Introduction

Algorithmic trading often involves the use of mathematical models to describe and predict market movements. These models are then implemented on computer systems for automatic execution. The job of an algorithmic trader is to first develop a market intuition or idea of how prices should evolve. Using mathematics, the trader then turns the idea into a quantitative model for analysis, back testing and refinement. When this quantitative model proves likely to be profitable after rigorous statistical testing, the trader implements the strategy on computer systems for execution.

This is a 2-day intensive course designed to provide participants with a good understanding of the core concepts and quantitative techniques used in the backtesting and optimization of a trading strategy with particular emphasis on momentum strategies such as arbitrage between futures and ETFs, statistical tests for momentum, long-short futures portfolios, calendar spreads, momentum crashes, event driven strategies, and high frequency momentum strategies. Stocks, ETFs, and futures are covered. Participants will use MATLAB software to solve backtesting problems using real market data.

Outcome

At the end of the course, participants are expected to develop:

- an understanding of the core concepts in quantitative trading and specifically momentum strategies
- a deep appreciation of the process of using mathematics and statistics to analyze the profitability of a trading model
- “hands on” experience of how backtesting is done
- an understanding of pair trading in stocks, ETFs and futures

Highly Recommended for

- Traders wishing to apply their mathematical and statistical strengths in the trading arena
- Algorithmic traders seeking a deeper appreciation of the role of quantitative traders
- Regulators, risk managers and auditors who need a good understanding of the nature of quantitative analysis
- Anyone who aspires to become a quantitative trader

Preferred Background

- Some experience in trading is preferred but not essential
- Some basic statistics background
- Some programming experience in any language is preferred

Contents

Topic 1: Overview of causes of momentum

a) Persistence of futures roll returns
b) Slow diffusion of news
c) Forced sales and purchases by index/mutual/hedge/exchange-traded funds
d) High Frequency Trading: market manipulation and “momentum ignition”

Topic 2: Tutorial to MATLAB

a) Quick survey of syntax
   - Arithmetics
b) Exercises: building some utilities useful for trading.

c) The pros and cons of using MATLAB as a backtesting platform vis-à-vis R and Python.

**Topic 3: Roll returns as driver of momentum in futures**

a) Practical importance of half-life
   - Definition, intuition, and illustration
   - Exercise: Estimating spot and roll returns of commodity futures using a simple linear model
   - Forward curves

b) Time-series vs cross-sectional momentum
   - Definition and arbitrage opportunities

c) Arbitrage between future and spot returns
   - Extraction of roll returns: why is it easier than extraction of spot returns?
   - Exercise: An arbitrage between a commodity future and an ETF
   - Other arbitrage examples between futures and ETFs
   - The case of VX-ES: a study in arbitrage and regime change!
   - Exercise: Computing roll returns of VX – a nonlinear model

d) Statistical tests for time-series (TS) momentum
   - Exercise: Use correlation function to determine TS momentum in fixed income futures
   - Exercise: Backtesting a TS momentum strategy for fixed income futures
   - Test for statistical significance of TS momentum
   - Hurst exponent and Variance Ratio Test for TS momentum

e) Example futures time-series momentum strategy
   - Indicators for TS momentum
   - Exercise: The benefit of combining momentum and mean-reversal indicators

f) Example futures cross-sectional (CS) momentum strategy
   - Long-short futures portfolio
   - Do calendar spreads have momentum?

g) Example stock cross-sectional momentum strategy
   - Long-short stocks portfolio
   - Indicators for CS momentum
   - A nod to factor analysis with “momentum factors”
   - News sentiment

h) The phenomenon of “Momentum Crashes”
   - Why do momentum strategies perform poorly after financial crises?
   - The S&P DTI index and ETFs/mutual funds replicating momentum strategies

**Topic 4: Event-driven momentum**

a) PEAD strategy
   - Earnings announcements as a momentum igniter
   - The shortening of momentum horizon

b) Other momentum-inducing events
   - Research from Ravenpack on corporate events
   - Macro-economic events
   - General news sentiment scores as momentum factor: natural language processing as applied to finance

**Topic 5: Forced sales and purchases due to funds**

a) Hedge funds: the dual roles of leverage and contagion

b) Mutual funds: the dual roles of contagion and retail sentiment
   - Example strategy using Pressure indicator: relating fund flows to stock prices

c) Index funds: index rebalancing generates momentum

d) Levered ETFs: keeping leverage constant generates momentum
   - Exercise: how much rebalancing is needed for a 2% index move?
   - Example strategy
Topic 6: High frequency momentum strategies

a) Ratio trade: as applied to futures markets with pro-rata fills
b) Ticking: gaming the order book
c) Flipping: momentum ignition
d) Stop hunting
e) Order flow: a predictor of short term returns

Topic 7: Exit Strategies

a) The 4 strategies suitable for exiting momentum position

Topic 8: Long-short portfolio

a) Risk management
b) Diversification
c) Kurtosis benefits momentum strategy
   - Exercise: Using Monte Carlo simulation to demonstrate kurtosis-induced returns
d) Momentum crashes revisited
e) Why holding period is an inconvenience

Instructor

Dr. Ernest P. CHAN
Adjunct Associate Professor, Nanyang Technological University

Dr. Ernest P. Chan is the Managing Member of QTS Capital Management, LLC. His career since 1994 has been focusing on the development of statistical models and advanced computer algorithms to find patterns and trends in large quantities of data. He has applied his expertise in statistical pattern recognition to projects ranging from textual retrieval at IBM Research, mining customer relationship data at Morgan Stanley, and statistical arbitrage trading strategy research at Credit Suisse First Boston, Mapleridge Capital Management, Millennium Partners, MANE Fund Management, EXP Capital Management.

While at the Human Language Technologies group at IBM T. J. Watson Research Center (Yorktown Heights, NY), Dr. Chan spearheaded IBM's research effort to develop a system for searching large text databases such as the World Wide Web, catapulting IBM's reputation as a top player in the field. His system was placed seventh among some forty competitors in a competition sponsored by the National Institute of Science and Technology and the Department of Defense in 1996. At the Data Mining group in Morgan Stanley's headquarters in New York, Ernie pioneered the application of some of these sophisticated statistical algorithms to the complex task of extracting customer relationships in the Morgan Stanley customer accounts database.

Ernie was invited to join a proprietary trading group at Credit Suisse First Boston in New York in 1998 to develop statistical models for futures trading, stock pair-trading as well as trading based on earnings revisions, surprises and analyst recommendation changes. He joined Mapleridge Capital Management Corp. in 2002 as a Senior Quantitative Analyst working on futures trading strategies, and then Maple Securities/MEANE Fund Management Inc. in 2003 as a senior researcher and trader. He was a co-founder and principal of EXP Capital Management, LLC, a Chicago-based fund management company. He is currently the principal of QTS Capital Management, LLC, which manages a hedge fund as well as separate client accounts.

Ernie has consulted for money management companies and independent traders. He has served as an expert witness in a matter related to algorithmic trading. He writes the Quantitative Trading blog which is syndicated to www.tradingmarkets.com and Yahoo Finance, and has published in the Automated Trader magazine. He was quoted by the New York Times, Forbes, and the CIO magazines, and interviewed on CNBC's Closing Bell program, Technical Analysis of Stocks and Commodities magazine, Securities Industry News, Automated Trader magazine, and the CFA Institute Magazine on topics related to quantitative trading. In recognition of his expertise in statistical data mining, he was invited to serve on the Program Committees of the International Conference of Knowledge Discovery and Data Mining in 1998 and also of the SPIE Conference on Data Mining and Knowledge Discovery in 1999. He was an invited panelist on Effective Arbitrage Strategies at the ETF Evolution 2007 Summit, an invited speaker at the Automated Trading conference in London, UK, in October 2009, the Market Technicians Association Toronto Annual Conference in 2010, and the Quant Invest Canada conference in 2012. He is the author of "Quantitative Trading: How to Build Your Own Algorithmic Trading Business", and "Algorithmic Trading: Winning Strategies and Their Rationale", both published by John Wiley & Sons. Ernie conducts workshops on Statistical Arbitrage, Quantitative Momentum Strategies, and Millisecond Frequency Trading in London. He is an Adjunct Associate Professor of Finance at Nanyang Technological University in Singapore, and an Industry Fellow of the NTU-SGX Centre for Financial Education, which is jointly set up by NTU and the Singapore Exchange. He also teaches a graduate course on Risk Analytics at Northwestern University in Chicago.

Ernie holds a Bachelor of Science degree from University of Toronto in 1988, a Master of Science (1991) and a Doctor of Philosophy (1994) degree in theoretical physics from Cornell University.
Venue and Time

Nanyang Technological University
NTU-SGX Financial Trading Lab
Block S4, Level B1, Section B, Unit 14/16, Nanyang Avenue, Singapore 639798

Time
20 and 21 September 2014 09 00 hrs - 17 00 hrs

Programme Fee

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<th>Non-SGX Member</th>
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<tr>
<td>Standard Fee</td>
<td>$2,988.00</td>
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<td>Early Bird (Register by 7 Aug 2014)</td>
<td>10% $2,689.20</td>
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<td>Group Discount for 3 or more pax*</td>
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<td>15% $2,285.82</td>
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*Only one discount applies
# NTU Alumni discount is only applicable for Non-SGX member’s programme fee
Note: Fee excludes GST & before funding support from FTS Grants

Mode of Payment
1) Cheque
2) Bank Wire Transfer

Payment will be advised once the online application is received.

Cancellation Fee
1. 100% refund of the program fee if notification is received more than 60 days from the start of the program, minus administrative fee of SGD$250.00nett.
2. 50% refund of the program fee if notification is received between 45-60 days from the start of the program
3. 25% refund of the program fee if notification if received between 15-44 days from the start of the program.
4. No refund if notification is received less than 15 days from the start of the program. In this regard, we would recommend you to either defer or find a replacement.

For Enquiries:
Please contact Ms Denise @ 6592 1791 or email nsce@ntu.edu.sg

Register Now!