COMP226: Slides 01

Background and overview

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COMP226 background

- Required for all **GN34/G3N4 Financial Computing** students

- Also chosen by other CS, Maths, and Exchange students

- Practical focus on **career-relevant skills**, e.g.,

    - analysis and manipulation of financial time-series data

    - design, implementation, evaluation of trading strategies

- **Programming is integral**

- Prerequitise for **COMP396 Honours Year Automated Trading Project**, which is taken by all GN34/G3N4 students, who work in teams to develop automated trading strategies

COMP226 aims

- Understand financial markets **at the level of individual trades**

- Provide an overview of **computer-based trading applications**

- Introduce key issues with the use of **market data**

- Develop practical understanding of the **development of trading strategies**

The reach of automated trading

- Over time **trading algorithms have increasingly replaced humans in financial markets**

- Other markets have become much more open to automated trading, e.g., **sports betting markets**

- More recently, new markets algother with exclusively electronic access (no human trading floors) have opened up, e.g., **crypto currencies**

Where can this module take you?

- Name: Jiawei Yue (ex-COMP226 student)

- Currently working for: **BlackRock** as **Technology Analyst**

Hi Rahul,

I want to share with you that I was just offered a technology analyst position in BlackRock Aladdin system starting from next August. I still remember the time when you taught me about R and algorithmic trading back in Liverpool. You led me to a new world that I am fascinated with now. Thank you. Hope we can keep in touch in the future.

Justin (Jiawei)

Where can this module take you?

- Name: Tiantian Dou (ex-COMP226 student)

- Worked for **Wilshire Associates** as a **Database Developer**

- Then became a **Senior Analyst** there

Dear Rahul,

Good news for both me and you:) Many thanks to your kind help, I received the offer from Wilshire Associates successfully and just started to work there.

Kind regards,

Tiantian

Learning outcomes

At the end of this module you should have an understanding of

- **market microstructure** and its impact on trading

- how to

    - **design trading strategies** and

    - **critically evaluate** their performance

- the **common pitfalls** of trading strategy development

- **risk management** in the context of trading strategies

Background reading

Links to articles:

1. Algorithmic Trading Review (Comm. of ACM review article)

2. Algorithms Take Control of Wall Street (Wired Article)

3. Economist article (2019-10-05)

4. Financial Times article (2019-10-17)

Module webpage

https://www2.csc.liv.ac.uk/~rahul/teaching/comp226/

The module webpage will be used heavily to:

- Slides (pdfs and videos of lectures)

- Reading materials

- Practicals

- Code examples

- Details on assessments

Check it regularly! And let me know if there are any problems.

Non-cs students

Materials page

The materials page of the module webpage contains a detailed table with:

- an overview of topics

- pdf versions of slides and worksheets

- videos of the lecture material

- code examples

- pointers to readings (pdfs of from reading list)

Lectures

Rules

PLEASE

- **Be on time**; **do not talk** during lectures

- ~~Bring your ID card (no signing)~~

- **Bring your ID card to practical sessions**

- **Questions DURING lectures NOT AFTERWARDS**

#	Topic
1	Intro to R
2	Market microstructure
3	Performance measurement for trading strategies
4	Trading Strategies
5	Backtesting, optimization, and cross-validation

Reading List: essential

R programming language:

- The art of R programming: A tour of statistical software design, Norman Matloff. **(ELECTRONIC BOOK)**

- R cookbook, Paul Teetor. **(ELECTRONIC BOOK)**

Trading:

- Algorithmic trading: Winning strategies and their rationale, Ernie Chan. **(ELECTRONIC BOOK)**

- Algorithmic trading & DMA: an introduction to direct access trading strategies, Barry Johnson.

- Trading systems: a new approach to system development and portfolio optimisation, Urban Jaekle and Emilio Tomasini.

Practicals

- **10 practical sessions** starting **next week** (week 2)

- Please **attend the practical to which you are assigned**

- Designed to

    - **Help with continuous assessments**

    - **Prepare you for the COMP226 exam**

- The are **5 worksheets**, one for each topic

- There will also be time in practicals to **work on your continuous assessments**

- The quicker you get good at R, the easier this module will be

Assessment

- **Written multiple-choice examination** (80%)

- **Two continuous assessments** (2 x 10%)

  1. Create a piece of software that solves a trading problem

  2. Implement and test a trading strategy

Why R?

- R is a **statistical** computing platform, and **complete** programming language. It is **cross-platform**, **free**, and **open-source**, so you can use it on your own computers (and in the labs).

- R is one of the **leading tools for statistics, data analysis, and machine learning**; proficiency in R is a valuable skill.

- **Lots of flexibility to develop and test trading strategies**

- **Hundreds of user-contributed packages** on CRAN, so many things have already been implemented for you.

- R is very **widely used** and there is a lot of freely available information about it.

Using R and RStudio

- R code is **interpreted**; there is **no need for compilation**.

- It is common to use R via an **interactive shell**.

- You are encouraged to use an **Integrated Development Environment** (**IDE**) like RStudio http://www.rstudio.com/.

- RStudio provides **syntax highlighting** and many other helpful features. It is available on lab machines and is **better than the default R GUI**.

Practice makes perfect

The best way to get good at something is to repeatedly do it.

We will cover lots of examples. You are strongly encourage to:

- **Run the examples yourself**

- **Vary them and extend them**

Now we dive straight in and do some simple examples of using R as a calculator

Simple arithmetic

The slides will often contain code extracts, like this:

```
> 3
[1] 3

> 3 + 5
[1] 8
```

For more involved pieces of code you will find **downloadable copies** of "R" files on the Materials page of the module webpage.

Simple arithmetic R file

simple_arithmetic.R:

```
3+5
```

Now this file can be "loaded" using the source function:

```
> source('simple_arithmetic.R',echo=TRUE)
> 3+5
[1] 8
```

The default value of the echo argument of source is FALSE

We set it to TRUE, otherwise we would not see any output (try it!)

More simple arithmetic

```
> 3 * 5
[1] 15

> 9^2
[1] 81

> sqrt(9^2)
[1] 9
```

That's it for these slides.

In the next set of slides, we will look at variables in R.

Homework

Get R and RStudio working on your own computer

Contacting me

Email me at

rahul.savani@liverpool.ac.uk

with questions or to arrange an appointment

Please put in the subject of the email: COMP226