24: Short Covering

Date	Price	OI
16-Mar-17	513.65	40626000
17-Mar-17	517.15	42825600
20-Mar-17	502.85	46516800
21-Mar-17	488.3	50912400
22-Mar-17	485.3	53067600
23-Mar-17	488.25	53667600
24-Mar-17	489.35	52232400
27-Mar-17	487.15	53347200

Axis Bank OI-vs-Price Chart

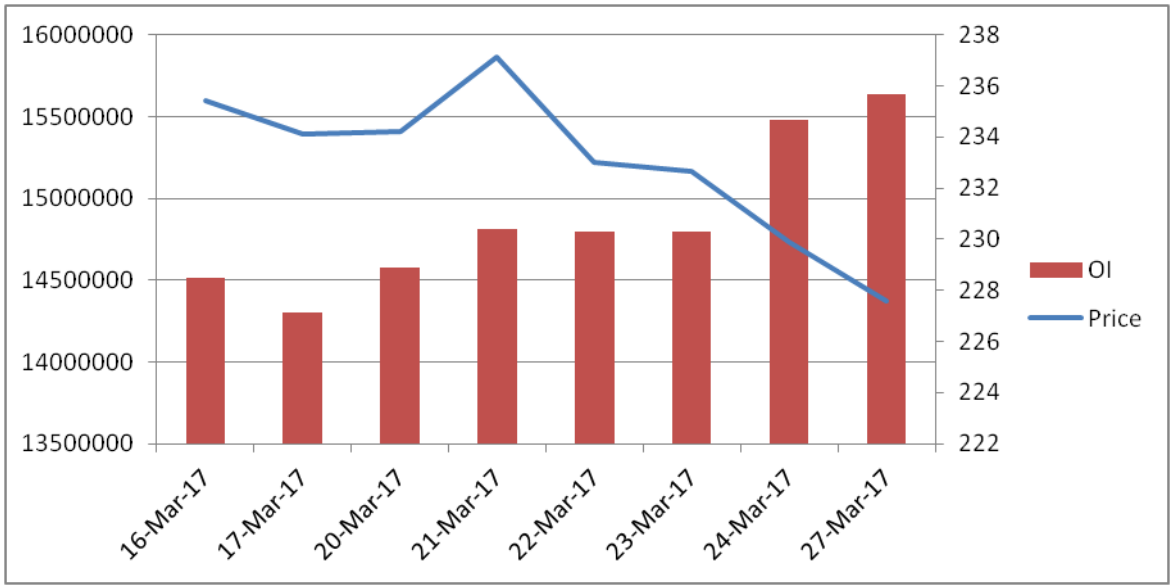


Sample Analysis -2

- Mar 16 - Mar 17: Profit Taking from Long
- Mar 20- Mar 21 : Fresh Long Buildup
- Mar 23- Mar 24: Fresh Shorting

Date	Price	OI
16-Mar-17	235.4	14517500
17-Mar-17	234.1	14302500
20-Mar-17	234.2	14575000
21-Mar-17	237.15	14812500
22-Mar-17	233	14797500
23-Mar-17	232.65	14795000
24-Mar-17	229.9	15477500
27-Mar-17	227.6	15637500

Ambuja Cem: OI-Vs-Price

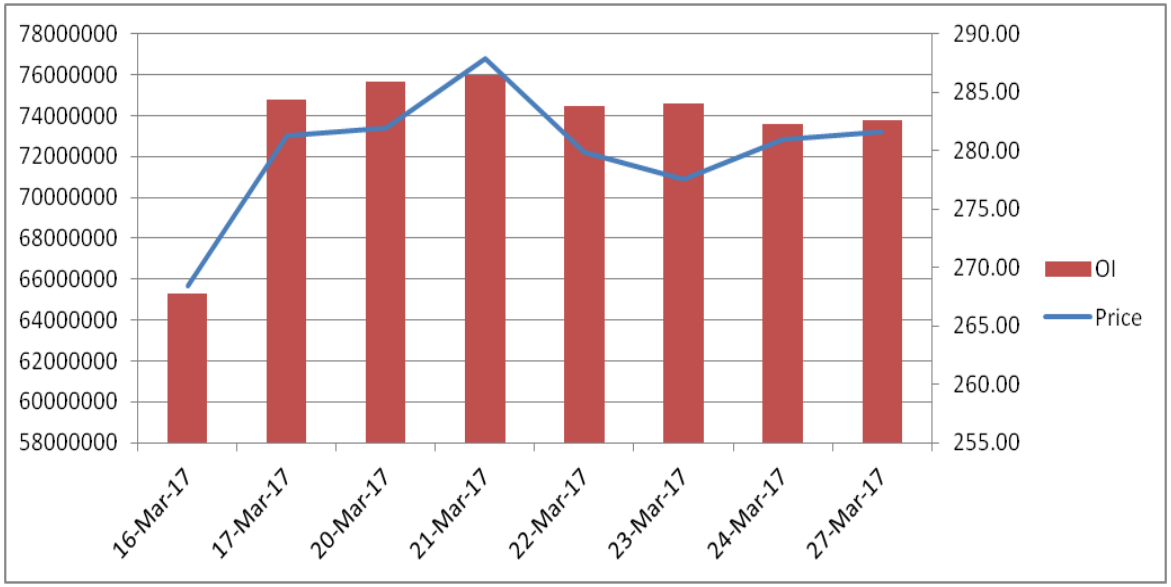


Sample Analysis -3

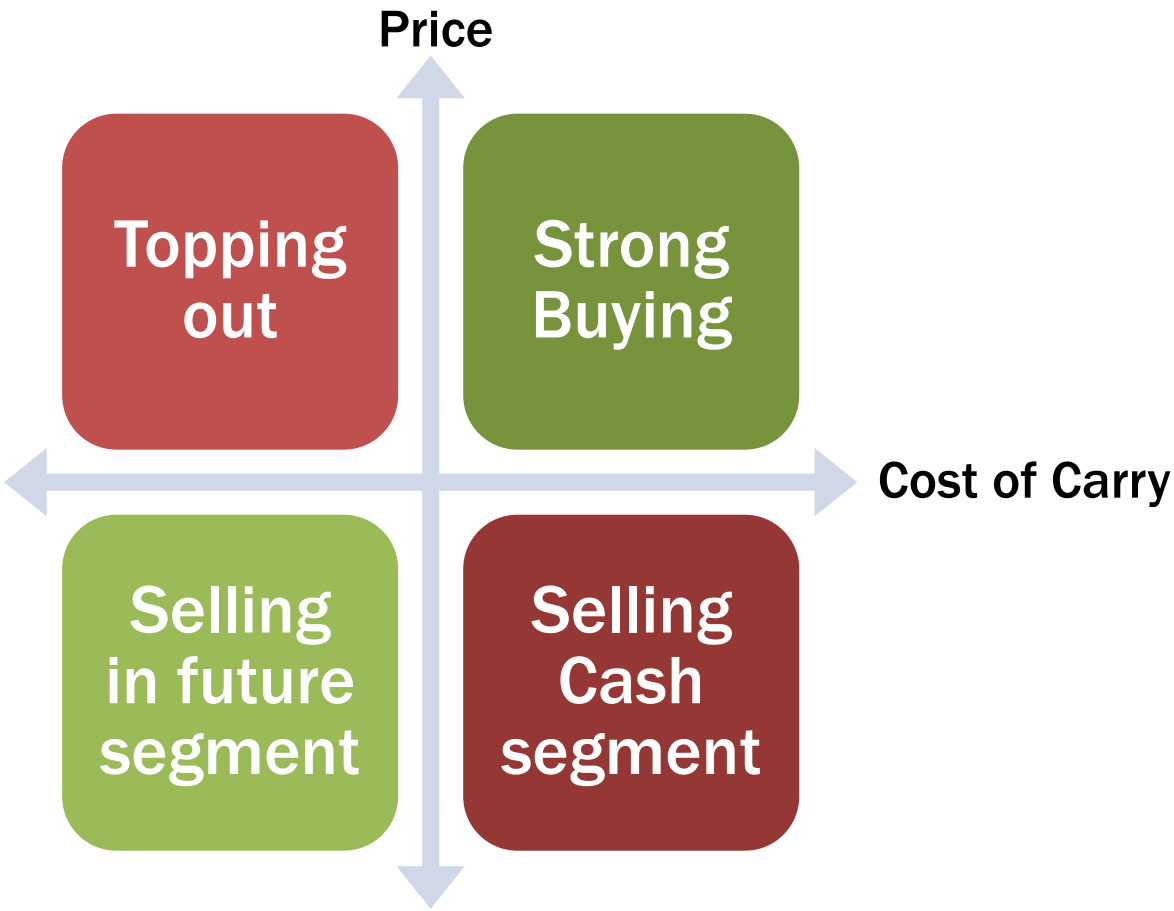
- Mar 16 - Mar 21: Fresh Long Buildup
- Mar 22: Long Square up
- Mar 23: Fresh Short
- Mar 24-Mar 27: Short Covering

Date	Price	OI
16-Mar-17	268.45	65287200
17-Mar-17	281.25	74764800
20-Mar-17	281.90	75657600
21-Mar-17	287.90	76000800
22-Mar-17	279.85	74457600
23-Mar-17	277.60	74592000
24-Mar-17	281.00	73584000
27-Mar-17	281.60	73759200

ITC: OI-Vs-Price



Decision Matrix-Price vs CoC



**Prices here are referred to Cash Prices*

Analysis of Delivery Volume

Definition:

- Long term Buying and Selling indicated
- Can be used in association with OI & COC , to ascertain arbitrage position (to be discussed in detail in later half of the lecture)
- Delivery percentage at both the exchange to be considered

Methodology of Delivery Volume Analysis

- Observing deviation from average can provide good insight (using percentage deviation from 20-day Average can be one methodology)
- A weighted system looking at factors like:
  - Change in OI
  - Change in Price
  - Change in Delivery

Can be used to create a weighted system or a factor model

Expiry-Day Trading Strategy

- Effect of Cash-Future Trading on the day of expiry
- Is their significant patterns which can be used to harness profits?
- What does Expiry-Day Trading Strategy Mean?
  - What is Cash-Future Arbitrage?
  - When does Expiry-Day – price action become significant?
  - Can we identify it??

Understanding Expiry-Day Price Action

- Who does this?
  - Arbitrageurs who fail to offload their positions
- Any Arbitrageurs (Cash-future) has 2 options after entering any position
  - Square-off position during the expiry tenure, if the spread converges.
  - Roll-over the position to next month while earning sufficient spread.
- If both the scenarios does not happen, then selling the cash during half-an hour expiry is option left.

Methods to identify the VWAP Stocks

- Significant Arbitrage setup during month
  - High COC accompanied with Equity Delivery and OI increase
- Indicators for un-rolled/un-squared-off position
  - High COC over the month (not able to square off)
  - Less Rollover for the month (un-rolled position)
  - Potential Spread to be earned is smaller than COC
- Why would selling affect the price
  - Unrolled OI/volume in half an hour should a significant number
- Objective of Selling during Last 30 minutes:
  - Meeting above objective results in closing the arbitrage successfully.

Trading Strategy

- Create a probable portfolio of around 10 stocks
- Take the trade at 3:00, its when action starts
- Cut the position at 3:20. It's the time when MFs try and buy stocks at subdued level
- Scan for stocks fallen heavily during first 20-mins. Take the contrarian trade. The reversed trade can be squared off next morning
- Estimate returns on portfolio basis.

Extension of Methodology

- Stock selling during the day of index re-balancing
- Strike-pinning on the day of expiry in option segment

Few Suggestions

- See market correlation in terms of driving force.
- Maintain log journal
- Be a strong risk manager
- Choose your own edge
  - Could be quantitative
  - Could be strong market understanding/sense/experience
  - Could be discretionary: Very strong emotional control required

Trading: Serious Business

- Two biggest mistakes traders make:
  - They don't do enough homework
  - They are a bit too casual about risk
- Markets gives you what you really want to get out of it
- Being right does not necessarily means you will make money
  - Decide: Whether you want to be right or make money
- Does market follow Efficient Market Hypothesis?

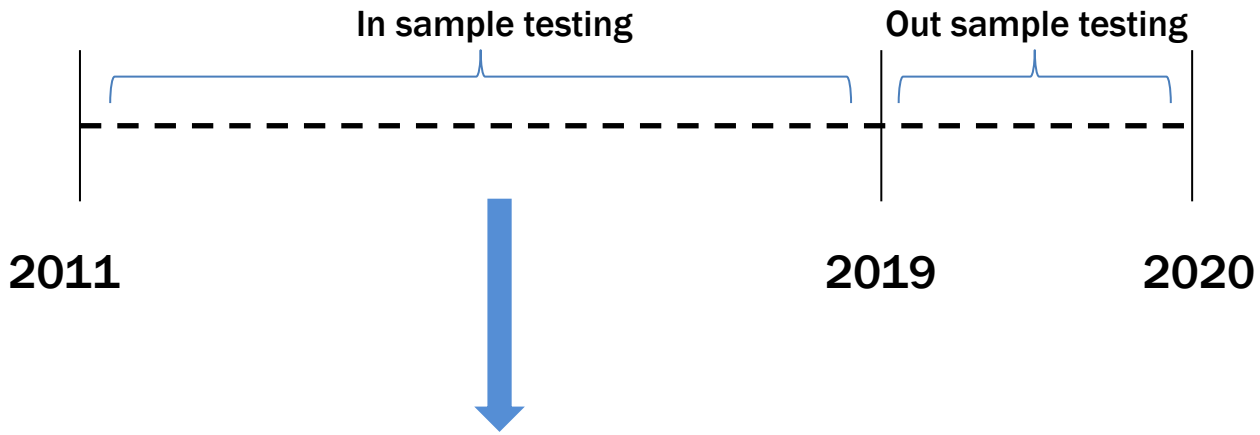
Summary

- Discussion of Moving Average & various trends

  (Mathematical and Coding part already covered in Excel)
- P & L calculation(Doing back testing & calculating certain parameters for trading system)
- Excel sheet demonstration- calculating CAGR (For what value of SMA & LMA, we are getting the best value of CAGR using Data tables & back testing)
- Leverage, Difference between Gambling & Investing, luck & probability, Stop loss(Risk of loss)
- Trending Strategies in perspective of various derivatives parameters
- Market patterns
- Decision matrix & Analysis
- Analysis & Methodology of Delivery Volume
- Expiry-Day Trading Strategy
- Expiry-Day Price Action
- Methods to identify the Expiry-Day Stocks
- Trading Strategies

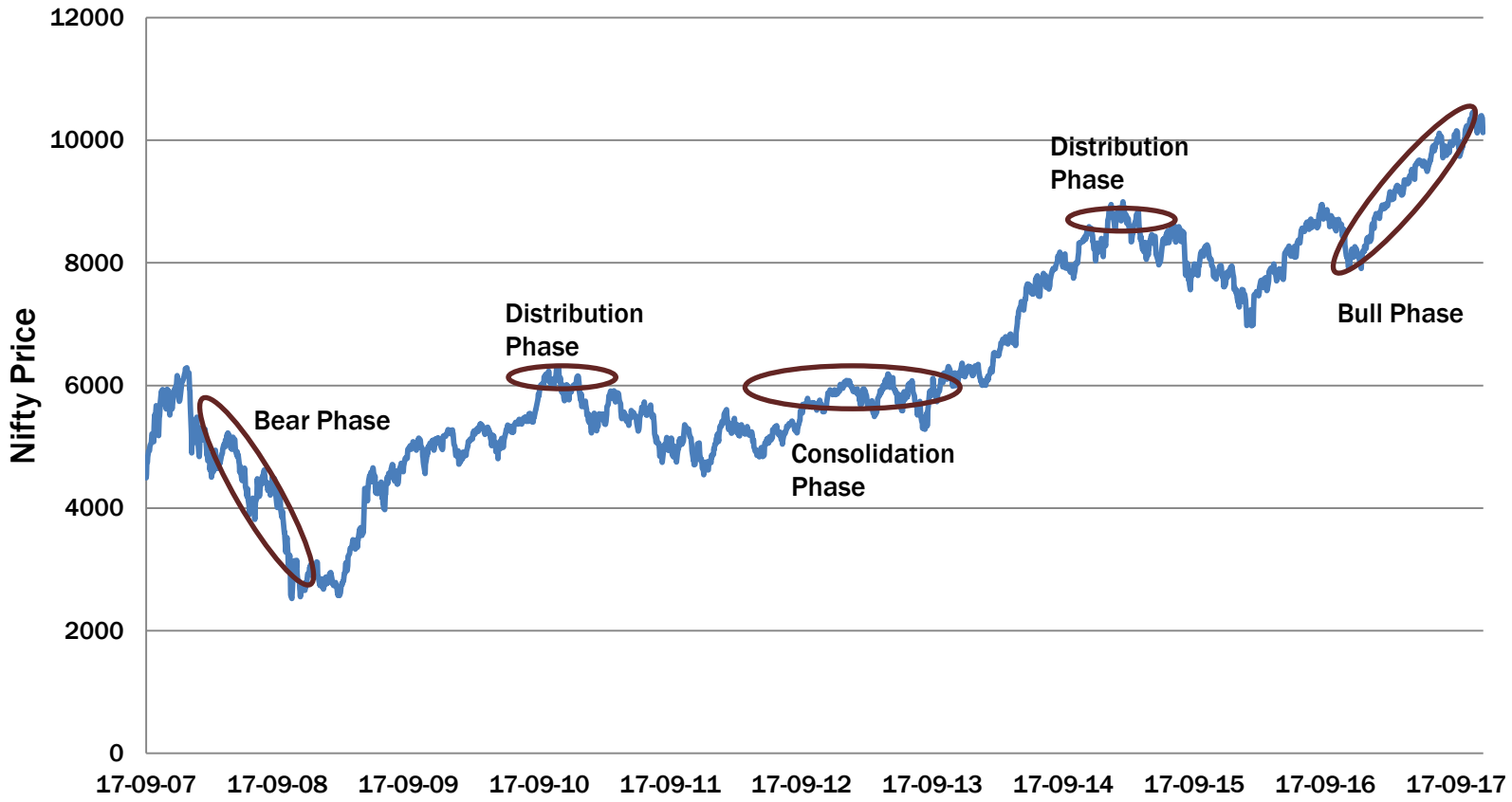
Back Up Slides

In Sample/Out Sample testing



In sample period will help in optimizing parameters

Testing Period



P&L Analysis for Trading System

Total Profit

- Does not say when the profitable trades occurred or how large they are compared to others.
- Possible that 10 loser for throughout the year and one large winner towards the end.

P&L Analysis for Trading System

Hit ratio

- Important for determining the Kelly fraction (Position Sizing)

- Recap - Parameters used to determine Kelly Fraction
  - Probability of positive trade
  - Probability of negative trade
  - Average return on a profitable trade
  - Average return on a negative trade

P&L Analysis for Trading System

Average Profit/Loss per trade

- Important for determining the Kelly fraction (Position Sizing)
- Better to evaluate in % terms
- 200 point average profit per trade when Nifty was 2000 vs 200 point average profit per trade when Nifty is 5000

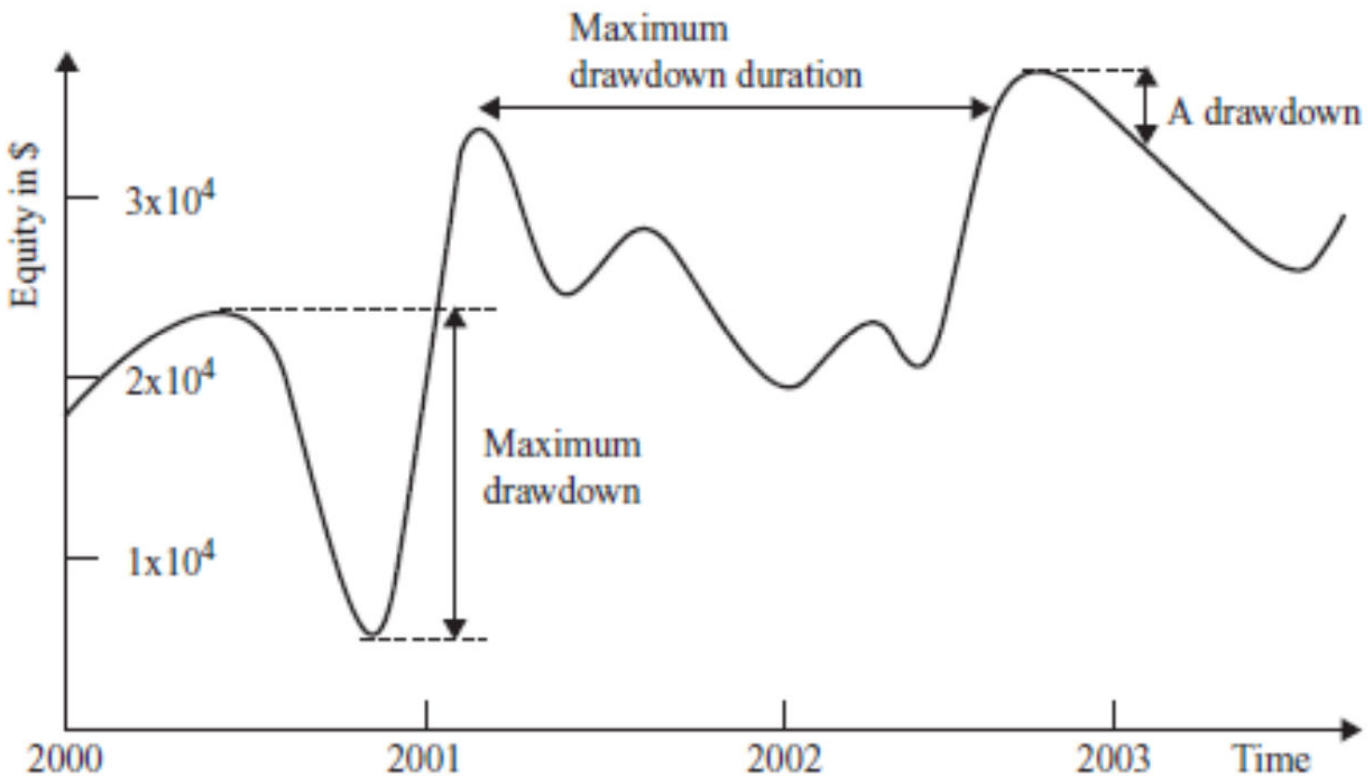
P&L Analysis for Trading System

Expectancy

- System 1: $P_{win} = 0.9$, $P_{loss} = 0.1$, $Amt_{win} = 1$, $Amt_{loss} = 1$
- System 2: $P_{win} = 0.4$, $P_{loss} = 0.6$, $Amt_{win} = 4$, $Amt_{loss} = 1$

- System 1 has an expectancy of 0.8 but System 2 has an expectancy of 1.0
- System 2 is more profitable despite having a winning % rate of 40% while system 1 has a winning rate of 90%.

Drawdowns



P&L Analysis for Trading System

Drawdown

- 5 lac drawdown? Absolute numbers don't give much meaning
- Better understood as a percentage... is it 10% of equity or 25% of equity?

Recovery after Drawdowns

Drawdown	Gains to recovery
5%	5.30%
10%	11.10%
15%	17.60%
25%	33%
30%	42.90%
40%	66.70%
50%	100%
60%	150%
75%	300%
90%	900%

P&L Analysis for Trading System

Sharpe ratio (Show excel)

- Annual returns don't say much:
  - Strategy A: 30% return with 15% risk
  - Strategy B: 20% return with 5% risk

- Look at the risk adjusted returns!

- Sharpe ratio: $$S = \frac{R - R_f}{\sigma} = \frac{E[R - R_f]}{\sqrt{\text{var}[R - R_f]}},$$

where:

R: Return of strategy

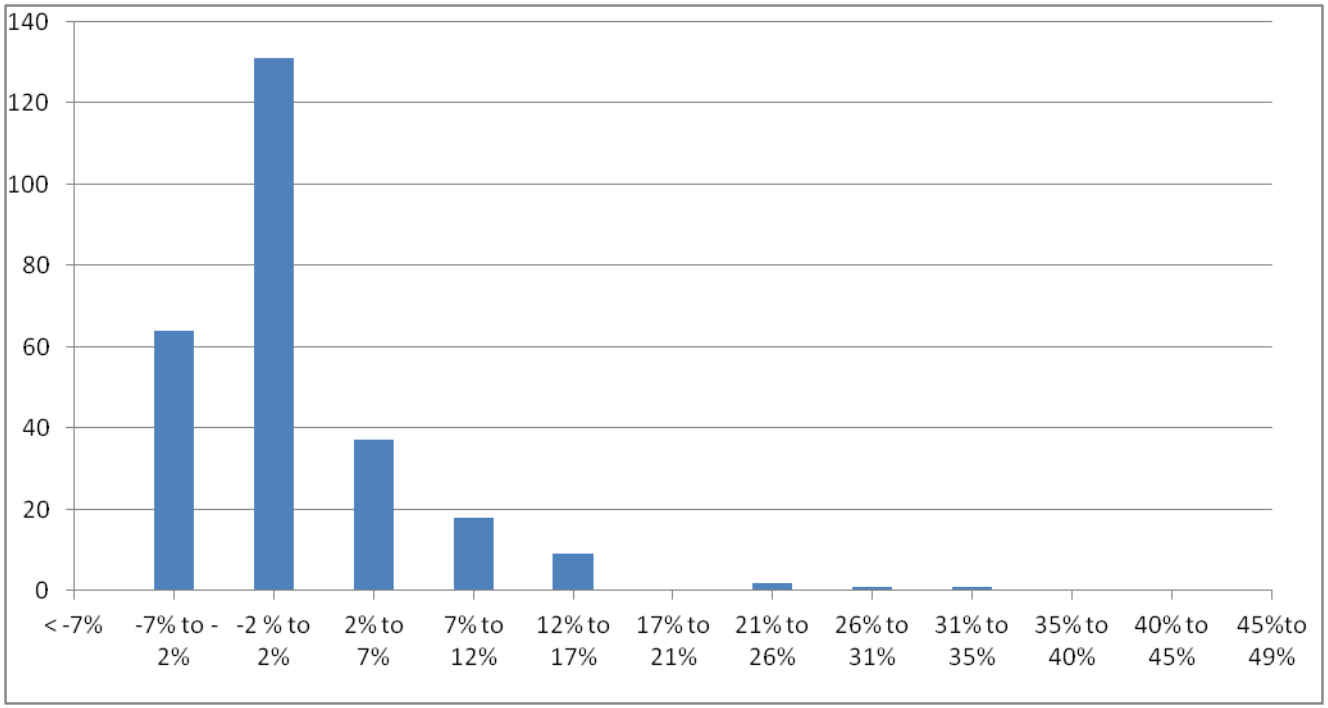
R_f: risk free return

$E[R-R_f]$: Expected value of the excess returns

σ: Std. deviation of excess returns of the strategy

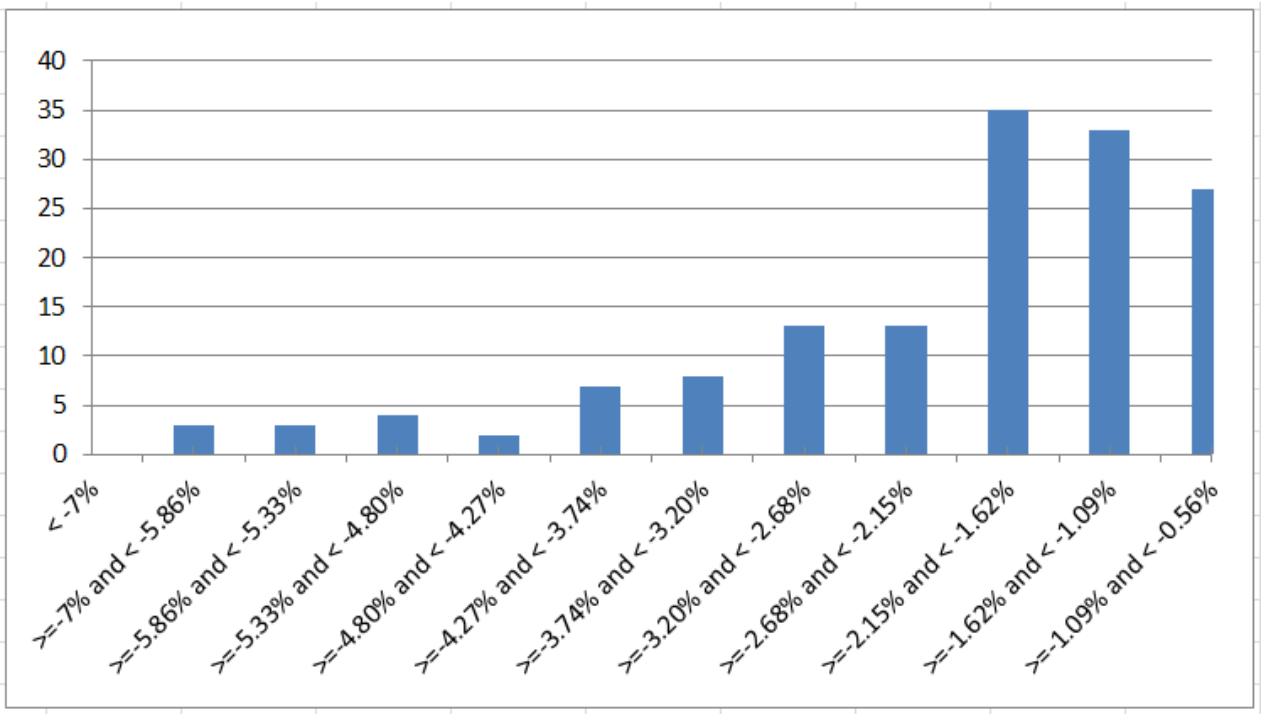
Return's Distribution

Bin	Frequency
< -7%	0
-7% to -2%	64
-2 % to 2%	131
2% to 7%	37
7% to 12%	18
12% to 17%	9
17% to 21%	0
21% to 26%	2
26% to 31%	1
31% to 35%	1
35% to 40%	0
40% to 45%	0
45%to 49%	0
More than 49%	1



Loss Distribution

Bin	Frequency
< -7%	0
>=-7% and < -5.86%	3
>=-5.86% and < -5.33%	3
>=-5.33% and < -4.80%	4
>=-4.80% and < -4.27%	2
>=-4.27% and < -3.74%	7
>=-3.74% and < -3.20%	8
>=-3.20% and < -2.68%	13
>=-2.68% and < -2.15%	13
>=-2.15% and < -1.62%	35
>=-1.62% and < -1.09%	33
>=-1.09% and < -0.56%	27
>=-0.56% and < 0%	18



P&L Analysis for Trading System

Total number of trades

- Does this system trade enough to suit your style of trading and other needs.
- Average time spent in the market
- Cost of trading more in the market: Higher brokerage, tax, etc.

P&L Analysis for Trading System

Open Interest

- Open interest is a number that tells how many contracts (Futures/options) are currently open/outstanding in the market.

- Let us say a seller sells 1 contract to a buyer. The buyer is said to be long on the contract and the seller is said to be short on the same contract. The open interest in this case is said to be 1.

P&L Analysis for Trading System

Open Interest

Monday: Rahul and Dhiraj buy 5 lots and 4 lots respectively, while Niraj sells all those 9 lots. The open interest on Monday would be 9.

	Monday		
Trader	**Buy**	**Sell**	**Contracts**
Rahul	5L		5L
Dhiraj	4L		4L
Niraj		9L	9L
Subhash			
Dionne			
Open Interest			9

P&L Analysis for Trading System

Open Interest

Tuesday: Niraj wants to buys back 3 lots and Subhash, a new entrant in the market sells all those 3 lots. Because the outstanding contracts have not been increased, therefore, the open interest on Tuesday would still be 9.

	Tuesday		
Trader	**Buy**	**Sell**	**Contracts**
Rahul	5L		5L
Dhiraj	4L		4L
Niraj	3L	9L	6L
Subhash		3L	3L
Dionne			
Open Interest			9

P&L Analysis for Trading System

Open Interest

Wednesday: Dionne comes in the market and buys 7 lots. 2 lots from Rahul, 3 lots from Dhiraj and 2 lots from Subhash. Effectively, Rahul and Dhiraj offloaded their positions to the new entrant, therefore the OI will not increase because of this action. Subhash and Dionne entered into a new transaction which created new contracts, therefore the OI on Wednesday increases due to this new transaction.

	Tuesday		
Trader	**Buy**	**Sell**	**Contracts**
Rahul	5L		5L
Dhiraj	4L		4L
Niraj	3L	9L	6L
Subhash		3L	3L
Dionne			
Open Interest			9

	Wednesday		
Trader	**Buy**	**Sell**	**Contracts**
Rahul	5L	2L	3L
Dhiraj	4L	3L	1L
Niraj	3L	9L	6L
Subhash		5L	5L
Dionne	7L		7L
Open Interest			11

Kelly Fraction

<u>Strategy</u>

Win ratio → 35%

Loss ratio → 65%

Returns on winning → 20%

Returns on Losing → 10%

Returns on winning → If $100 is invested, you get $20
Final wealth becomes $120

Returns on losing → If $100 is invested, you lose $10
Final wealth becomes $90

Kelly Fraction

Strategy

Win ratio → 35%

Loss ratio → 65%

Returns → 20%

Wealth → w

Fraction invested each time → x %

Win → Wealth = $(1+0.2x)w$ * $(1+0.2x) = (1+0.2x)^2w$

Lose → Wealth = $(1-0.1x)w$ * $(1-0.1x) = (1-0.1x)^2w$

Kelly Fraction

$W = (1+0.2x)^{n1}\ (1-0.1x)^{n2}\ w$

$n1 \sim 35$

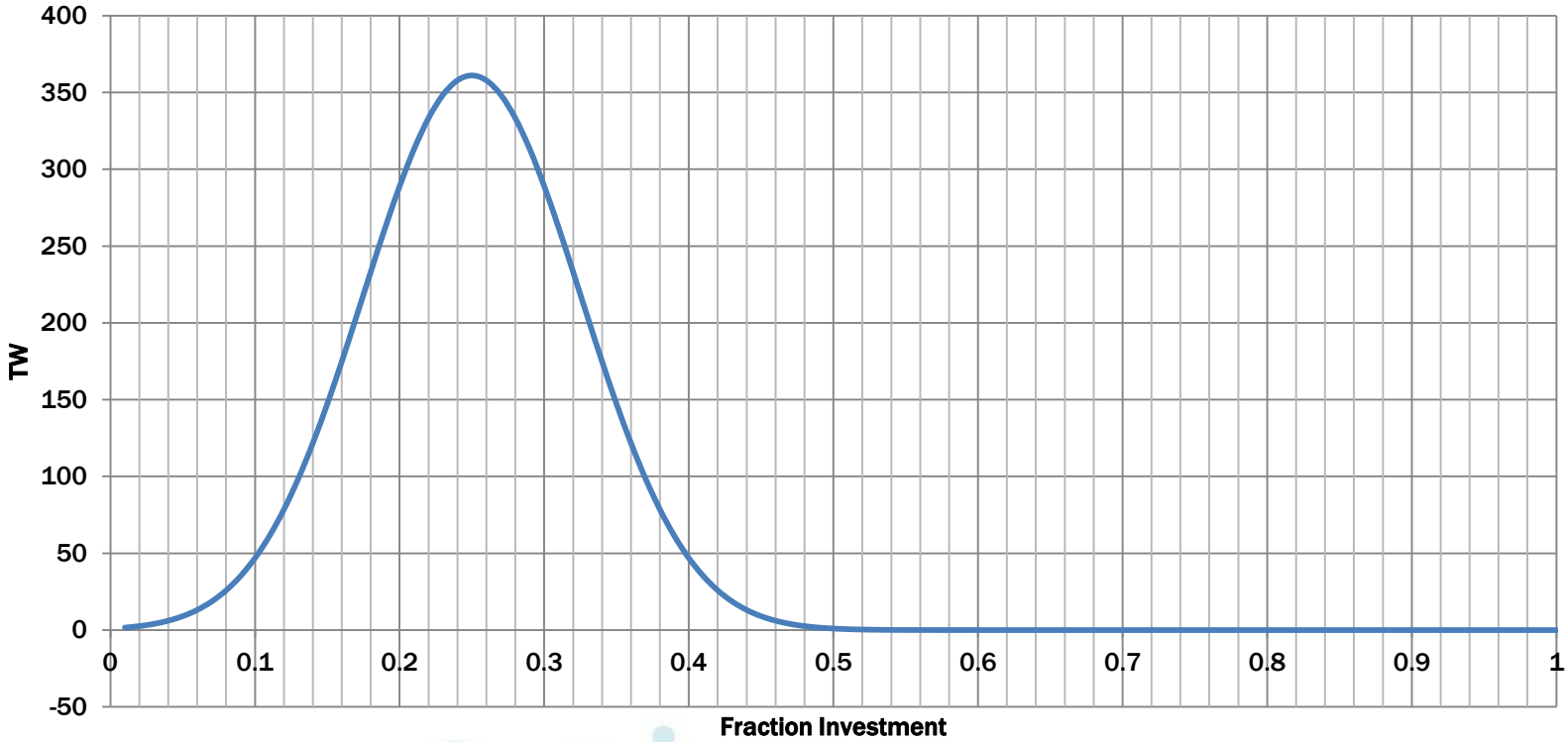
$n2 \sim 65$

$W = (1+0.2x)^{n1}\ (1-0.1x)^{n2}\ w$

Maximize the expression to increase wealth

Now, Use Probability – Kelly Fraction

Payout ratio	2
Trades	100
Prob of +ve trade	0.5
Prob of –ve trade	0.5



Simulation result assuming equal positive and negative trades