Algorithmic Trading 101

FORDHAM
FINTECH NETWORK

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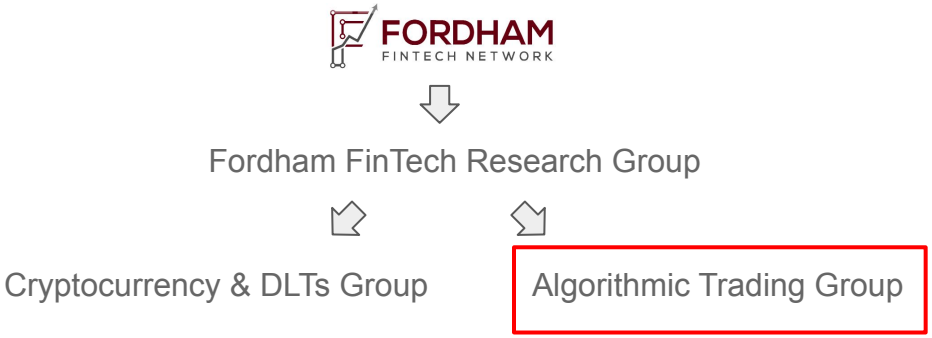
Presentation Breakdown

1. Structure and Overview of the Algorithmic Trading Group
2. High-Level Information
3. Algorithmic Trading Strategies
4. Backtesting
5. Modern Innovations in Algorithmic Trading

1 Structure & Overview of Algorithmic Trading Group

Structure of the Fordham FinTech Research Group



You will be working in a group on a semester long Project:

- Industry Overview (Non-Technical/General; At least 1 slide)
- Low-level Overview (Technical, No slide restriction; Expected 3+)
- Meaningful Work (This is subjective; Can this help you, other people, is this uncommon information?)

Requirements:

- Attend mandatory bi-weekly meetings (must have a valid excuse if you miss).

What to Expect to Learn in Algorithmic Trading Group

- Learn about derivative instruments (mostly options) .
- Learn how to Backtest different potential strategies and instruments.
    - Ex: Backtesting option trading strategies, different equity strategies, etc.
- Learn about different trading strategies.
- Learn how to make a simple algorithm using python & utilizing quant. platforms.

2 High-Level Overview of Algorithmic Trading

What is an Algorithm?

- **An algorithm** is “a process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer.”

Ex: Sorting people by height.

Step 1...2....3...4...5..., etc.

What is Algorithmic Trading

- Algorithmic Trading uses a computer program that follows a defined set of instructions (an algorithm) to place a trade. The trade, in theory, can generate profits at a speed and frequency that is impossible for a human trader.

- Can be any time horizon (ms, seconds, intraday, months, etc.)

Why Use Algorithms?

- Accuracy
- Speed
- Liquidity provision
- Cost efficiency (imagine you had to feed, clothe, and house a computer!)
- Ability to make predictions based on large amounts of data
- Preventing large price swings (VWAP execution, etc)
- Reduced possibility of mistakes by human traders based on emotional and psychological factors.

The Four Markets

- First market: issuer transactions (IPOs and bond offerings)
- Second market: NYSE
- Third market: OTC
- Fourth market: Dark pools

Two Schools of Thought: Technical & Fundamental Analysis

- Technical Analysis: Using patterns in market data to identify trends and make predictions.

- Fundamental Analysis: Evaluating the intrinsic value of a company.

What is Technical Analysis

- Use past price data in order to predict future share price
- Technical indicators
  - Exponential Moving Average
  - Bollinger Bands
  - Moving Average Convergence/Divergence
  - And many more…

Fundamental Analysis

- **Fundamental Analysis:** Evaluating the Intrinsic Value of a company.

- **“Margin of Safety”** - The difference between the intrinsic value (what you perceive the value of the company to be) and the market value (what it’s currently trading at).

- **Financial Ratios:** Price/Earnings, Price/Book (Heavier asset companies), Price/Equity, Debt/Equity, EV/EBITDA (Adjusted as well), Free Cash Flow, Return On Assets, Return on Equity.
    - Trading off ratios & Information

- **General Models:** Discounted Cash Flow Model, Comparable Company Analysis, Liquidation Model.

Fundamental Analysis: Financial Models

General Models:

- **Discounted Cash Flow Model**
  - Project future cash flows of a company and discounting it to present value.
    - Perpetuity Growth Method or Multiples Method (EBITDA is most commonly used, as it's a proxy for CF).
- **Comparable Company Analysis**
  - Compare metrics between a company and its competitors (that are similar).
- **Liquidity Analysis (Not a model, but nice to know)**
  - See if a company is able to meet its short term obligations (Check letters of credit, revolving lines of credit, financial covenants, debt schedule analysis, Cash Cycles, etc.)
- **Liquidation Model**
  - If a company sold all its assets, what would it be worth? (Generally in an event that mandates liquidation such as bankruptcy)

3 Algorithmic Trading Strategies

Algorithmic Strategies

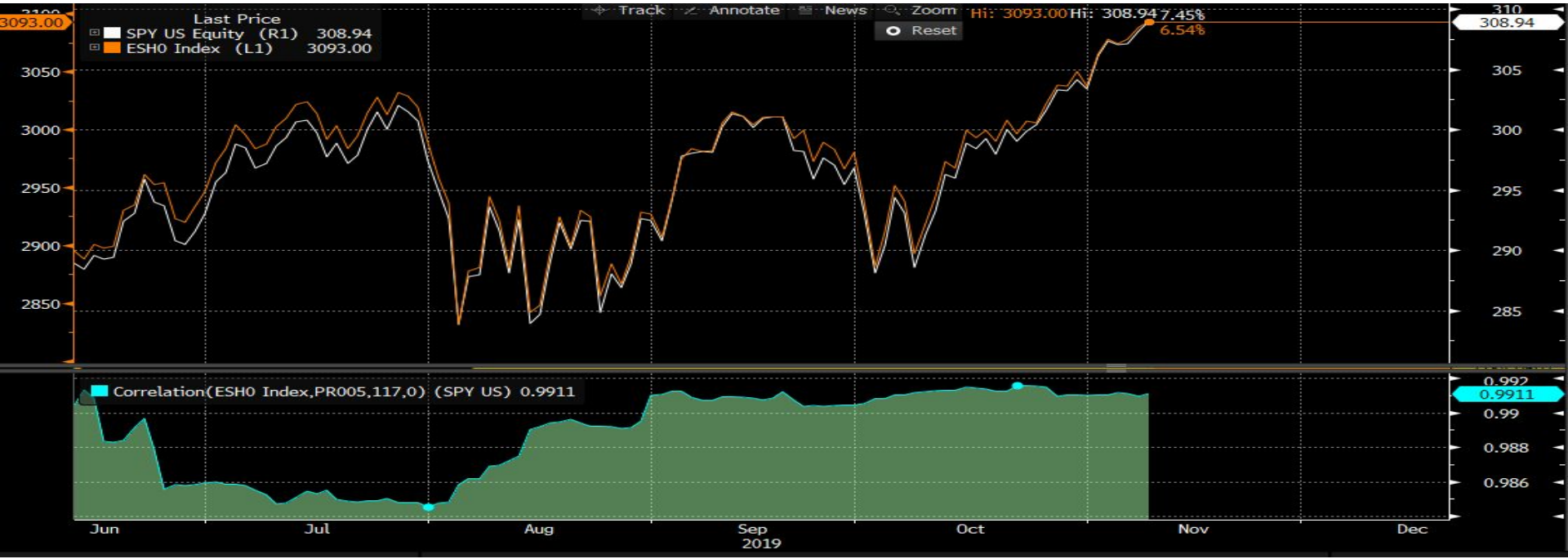
- Market making
- Statistical arbitrage
- Inter-market arbitrage
- Hedging
- Speculation

Market Making

- Making money by creating liquidity in the market
- Buying and selling frequently from your own inventory, earning the *bid/ask spread* (difference between the best buy and best sell price)
- Why use an algorithm?
  - Decreased bid/ask spread
  - Ability for a single broker to offer more products with less overhead

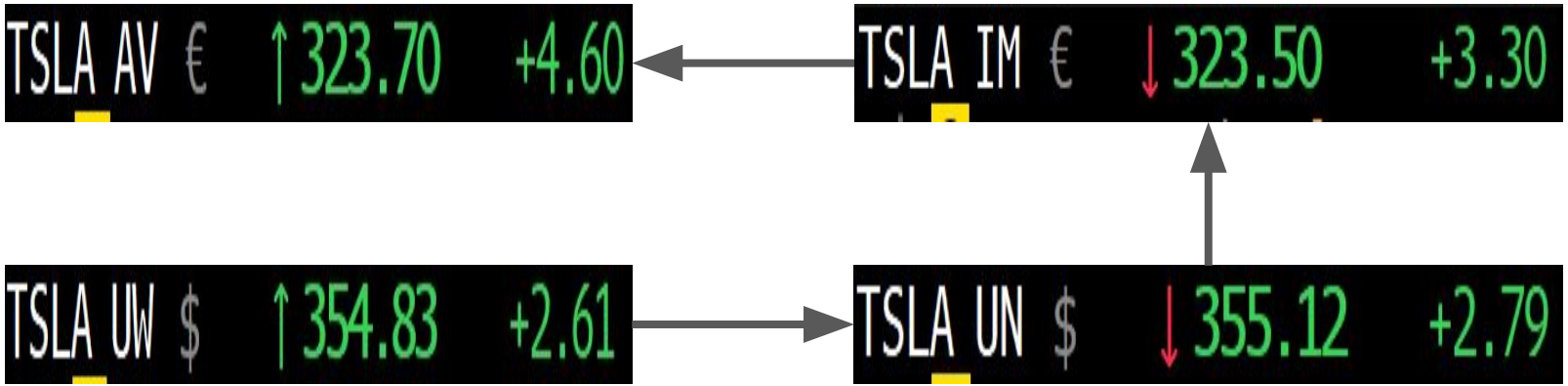
Statistical Arbitrage

- Trading nearly instantaneous differences on very highly correlated products ($r \rightarrow 1.0$)



Intermarket Arbitrage

- Identifying differences in price for the same stock across different exchanges
- Example: TSLA on multiple exchanges



Hedging

- Reducing risk to a certain level by betting against what you bet on
- Common example: buying stock against selling call (bullish) options
- Why use an algorithm?
  - Specific risk level
  - Constant monitoring (especially important for constantly decaying and volatile instruments like options)

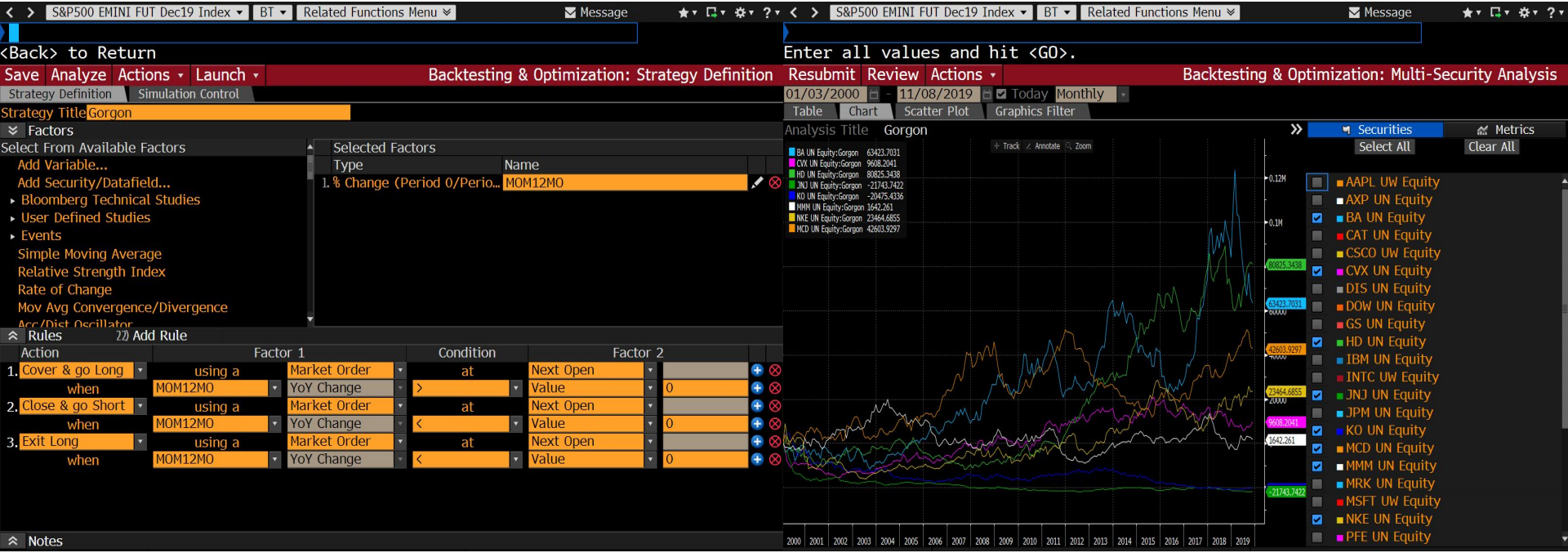
Speculating with Algorithmic Trading

- Speculation: profiting from market fluctuation
- Arbitrage: finding a pricing asymmetry and acting upon it
- What you all probably hear about all the time
- Using algorithms to predict changes in price
- Algorithmic calculation of fundamental or technical indicators
- Example

4 Backtesting

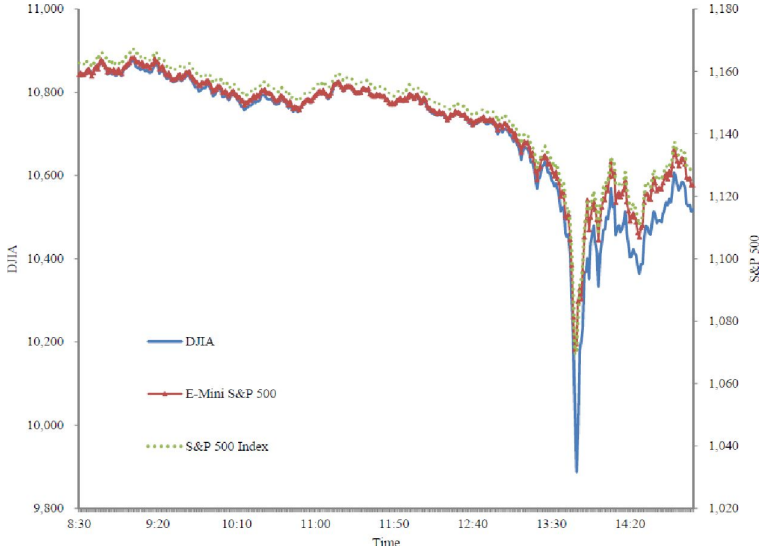
Backtesting on Bloomberg

- Limited function, there's only so much you can quickly test
- Over to BBT for a quick demonstration



The Downfalls of Algo-Trading

- Technological arms race
- “Race to the bottom”
- Spoofing
- Quote stuffing
- Front-running
- May 2010 Flash Crash



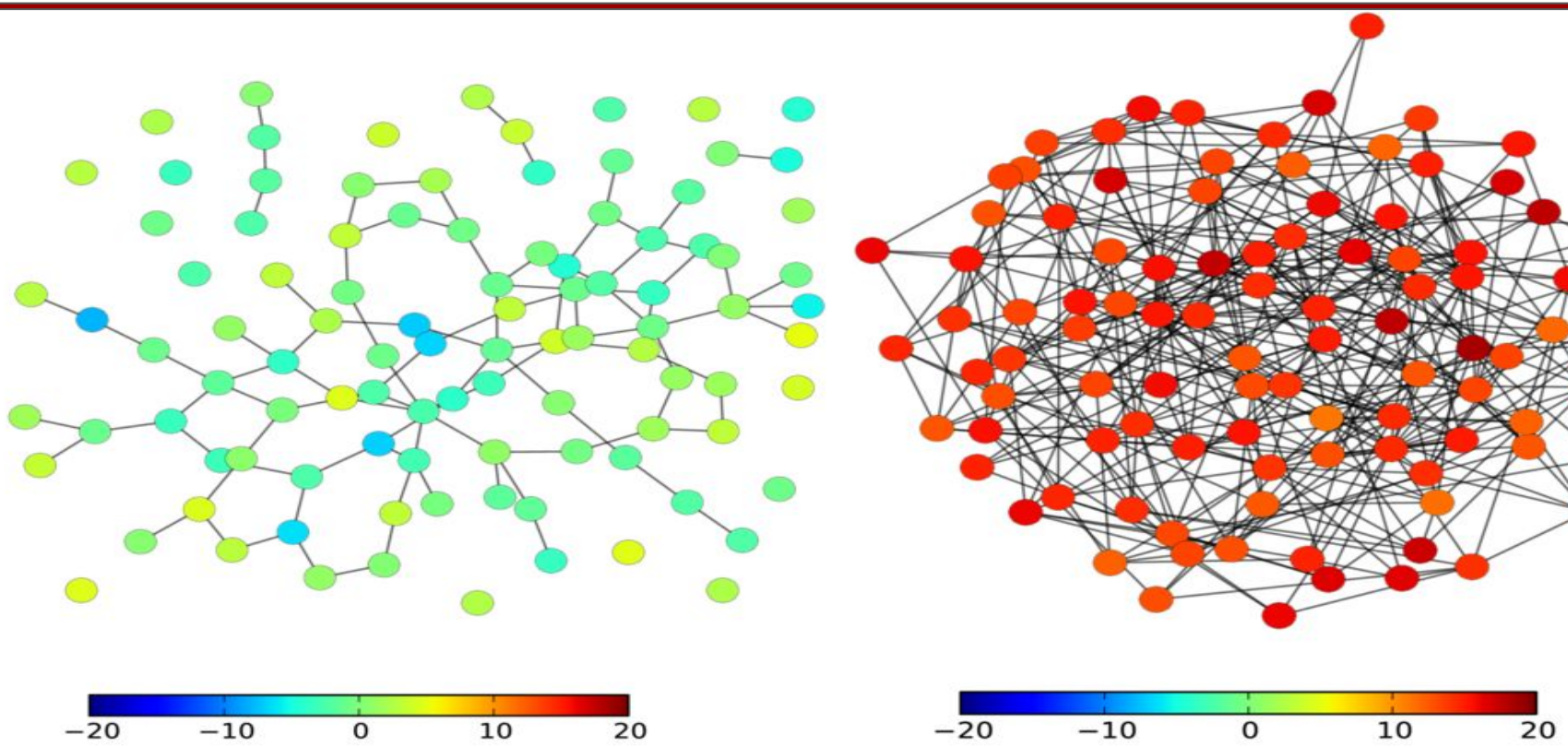


Figure 4: Network snapshots before (left) and during (right) the simulated flash crash. The nodes represent the HFT agents and the color range represents the inventory size.

5 Modern Innovations in Algorithmic Trading

Modern Innovations in Algorithmic Trading

- AI & Machine Learning
- Natural Language Processing
- Ex: Drone usage in Oil Tanks, automated trading

Questions?