

ALGORITHMIC TRADING COURSE MODULE 2 BACKTESTING & QUANTITATIVE TRADING

- ❖ *2.5-day workshop*
- ❖ *Learn how to carry out rigorous quantitative analysis of a trading strategy*
- ❖ *Receive a complimentary copy of Dr Ernest Chan's "Quantitative Trading: How to Build Your Own Algorithmic Trading Business"*

- ❖ **Class size is capped**
- ❖ **50% funding from Financial Training Scheme grants (based on MAS qualifying criteria)**
- ❖ **SGX Trading Representatives who complete this course are eligible for one Continuing Education Programme (CEP) credit**

Technology Partners



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 2.5-day intensive course is designed to provide participants with a good understanding of the core concepts and quantitative techniques used in the backtesting and optimization of trading strategies with particular emphasis on pair trading and related strategies. Participants will use MATLAB software to solve backtesting problems using real market data. Participants with no or limited knowledge in MATLAB programming should attend our optional 0.5-day workshop on MATLAB programming. The workshop will provide an overview of MATLAB syntax and a review of the key functions required in the backtesting course; in addition, a few user-defined functions will also be developed.

Outcome

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

- an understanding of the core concepts in quantitative trading
- 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, futures and currencies

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

- MATLAB programming experience is required (Participants with no background in MATLAB should register for the MATLAB workshop).
- Some experience in trading is preferred but not essential
- Some basic statistics background

Contents

MATLAB Workshop (optional)

- Quick survey of MATLAB arrays & subarrays
 - Arithmetic operations
 - Functions
 - Data import
 - Graphs
- Useful user-defined functions
 - Backshift
 - MovingAvg

Topic 1: Introduction to backtesting

- What is backtesting?
- The importance of backtesting
- The limitations of backtesting: a survey of common pitfalls
- How to decide whether to backtest a strategy: a series of examples
- Criteria for choosing a backtesting platform: pros and cons of various platforms

Topic 2: The use of MATLAB in trading

- Why is MATLAB superior to Excel/VBA/Java/C++/C# for portfolio trading research?
- Overview of capabilities as research and backtesting platform
- The pros and cons of using MATLAB as automated trading platform

Topic 3: Nuts and bolts of backtesting

- Backtesting a single instrument
- Performance measurement: common metrics
- Transaction costs: discussion of various sources of transactions costs
- Choosing a historical database: important pitfalls to avoid
- Reuters presentation on their databases
- Backtesting a portfolio
- Strategy refinement
- Ways to avoid look-ahead and data snooping biases
- Why is live trading performance usually worse than backtest performance?

Topic 4: Kelly formula

- Risk management using Kelly
- Capital allocation using Kelly

Topic 5: Theoretical foundation of pair trading

- Concept of stationarity, and why it is useful
- Concept of cointegration, and why is it useful
- How is cointegration different from correlation?
- How are stationarity and cointegration different from mean-reversion?
- Test for mean-reversion: computing half-life based on Ornstein-Uhlenbeck formula
- Why is computing half-life better than computing average holding period?

Topic 6: Trading applications of stationarity

- Statistical test for stationarity: ADF

Topic 7: Cointegration and pair trading

- Statistical tests for cointegration: CADF and Johansen
- Finding the best hedge ratio
- Backtest vs. cointegration
- Past \neq Future
- Parameterless pair trading
- Stop loss?
- Trading cointegrated triplets
- What are the best markets to pair-trade? Pros and cons of each market
- Automated pair trading

Topic 8: Related strategies

- Index arbitrage: Trading an index against a basket of its component stocks
- Statistical arbitrage
- Momentum vs. mean-reversal
- Momentum pair trading: examples
- Other stock mean-reversion trades

Topic 9: Reuters presentation on Quantitative Research & Trading workflow