

COMP226: Slides 05

Equities and futures markets

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Overview

- Definition of **automated trading**
- Overview of **financial markets**
- **Equities markets**, including corporate actions
- **Futures markets**
- **Trading mechanisms** (e.g., brokers, dealers, exchanges: limit order books, dark pools)

Automated trading

Definition

Automated/algorithmic trading: trading decisions are made by computer programs (as opposed to humans)

Our focus on equities and futures markets is due to the prevalence of automated trading in those markets

Financial markets

A simple breakdown is:

- **Capital markets** (equities and fixed income)
- **Foreign exchange markets**
- **Money markets**
- **Derivative markets** (e.g. futures and options)

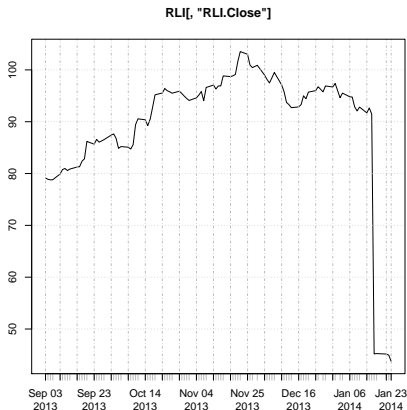
Broadly speaking:

- For **equities** and **futures** trading, **exchanges** have been prominent (**our focus**)
- For **other securities**, **over the counter (OTC)** trading had predominated, but this is changing

Equity markets

- Shares allow firms to finance themselves via public ownership
- A share represents a portion of firm's inherent value or equity
- The number of shares at a given time is known. But
 - Firms may **issue** or **buy back** shares, or
 - make periodic **dividend payments** to shareholders
- These **corporate actions** are **important** when valuing equities and **evaluating trading strategies**
- These actions are represented via **adjusted prices** for equities (available, e.g., from Yahoo)

Example: RLI Corp



The big drop was **not** bad news, but a **2-for-1 stock split**

Stock split example

RLI Corp. did a **2-for-1 stock split** on **2014-01-16**:

```
> source('stock_split.R', echo=TRUE)
> library(quantmod)
> getSymbols("RLI", from="2014-01-14", to="2014-01-20")
[1] "RLI"
```

```
> print(RLI[,c("RLI.Close", "RLI.Adjusted")])
```

	RLI.Close	RLI.Adjusted
2014-01-14	92.65	46.33
2014-01-15	91.50	45.75
2014-01-16	45.20	45.20
2014-01-17	45.26	45.26

Adjustment formulas

Cash dividends: dividend value deducted from close price

E.g. assume close price is \$25 pre-adjustment and a \$2.50 dividend is paid on every share. The adjusted close price would be \$22.50 ($\$25 - \2.50).

Stock dividends/stock splits: close price divided by factor by which number of shares has increased

E.g. **stock dividend** of 2 shares for every share owned gives a multiplicative adjustment of $1/(2+1)$. So a pre-adjustment price of \$25 becomes \$8.33 (rounding required).

E.g. a 2:1 **stock split** gives a multiplicative adjustment factor of $1/2$. So a pre-adjustment price of \$25 would become \$12.50.

These are simplest and most common corporate actions. There can be much more complicated actions such as rights offerings.

AAPL Dividend History

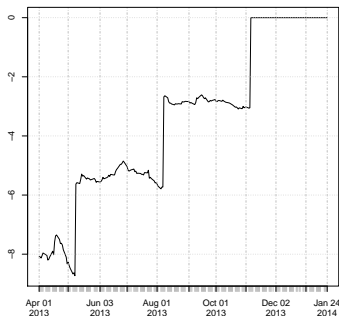
Source: <http://investor.apple.com/dividends.cfm> (amounts NOT split adjusted)

Payable	Amount	Type
Nov 14, 2013	\$3.05	Regular Cash
Aug 15, 2013	\$3.05	Regular Cash
May 16, 2013	\$3.05	Regular Cash
Feb 14, 2013	\$2.65	Regular Cash
Nov 15, 2012	\$2.65	Regular Cash
Aug 16, 2012	\$2.65	Regular Cash
Feb 28, 2005	N/A	2-for-1 Stock Split
Jun 21, 2000	N/A	2-for-1 Stock Split

AAPL Example

```
library(quantmod)
getSymbols("AAPL", from="2013-04-01")
adj <- Ad(AAPL) - Cl(AAPL)
pdf("AAPL_adjustments.pdf")
plot(adj, main="")
dev.off()
```

AAPL adjustments



The three jumps (May, Aug, Nov) are approximately \$3.05, corresponding to the dividend payments

Note

Sometimes we will not pay proper care and attention to adjustments (we do not have money on the line).

However, you **need to be aware of how important corporate actions are when using historical data for real trading in equities and corporate bond markets.**

This is an example of a general point: **it is crucial to understand the correct interpretation of financial data.** Data cleaning, pre-processing is an important part of developing trading strategies.

Our interest in equities markets

- Equities markets have **extremely high volumes of automated trading** - it can account for over 70% of trading volume on equities exchanges on some days
- Moreover, automated trading is supported across the **different types of execution venue** for equities markets, namely, both limit order books and dark pools

Derivatives

- **Futures**
- Options
- Swaps
- Credit Derivatives

In this module, **much of the material will be relevant for Futures markets**

We will **not** focus on Options, Swaps or Credit Derivatives

Futures

- A **forward** is an agreement to buy or sell a **fixed quantity** of a given asset at a **certain price** at a **specific date** in the future
- A **futures contract** is a forward with **standardized terms**

Examples

- S&P 500 E-mini Futures
- FTSE 100 Futures
- Crude Oil Futures
- Eurodollar futures (interest rate futures)
- CME Euro FX Futures

Futures

Futures exist for a **wide array of underlying assets**

Futures markets are

- **exchange-based order-driven** markets; and
- **automated trading** is prevalent

We will discuss them again, in the context of inter-calendar spread trading strategies (near the end of the module)

On the Chicago Mercantile Exchange (CME), the world's largest commodities and futures exchange, high-frequency algorithmic trading accounts for about 50% of trading volume

Futures Contracts

- Futures contracts have a **fixed expiry**
- Multiple futures contracts with different expiries can be traded at any one time
- This provides trading opportunities such as **spread trading**: trading one contract against another for the same underlying
- It also means there is **no single data set**:
- Often, a futures **"continuous contract"** data set is formed by "glueing together" individual contracts
- One of the most common approaches is to **back-adjust** by adding the price gaps on to earlier prices

Exchange-traded funds (ETFs)

- Tradable share in an investment fund
- Since they represent baskets of assets they are an **effective way to gain exposure to whole sectors or markets** (much like index futures)
- There are index, commodity, bond and currency ETFs

ETFs are becoming **ever more utilized by algorithmic traders**, which is why I mention them; we will not revisit them in this module though

Trading mechanisms

- Dealers (buys/sells securities on their own account)
- Brokers (buys/sells securities solely for clients)
- **Limit Order Book** markets
- **Dark Pools**

Limit order books and dark pools allow **automated trading**

We will cover these trading mechanisms in detail

Trading venues

- Traditional venue is the **exchange**, e.g. LSE or NYSE
- Alternative venues are now allowed. Different names:
 - Europe: **Multi-lateral Trading Facility (MTF)**
 - US: **Alternative Trading System (ATS)**

These typically provide limit order books and often also dark pools

Summary

- **Equities** and **futures** will be our focus
- Equities have led the way in terms of the adoption of trading innovations such as dark pools

We will study in more detail in the next sets of slides:

- **Limit order books**
- **Dark pools**

Further reading: Johnson, Chapter 3 and the Appendices