QF206
Quantitative Trading Strategies

What this course is about
About the Instructor

Christopher Ting
Bachelor: Mechanical engineering
Master: Physics
Ph D: Theoretical physics
Research scientist in DSO
- Laboratory heads
  - Computer Systems
  - Applied Physics
Area coordinator for QF
Founding director of Joint Masters of Science in QF program

University of Tokyo
National University of Singapore
DSO National Laboratories
Singapore Management University
Promised Land (Simex Traders)

3-D molecular biology
Topological quantum field theory
Neural network
Natural language processing
Chaos theory
Computer security
Quantitative Finance
Quantitative Trading Strategies
Consultation by Appointment

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Assessment

Class Activity: 10%
- Attendance
- Contribution to class discussion and activity

Assignments: 20%
- A1: Design 5 MCQs (10%)
- A2: Data analysis using Excel and Python (10%)

Project Presentation 20%

Final Exam: 50%
- 2-hour short questions and MCQ
- Closed book, no cheat sheets
Learning Outcomes

- Distinguish and differentiate between trading and investment
- Identify and elaborate the IT infrastructure and processes needed for a trade to occur
- Compare different types of trading: quantitative, low-latency, high-frequency, algorithmic, and program trading
- Compute the stock index value from the component stocks and the fair value of the index futures
- Apply the knowledge acquired in computing the fair values to construct spread-trading strategies
- Analyze buying and selling pressures in the limit-order book using tick-by-tick data
- Use different orders to trade futures
- Evaluate different quantitative trading strategy by applying the relevant performance measures and statistics in a scientific manner
- Explain different statistical arbitrage strategies and
- Develop the mental strength of a professional trader in managing risks and profits
- Define and explain Kelly’s criterion
- Explain why and how trading on one’s own account (proprietary trading) is a business venture
## Class Schedule (subject to $\Delta$)

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to Quantitative Trading</td>
</tr>
<tr>
<td>2</td>
<td>Electronic Market: Limit-Order Book, <strong>Hands-on</strong></td>
</tr>
<tr>
<td>3</td>
<td>Trading CME, Eurex, and SGX Futures, <strong>Hands-on</strong></td>
</tr>
<tr>
<td>4</td>
<td>Technical Analysis: Language Spoken by Traders, <strong>Hands-on</strong></td>
</tr>
<tr>
<td>5</td>
<td>Advanced Quantitative/Technical Indicators, <strong>Hands-on</strong></td>
</tr>
<tr>
<td>6</td>
<td>Spread-Trading, <strong>Hands-on</strong></td>
</tr>
<tr>
<td>7</td>
<td>HFT, <strong>Hands-on</strong></td>
</tr>
<tr>
<td>8</td>
<td>Recess</td>
</tr>
<tr>
<td>9</td>
<td>Back Testing, <strong>Hands-on</strong></td>
</tr>
<tr>
<td>10</td>
<td>Tick-by-Tick Data Analysis, <strong>Hands-on</strong></td>
</tr>
<tr>
<td>11</td>
<td>Statistical Arbitrage, <strong>Hands-on</strong></td>
</tr>
<tr>
<td>12</td>
<td>Prop Trading as a Business: Risk Management</td>
</tr>
<tr>
<td>13</td>
<td>Project Presentations</td>
</tr>
</tbody>
</table>
Intro to Quantitative Trading

An overview of tradable financial instruments

- Four major asset classes: equities, currencies, commodities, and fixed income
- Cash markets versus derivative markets
- Exchange versus OTC
- Financial instruments with maturities versus those without maturities
- Linear payoff versus nonlinear payoff

Trading versus investment

- Holding period or investment horizon
- Portfolio rebalancing
- Hedging versus scalping
- Market making
Electronic Market: Limit-Order Book

- Price grid, tick size
- Market order versus limit orders versus stop order
- Dynamics of the limit-order book
- Liquidity
  - Bid-ask spread
  - Market depth
- Hands-on session at Simulated Trading Room

TRADING TECHNOLOGIES

TT CAMPUSCONNECT™
Software Used by Professional Traders

Thanks to the industry experience and connections, we have signed MoUs with CME, Eurex, and SGX.

Live feed market data from these exchanges!
Trading Futures

- Calculation of cash index value from the component stocks
  - Free float
  - Divisor
- Calculation of the fair value of SIMSCI index futures
- Market behaviors of SIMSCI index futures
- Calculation of the fair value of calendar spread
- A simple trading strategy using stop-limit orders
Technical/Quantitative Analysis

- Finding patterns in prices and volumes

- Is forecasting possible at all?
  - Most academics: No
  - Most practitioners: Yes

- Common technical analysis patterns, indicators, and cycles

- How to predict volatility using GARCH?
Spread Trading

- Calendar spread trading
- Inter-market spread trading
- Quanto spread trading
- Mis-hedges and risk management

High-Frequency Trading

- An overview of automated trading
  - Market making
  - Algorithmic trading
- State-of-the-art HFT infrastructure
  

- Dark pool
Common backtesting methods

Finding and using historical databases
- Adjustments for stock splits and dividends
- Survivorship bias
- High and low of the day

Performance measurement

Common backtesting pitfalls to avoid
- Look-ahead bias
- Data-snooping bias

Transaction costs
Tick-by-Tick Data Analysis

- Trade and Quote (TAQ) data
- Intraday trading patterns
- Short-term intraday momentum
- Order flows
- Price impact

https://www.algoseek.com/equities/
Statistical Arbitrage

- Non-stationary versus Stationary time series
- Co-integration
- Correlation
- Dispersion


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Proprietary Trading as a Business

- Proprietary trading as a business
- Margin
- Money & risk management
- Kelly’s criterion

Trading continues to be a humbling yet bountiful provider – if one can find the right frequency to resonate with her. The mysteries of the market are always daunting, but solvable. With experience, one realizes that the “enemy” we fought daily was really our own doubt and inertia.

– JOHN H. LIN, CHIEF & FOUNDER
Trading

Systematic

Discretionary

Investment

Statistical Arbitrage

Trading Strategies

Momentum

Mean Reversion

Money/Risk Management

Backtesting
Mean Reversion

Calendar Spread

Quanto Spread

Inter-Market Spread

Momentum

Trend, cycle

Technical Analysis

Forecasting

Market Neutral

Market Directional
Algorithmic Trading

- Ultra-high frequency
- High-frequency
- Systematic Scalping

Tick-by-Tick Data

Order Submission Strategies

Price Impact → Slippage

Market Microstructure
Trading is Hard
Trading is Personality
Trading is Discipline
Trading is Business