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**
- Cash to Cash Arbitrage / Badla
- Cash-Future Arb on NSE / Simple Badla
- Index Arb - Pure
- Pair Trading Technicals
- Tend Following – Technicals
- Fundamentals on Equity Research

**Future**
- Multi-Exchange / Multi Asset Co-located Arb
- NSE Co-located Cash Future Spread Arb
- Risk-based Index Arb
- Pair Trading on Statistical and Advanced Algos
- Pair Trading on Baskets
- Trend Following on Multi-Statistical Factors
- Factor Modelling
The building blocks

Define End Goal
Define Set of Rules

Collect Data  Back-test  Optimize  Simulate

Connect to OMS  Connect to Exchange  Manage Risk

Improve and Maintain
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

- Experience
- Logical and business sense
- Talking to traders and analysts
- Simple technical rules
- Simple observations in market

Experience

Logical and business sense

Talking to traders and analysts

Simple technical rules

Simple observations in market
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

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

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

- **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 goto 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 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
Designing profitable trend following system

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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

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High frequency example

Trades lifted on the Offer

Short Term Upward Momentum

Trades hitting the Bid

10:00:00  10:00:30  10:01:00  10:01:30
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

- Mindset in Past: Easy money / No Risk
- Pure delta hedging in cash / future arbitrage
- Pure delta hedging in options arbitrage
- Delta hedging in Index arbitrage
- Delta hedging in Bank Nifty Index
- Delta hedging in Gold ETF / Nifty ETF
- Delta hedging in Portfolio

The way delta hedge is changing

- Mindset Today: Taking risks and managing risks to yield consistent returns
- Partial delta hedging – based on volatility of the underlying
- Managing delta risks using dynamic options strategies
- Risk based hedge, partial hedge based on convergence criteria of underlying
- Hedging using partial bank futures stocks based on convergence criteria
- Opportunity in Pure ETF arbitrage still exists
- Trend momentum based strategies to occasionally hedge / partial hedge

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**
- 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 Ernest P. Chan

**Web forums**
- Wilmott forum: [www.wilmott.com](http://www.wilmott.com)
- Nuclear Phynance: [www.nuclearphynance.com](http://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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