



Systematic trading

Comprehensive training material for brokers / dealers / arbitrageurs

By:

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Overview of the program

- Introduction to the systematic trading strategies
- Building blocks of the systematic trading strategies
- Spread and badla strategies – non-risk / risk
- Using practical mathematics to profit from spread trading
- Details on risk based arbitrage like sector-sector, stock-stock
- Examples of comprehensive and practical systematic trading strategies like pair trading, trend following, high frequency trading
- Delta hedging and risk management in trading strategies
- Brief overview of automation and algo trading

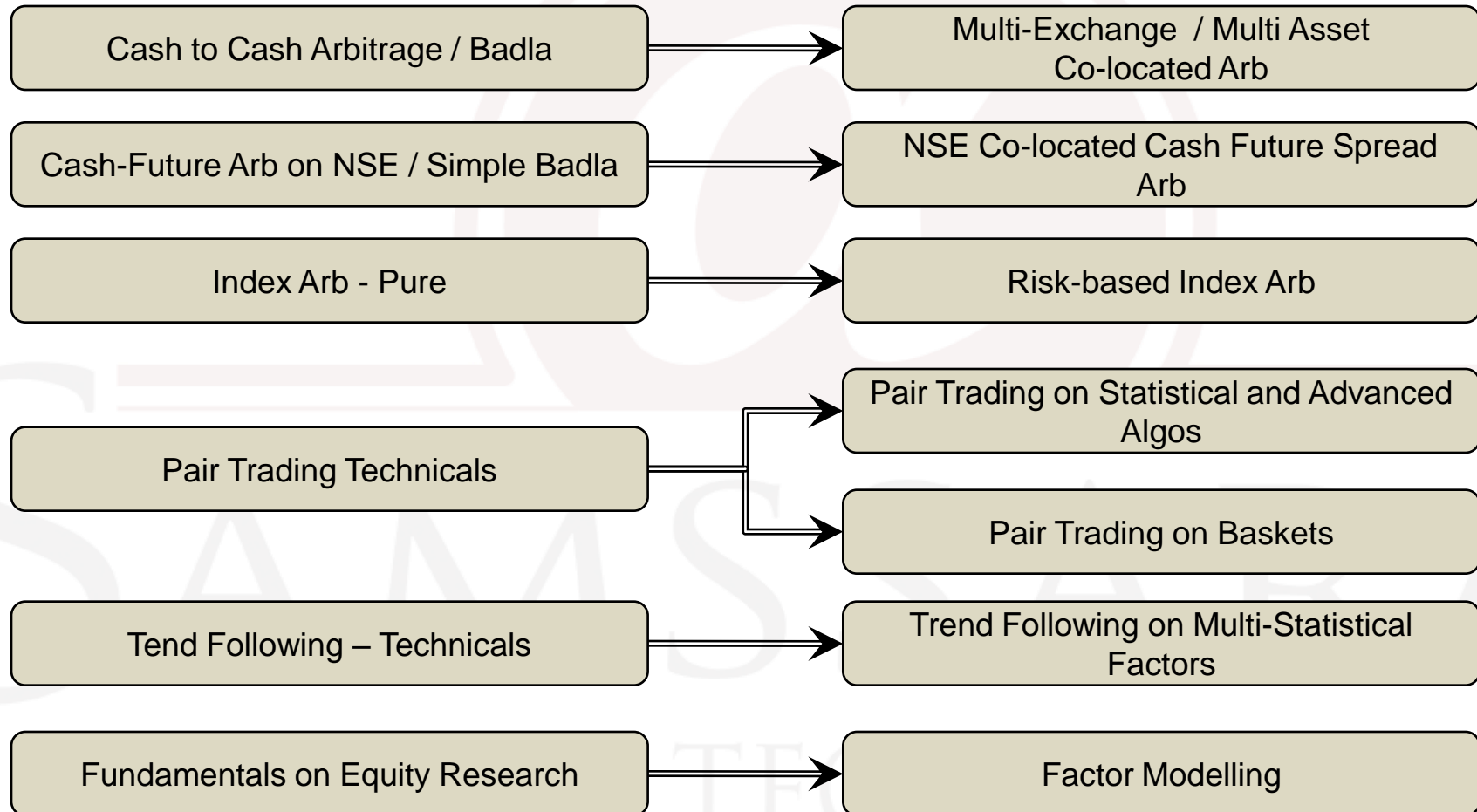
The size of systematic trading strategies

- TABB group reported in Aug'2009
 - 300 securities and large quant funds
 - Recorded \$21 billion in profits in 2008!
- Pure high-frequency firms represents
 - 2% of the 20,000 trading firms in US
 - Account of 67% of all US volumes
- Total AUM of high-frequency trading funds
 - \$141 billion
 - Down 21% from the high
 - Compared to global hedge fund shrinking by 33% since 2008

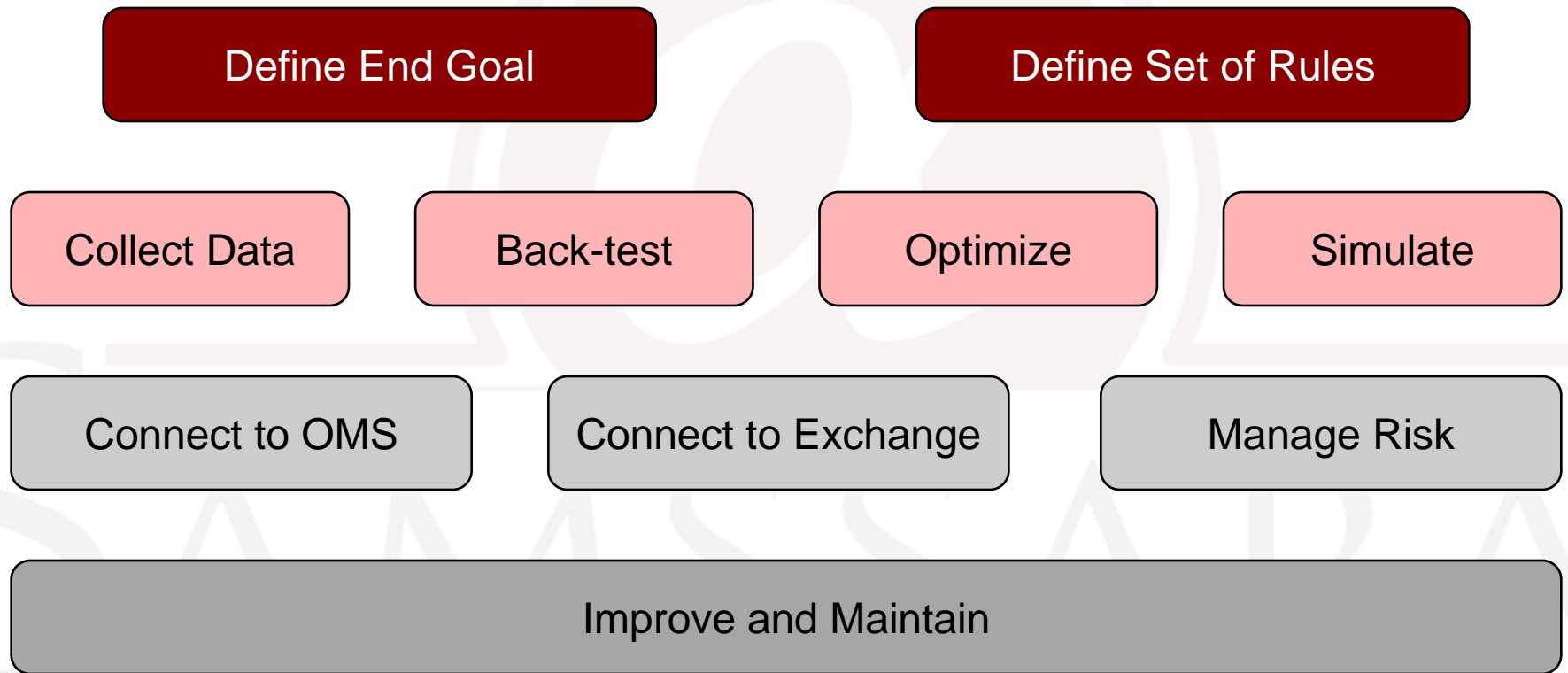
The changes in trading techniques in Indian market

Present

Future



The building blocks



CAPITAL TECHNOLOGIES

Defining the end goal

Nature

- Proprietary Trading
- Agency Trading
- Clients Trading (Wealth Management)

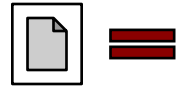
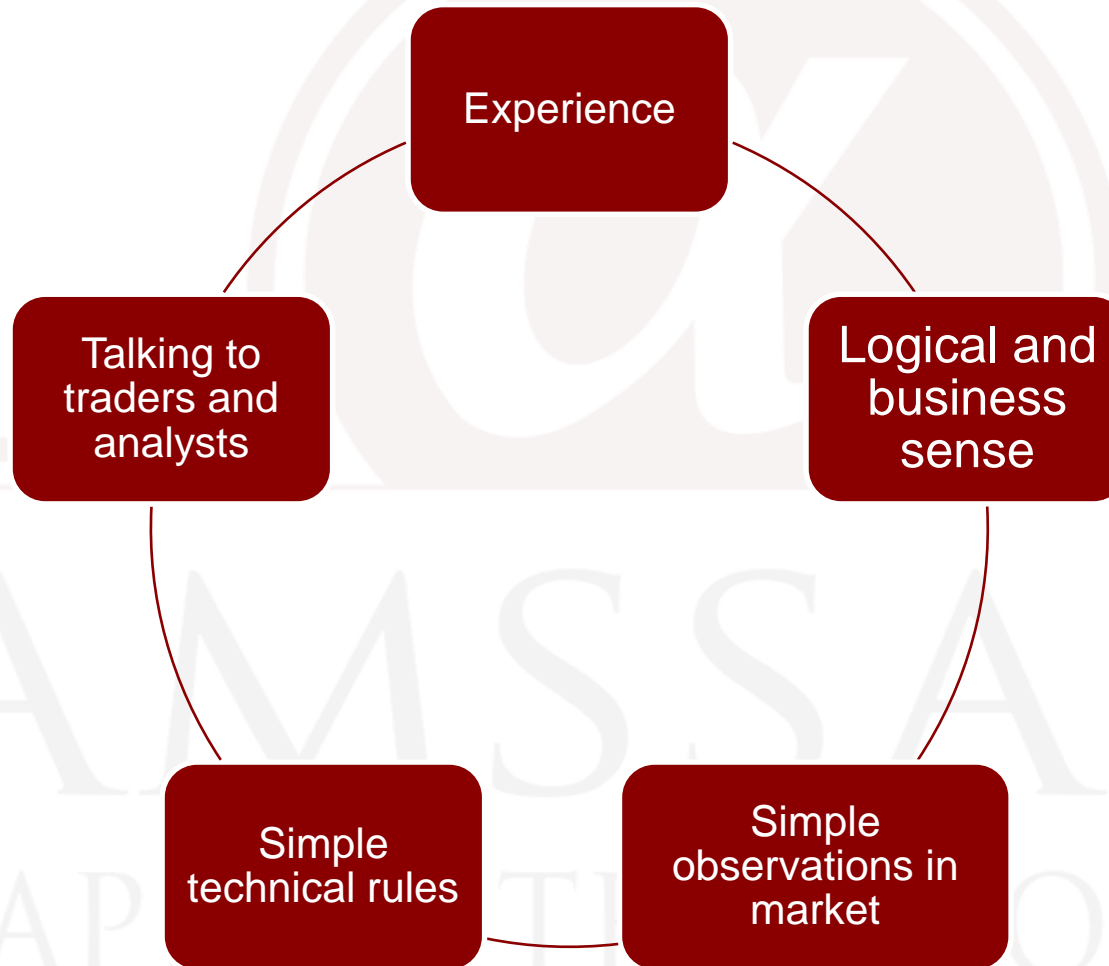
Frequency

- Low
- Medium
- High

AUM & Strategy

- Higher AUM, Long term return
- Lower AUM, Daily profits
- Non-correlated fresh strategy / Refine old ones

Defining the set of rules



The spread strategies

- Simultaneous buying and selling of assets in 2 different exchanges, expiries, sectors etc. which are suppose to move in tandem
- Traditionally pure spread strategies like cash-future arbitrage, BSE-NSE arbitrage, Calendar spreads has done very well
- Now most of the spread strategy game has shifted to NSE co-locations as the spreads needs to be hit fast
- Hence, in the process – risk based arbitrage strategies are gaining much needed ground

The spread / badla

$$\text{Spread}(BP) = \frac{(\text{BestAsk} - \text{BestBid})}{\frac{(\text{BestAsk} + \text{BestBid})}{2}} \times 10000$$

$$\text{Spread}(Ticks) = \text{BestAsk} - \text{BestBid}$$

▪ Pure Spread / Badla Strategies:

- Cash – Future
- Eg: Reliance futures vs Reliance in cash, Nifty futures vs Nifty 50 basket in cash
- Nifty cash future arbitrage – also called index arbitrage
- Calendar spreads – Nifty futures near month / next month / far months
- Options spreads – Buying Nifty call, put and hedging delta with futures

▪ Risk based spread strategies

- ICICI – HDFC Bank spread, Nifty – Reliance spread, Nifty – Basket spread
- Mitigate risks using mean reversion techniques

Type of spread strategies

▪ Cash-Future Arbitrage

- Prevalent with houses having large funds
- Cash-Future Arbitrage (Long Cash / Short Futures) – As they converge on day of expiry
- Rollover of the futures – to continuously benefit from premiums / discount (~ 1% monthly)
- Risk free trade
- Most frequently in stocks which has higher volatility in futures

▪ Calendar Spreads

- Only span margin required with doing calendar spreads in futures in NSE
- Stocks in Premium – when they go to extra premium – you short far month and buy near month
- Stocks in Premium – when they trade at par – you buy far months and short near month
- FII's willing to automatically trade even at 0.5% monthly
- Most prevalent from middle of month – when liquidity in next month starts in stocks
- Nifty – always liquidity available

▪ Dividend Arbitrage

- Stocks trading at premium goes to discount in futures
- Underlying cash delivery is bought by many because of the dividend benefits
- You get tax free dividend – on the delivery stocks and hence the discount Eg: SBIN

ETF / Other instruments

▪ Gold ETFs and Gold Futures

- Gold ETF available from various banks with demat numbers – subject to physical arbitrage
- Arbitrage between Gold and Gold mini possible
- Arbitrage between near and next month possible in Gold futures
- Options arbitrage is not possible – as Gold options are not available

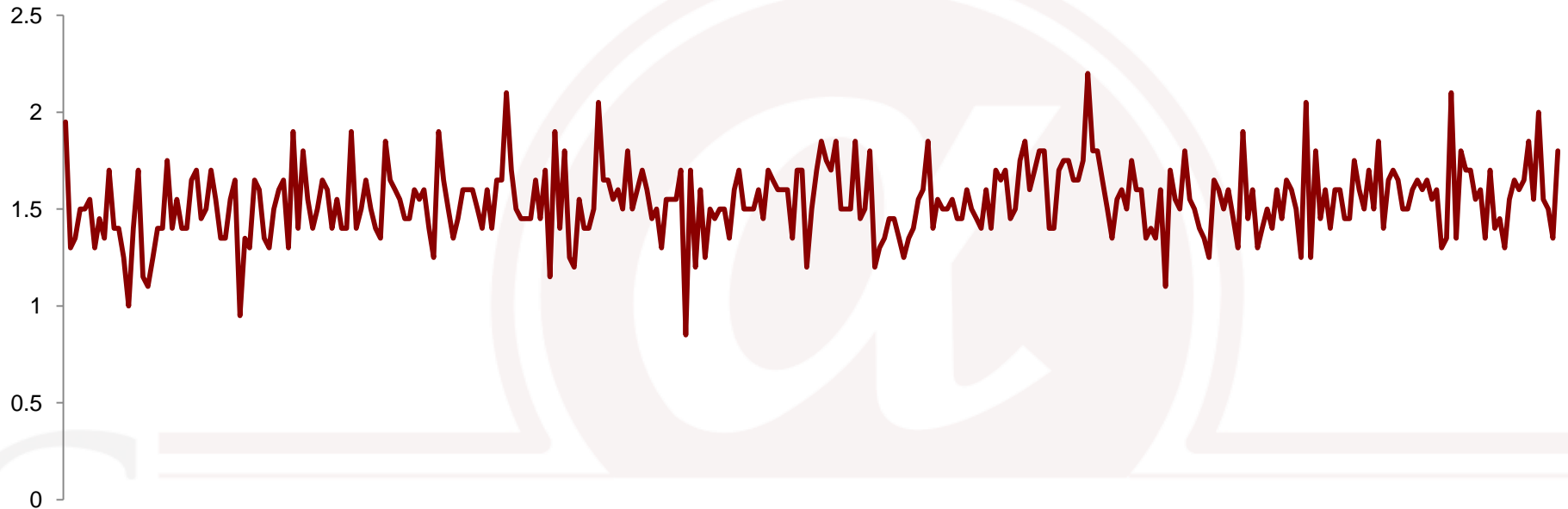
▪ Currency

- Calendar spreads, Dollar arbitrage

▪ Options Spread Arbitrage

- Options spread – Implied vol arbitrage
- Implied vol – acts as prices in options – and the delta needs to be continuously hedged
- Implied vol can be used for spread trading – as long as the delta is continuously hedged
- Single stock options arbitrage like buying call and put options of Suzlon and hedging with stock futures

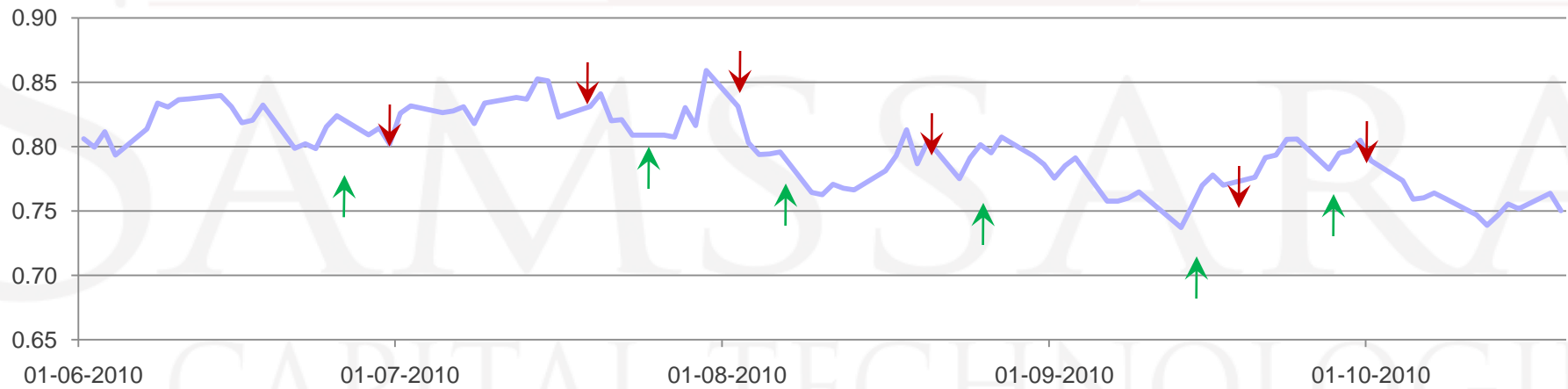
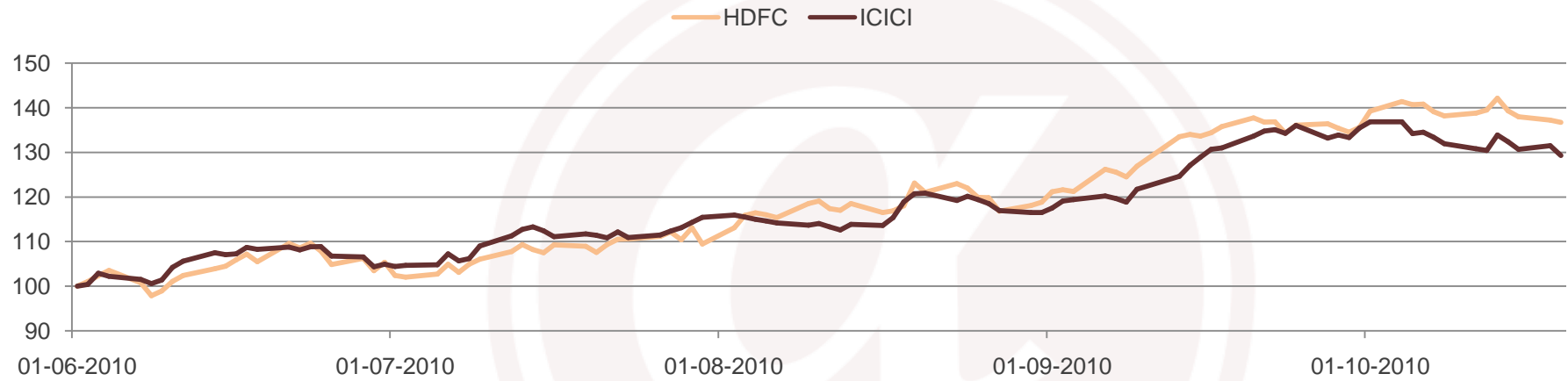
Trading Calendar Spreads in Tata Motors



- Calendar spread in Tata Motors between July and August Contract
- Mean spread: Rs. 1.53 and StDev in Spread: Rs. 0.18
- 2 StDev of Spread: Rs. 1.91 and Rs. 1.16 (StDev = 36 Paisa)
- Total cost on per Lot= Rs 240*4*1000 = Rs. 960,000 (Rs. 144 @ Rs. 1500 Per Cr.)
- Hence total net profit = Rs. 0.36*1000 = Rs. 360 – Rs. 144 = Rs. 216
- Hence on putting the trade, we can make about: Rs. 216 (unleveraged on capital of Rs. 50000 per day)
- Most of these spreads are available only say 10 days in a month – mostly near to the expiry
- Fund deployment is only the span margin and hence the ROI increases on these trades

Excel hands-on exercise for participants on spread trading

Spread trading in HDFC-ICICI futures



Why Mathematics & Statistics?

Pure Technical Models

Moderate ROI when model is working

Large draw-downs when model stops

Long stretch of continuous bleeding
in returns

User might lose confidence

Technical & Statistical Models

Superior ROI when model is working

Flattish ROI when model stops

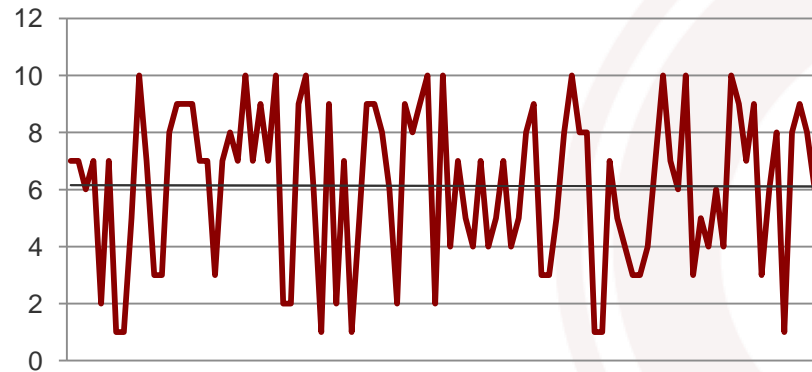
Shorter stretch of continuous flattish
period

User can diversify and make multi-
models

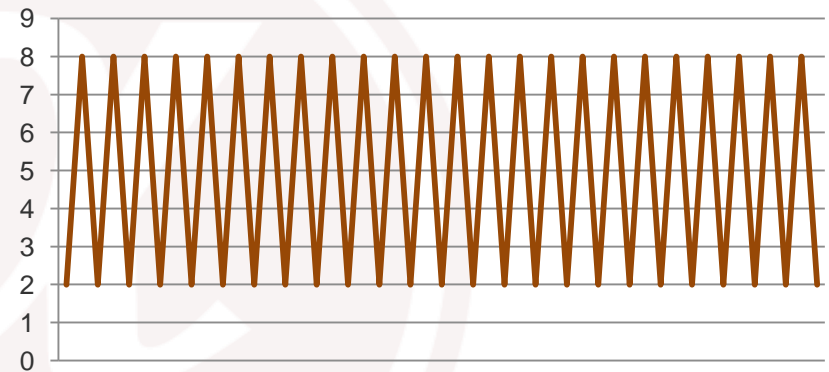
CAPITAL TECHNOLOGIES

Mean and Variance

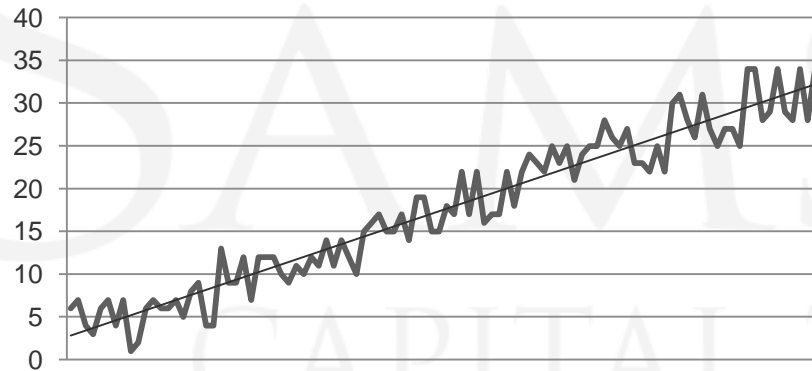
Constant Mean



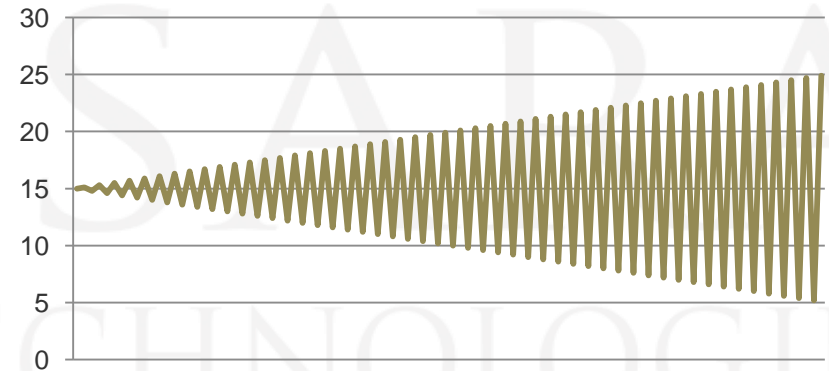
Constant Variance



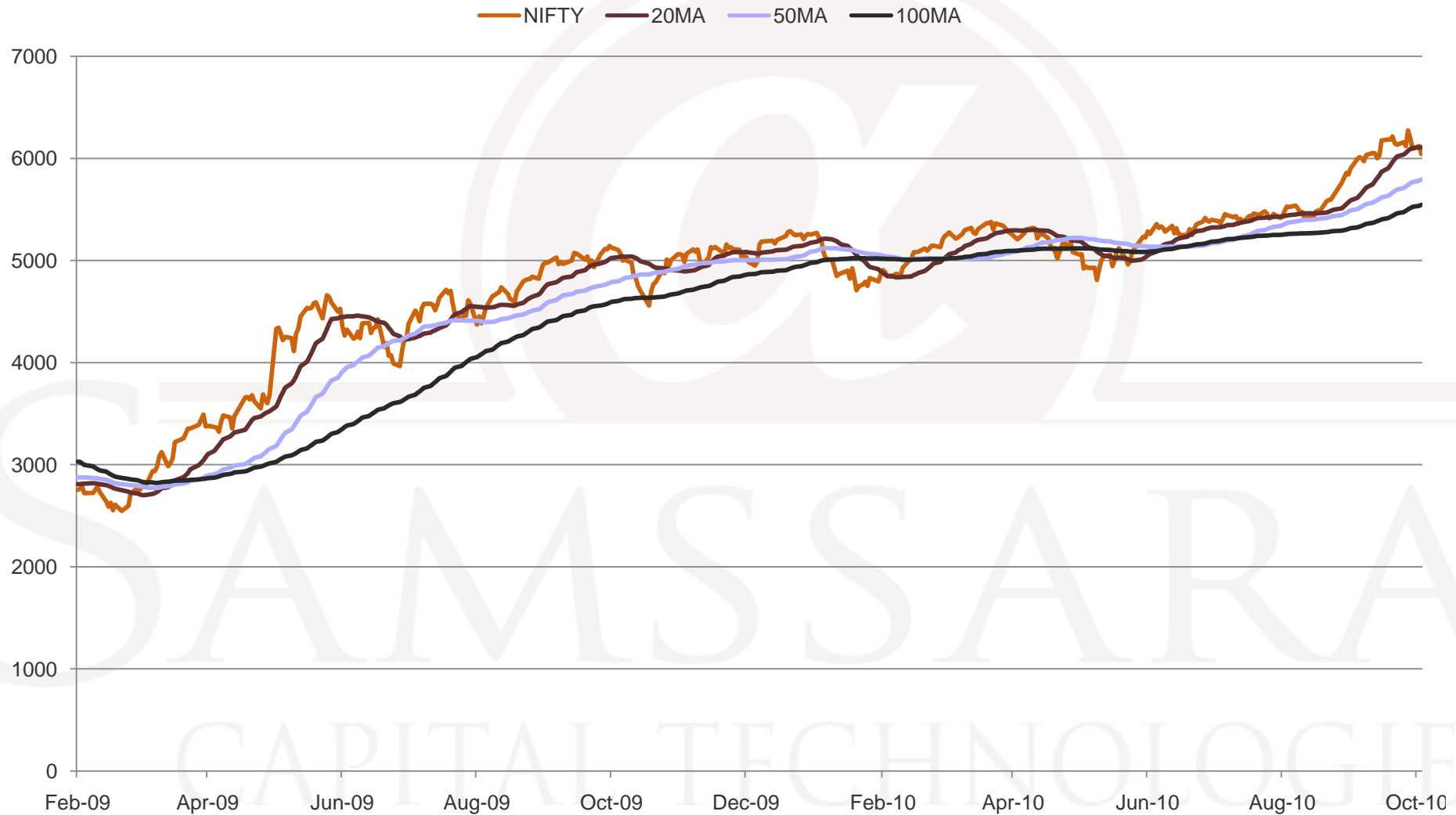
Increasing Mean



Increasing Variance



Designing profitable trend following system



Profiting from Bid/Ask and Order books in Currencies – USDINR

$$f(Bid, Ask) = \frac{VA_{eq}}{VB_{eq}}$$

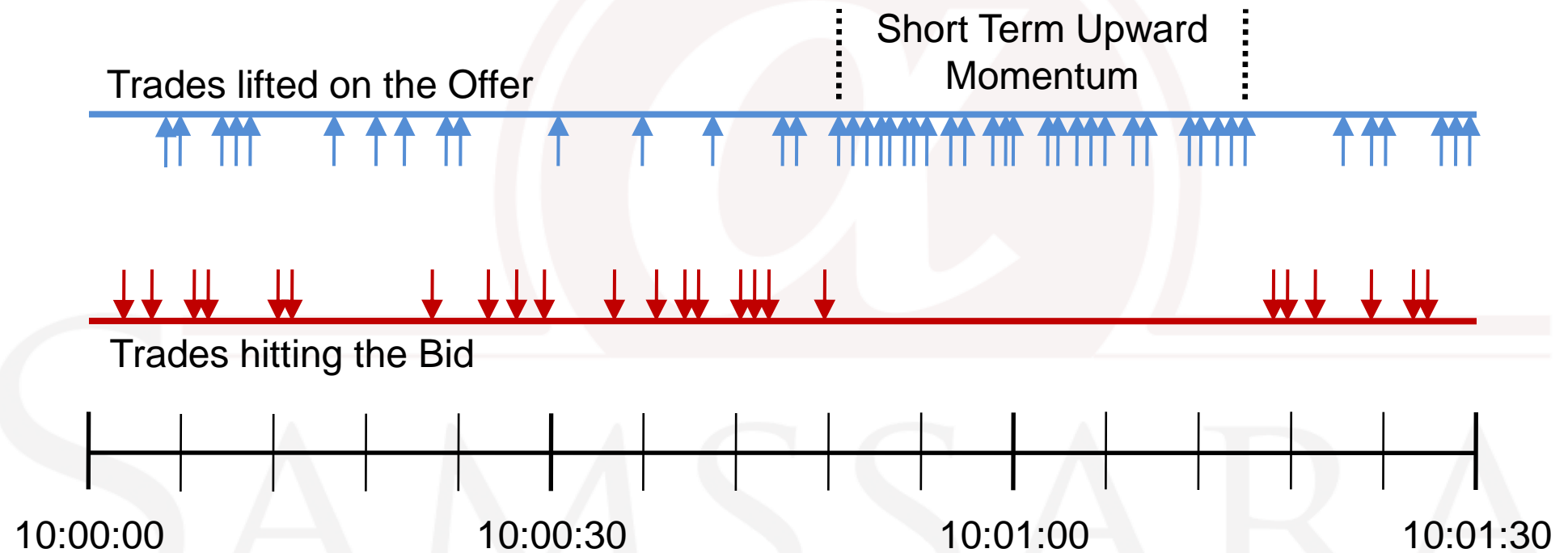
$$VB_{eq} = B_0 + (B_1)^{1/2} + (B_2)^{1/3} + (B_3)^{1/4} + (B_5)^{1/5}$$

$$VA_{eq} = A_0 + (A_1)^{1/2} + (A_2)^{1/3} + (A_3)^{1/4} + (A_5)^{1/5}$$

- Use the order book to identify whether bids are heavy or offers are heavy
- Analyze trades done on bid/offer to identify short term directional movement
- Give higher preference to best bid / ask and decay the significance down the order book
- Identify short term directional movement – to benefit from short term movements in the USDINR currency market

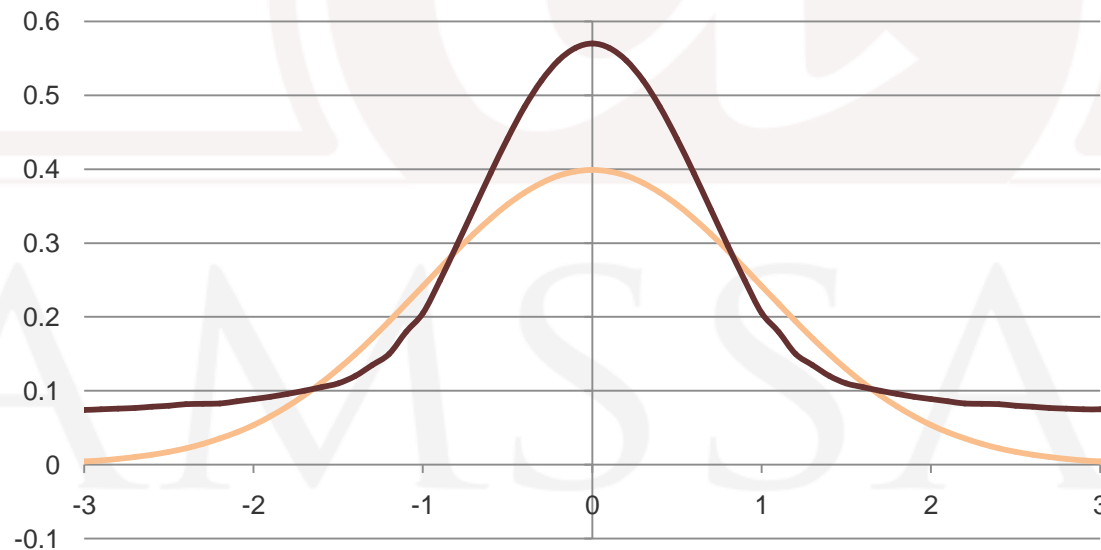
	55.5725	2
	55.5700	7
	55.5675	15
	55.5650	25
	55.5625	31
	55.5600	
42	55.5975	
20	55.5950	
15	55.5925	
11	55.5900	
6	55.5875	

High frequency example



What is Risk?

- Deviation from possible outcomes
- Fat-tails in the market
- Risks: Systematic and Non-systematic



Systematic Risks

- Systematic Risks
- We can foresee and prepare for these risks
- Market direction risk, net rupee exposure
- Sector risk
- Single stock risk (E.g.: Satyam)
- Slippage risk
- Execution risk (software crash, power failure etc.)

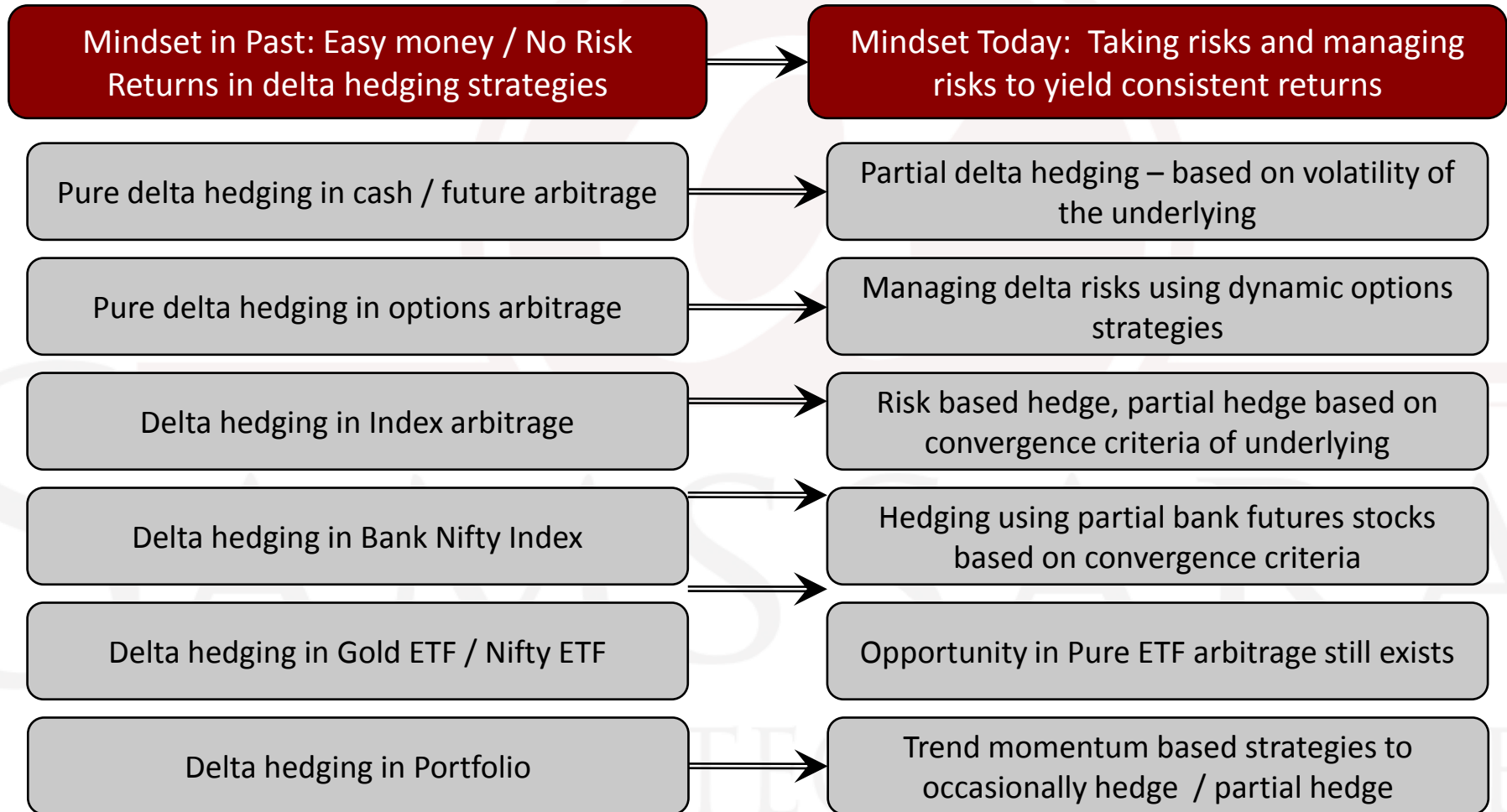
Systematic risk mitigation

- In design
 - Portfolio hedging and dynamic hedging
 - Market direction, net rupee risks / Market direction neutral
 - Single sector exposure risks ($< y\%$ of the portfolio)
 - Single stock exposure ($< x\%$ of the portfolio)
- During execution
 - Design to take order book (bid and ask) into account
 - Caps on daily turnover in the system
 - Caps on single trade max rupee value to be executed
 - Caps on number of trades in a day
 - System should handle power failure and software crash

The Delta Hedging – Evolution

Type of delta hedging in India

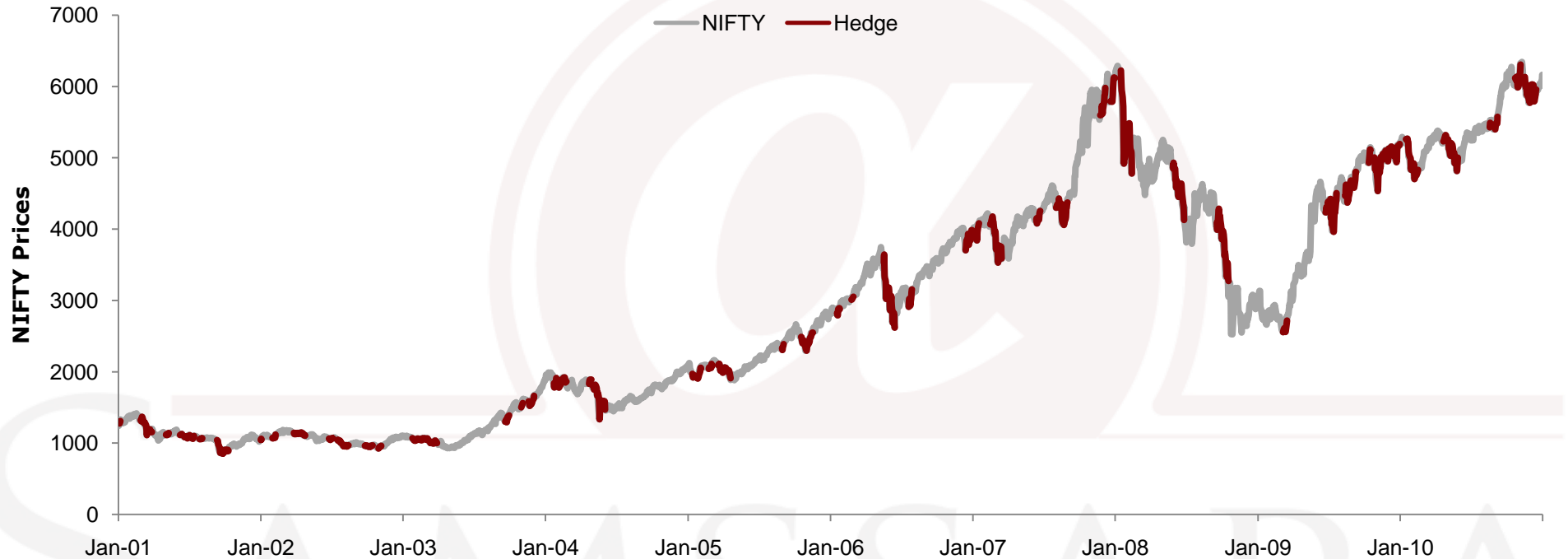
The way delta hedge is changing



Delta hedging in Bank Nifty Options

- Buying options => buying volatility and vice versa
- Options spread => Implied Volatility spread
- Determine the net delta
 - Long call / Short put: Long delta
 - Short call / Long put: Negative delta
- Bank Nifty Options: Long Call / Long Put (to take the IV spread) then the net delta has to be neutralized. Hence, $0.5 \times 10 - 0.4 \times 10 = 1$ delta. Hence short 1 futures contract.
- The delta hedge can be static / dynamic. For intra-day spread – static delta hedge is enough at times, as market does not move too much. But for carrying over of the positions – people like to do end of the day delta hedges to avoid overnight risks.
- Most profit in options spread strategy comes when market has wild swings and volatility spikes beyond reasonable limits. E.g.: October' 2008

Delta Hedging in Nifty Portfolios



- Delta - Net rupee exposure in the market – subjected to market direction risk
- Delta hedging is the most popular technique to protect wealth and manage risk
- Identify cycles in the market using trend momentum strategies
- Time period to be decided based on trading position: daily, weekly, monthly etc.
- Using of Nifty futures and options to hedge delta
- Hedging can be all 100% or partial: 50%, 25% etc.

Recommended referrals

Prop trading

- High-Frequency Trading: A Guide to Algorithmic Strategies and Trading Systems by Irene Aldridge
- Statistical Arbitrage: Algorithmic Trading Insights and Techniques by Andrew Pole
- The Encyclopedia of Trading Strategies by Jeffrey Owen and Donna McCormick

Agency trading

- Algorithmic Trading and DMA: An introduction to direct access trading strategies by Barry Johnson
- Quantitative Trading: How to Build Your Own Algorithmic Trading Business by Ernset P. Chan

Web forums

- Wilmott forum: www.wilmott.com
- Nuclear Phynance: www.nuclearphynance.com

About Samssara Capital Technologies LLP

COMPANY BACKGROUND

- Samssara Capital Technologies LLP (“Samssara”) is an investment solutions firm focused solely on developing automated algorithmic and quantitative trading and investment strategies
- It was launched in 2010 by a team of IIM Ahmedabad and IIT Bombay graduates - Rajesh Baheti, Manish Jalan and Kashyap Bhargava
- Samssara caters to its clients' needs of providing an alternative asset management vehicle, with the focus on 100% automated and quantitative trading strategies
- The team at Samssara works on mathematical models and statistics that identify repetitive patterns in equity, commodity and currency markets
- The addressable market for Samssara is global - as the firm can develop and build models which can function in both developing markets with limited competition and developed markets with strong competition
- Samssara’s client base includes the leading international and domestic banks, international and domestic stock brokers, family offices, corporate treasuries and HNIs

PRODUCTS OFFERED

- Samssara’s products vary from pair trading (statistical arbitrage), factor models, Nifty Index beating products to very high frequency trading strategies
- samCAP, a key product offered by Samssara, is a factor model, where the model identifies a basket of stocks in Nifty that tend to outperform the index and takes a long position in these stocks. Alongside, the product also hedges the investor’s portfolio using Nifty futures – whenever the market turns bearish
- Other products offered include samTREND - a trend following strategy in equities, commodities & currencies and samWILLS – a long-short strategy based on statistical arbitrage
- Samssara also develops in-house products which are used by investors like HNI’s, corporate treasuries, Prop houses of brokers and investors who wants an alternative vehicle for investment apart from equities and fixed income.
- The products are designed to generate consistent returns and ride the volatility of the markets with systematic approach
- Additionally, Samssara works on providing high end services and strategy development consultancy to hedge funds and International Banks globally

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