# FIN4124/4719 FINTECH AND FINANCIAL DATA ANALYTICS

AY2020/21 Semester 1

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## MODULE DESCRIPTION

This course covers analytical tools and innovations in finance that solve practical problems. The objective is to connect theory with practice by building models, testing them with data, and using them for financial decision making. The topics include (1) efficient market hypothesis, (2) behavioral finance, (3) event studies, (4) Monte Carlo simulation, (5) Markowitz mean-variance portfolio, (6) artificial intelligence, (7) blockchain, (8) fintech, and (9) real option. The course adopts a cookbook approach to model, code, and solve problems in finance.


## LEARNING OBJECTIVES

1.  Apply theories and concepts to study problems in finance.
2.  Develop useful models to analyze and solve problems in finance.
3.  Implement, assess, troubleshoot, and evaluate solutions.
4.  Understand the key fintech concepts and their impact on the financial services sector.
5.  Understand and develop strategies to unleash the potential of fintech in the financial services sector.


## PREREQUISITE

BMF5322 Introduction to Finance


## ASSESSMENTS

| Component | Weightage |
|---|---|
| Class Participation | 10% |
| NUS' Next Top Fund Manager | 10% |
| Final Project | 20% |
| Bootcamp Problem Sets | 30% |
| Tests | 30% |
| **Total** | **100%** |

| S/N | Assessment Item | Submission/ Due Date (SG Time) | Note |
|---|---|---|---|
| 1 | **Class Participation (10%)** | Please see Class Participation (Individual) for more details. | The evaluation includes your discussions in face-to-face classes, Zoom sessions, and Microsoft Teams channels (e.g., supporting a point of view with facts, challenging a point of view with respect, helping others with technical issues, sharing thought-provoking insights/articles, synthesizing new ideas or arguments, etc.). *Individual*. |
| 2 | **NUS' Next Top Fund Manager (10%)** | "Warren Buffett Million Dollar Challenge" on Investopedia & LumiNUS - Please see NUS's Next Top Fund Manager (Individual) for more details. The due date is Nov 16 (2359). | Put what you learn in class and beyond into practice. Manage a sub-fund with seed money of $1,000,000 (the Investopedia simulator endows each of you with $1,000,000 with which you can invest in various financial instruments). Collaborate with your group (the master fund) to beat others! Your group will be evaluated based on the quality of your report and investment performance. A *bonus* is available for the master fund with the *best* portfolio performance (e.g., raw portfolio return, Sharpe ratio). *Group* (Team submission of collective work). Peer-to-peer learning via Microsoft Teams #top_fund is encouraged. |
| 3 | **Final Project (20%)** | LumiNUS - Please see the Final Project (Group) for more details. The due date is Nov 08 (2359). | Play the role of a management consultant and advise your client on how to leverage fintech for business. Each group is to choose a unique client type (on a first-come, first- served basis). *Group* (Team submission of collective work). Peer-to-peer learning via Microsoft Teams #final_project is encouraged. |
| 4 | **Bootcamp Problem Sets x 6 (30%)** | Kaggle Notebook (code and text) - Please see Bootcamp Problem Sets (Group) for more details. Please share your Kaggle notebook with me the day *before* the next class (2359). | If you are stuck, ask for help at Microsoft Teams #bootcamp_discussion or #python_clinic. A *bonus* is available for the best team in a quest. *Group* (Team submission of collective work). Peer-to-peer learning of the Bootcamps (but not Bootcamp Problem Sets) via Microsoft Teams is encouraged. |
| 5 | **Tests x 2 (30%)** | LumiNUS Assessment or ExamSoft (TBC) – Please see Course Roadmap for the test schedule. Make-up is not available. Details TBC. | *Individual* (strictly). |

## Assessment 1: Class Participation (Individual)

You are expected to be active in interactions and discussions inside (e.g., face-to-face classes, Zoom sessions) and outside the classroom (e.g., Microsoft Teams channels). The depth and quality of your comments matter more than the frequency with which you speak up inside and outside the classroom. Furthermore, regular class attendance (face-to-face or online) and asynchronous discussions are essential to effectively participate in this course. All absences, even partial, are assumed "unexcused" resulting in zero credit for the session. Fair consideration for "excusing" absences includes those with medical emergencies and in some non- emergency cases when ample advanced notice is provided. To facilitate asynchronous learning via Microsoft Teams, a leading

group will be assigned each week to simulate and extend the discussion of relevant topics on Microsoft Teams (e.g., on #food_for_thought). All members of the group will receive credit accordingly.

**Evaluation criteria**

1. Are you concise and articulate?
2. Are you a good listener? Are the points made relevant to the current discussion? Are your points linked to the comments of others?
3. Do your comments show clear evidence of appropriate and insightful analysis of the question?
4. Are you willing to participate and contribute to overall session learning?

**Assessment 2: NUS's Next Top Fund Manager (Group)**

Join the "Warren Buffett Million Dollar Challenge" on https://www.investopedia.com/simulator/! Put what you learn in class and beyond into practice and compete with players around the world. You will manage a sub-fund with seed money of $1,000,000 with which you can invest in stocks, ETFs, or options. Not enough money? No worries, you can short-sell or trade on margin in this game. However, be careful because leverage is a double-edged sword! Collaborate with your group (the master fund) to beat others!

The objective of this challenge is to make as much money (i.e., portfolio raw return) as possible collectively as a master fund. The collective investment thought process will be evaluated in an attempt to separate skills from luck. Other portfolio performance metrics (e.g., portfolio Sharpe ratio) will also be considered. Please include the following in your written report:
1. Your collective investment thought process (e.g., Why do you invest in what you invest in? Does it relate to a theory or investment strategy you learn in class? How do you put the theory into practice or execute the investment strategy? How do you decide how much of your money to deploy for the trade?).
2. A log of your trading activities, profit and loss, and a note on why you do what you do.
3. Do the sub funds complement each other? How?
4. A reflection note (e.g., What have you learned? How can you do better?).

**Evaluation criteria**

1. The quality of your group final project report, especially your collective investment thought process, how you put into practice what you have learned in class, and how you collaborate with each other in the master fund.
2. Your investment performance (How well do you do relative to your peers and the ~100K players) in this challenge. Please attach a snapshot of your performance on the Investopedia simulator, i.e. portfolio value and global rank, in the report.
3. A *bonus* is available for the group with the highest collective portfolio performance.

**Guidelines on the written report**

1. Your write-up should be single spaced and maximum 10 pages long (excluding appendices). Please use text fonts no smaller than 12.
2. Your write-up (with a snapshot of your investment performance) is to be turned in electronically via LumiNUS.

**Assessment 3: Final Project (Group)**

Your group comprises of fintech experts from one of the big three management consulting firms. Your portfolio consists of clients from the financial sector (i.e., retail banks, corporate banks, investment banks, life insurers, general insurers, brokerages, fintech start-ups, corporate treasuries, payment processors, central bankers, MNCs, SMEs, NGOs) in Southeast Asia. For this project, please pick a client type and you should pick a unique client type (on a first-come-first-serve basis).

Your client wants to know how to leverage fintech for business (e.g., to digitally transform your client's business). Here are some questions your clients have for you:

1. What are the key ideas behind the recent *fintech developments* that are relevant to me? What problems do these fintech developments aim to solve and how?
2. What are the promises and perils of these *fintech developments*?
3. What are the threats and opportunities? What are the impacts of these *fintech developments* on my business?
4. How do my peers respond to these f*intech developments*? How should I respond strategically to these *fintech developments*?
5. How should I leverage fintech or work with fintech companies for my business? What are the potential roadblocks and how to get around them?

Note 1: *Fintech developments* include new financial technologies (e.g., artificial intelligence, blockchain, cloud computing, big data, internet of things, 5G), new 'asset classes' (e.g., cryptocurrencies like Libra, Bitcoin, etc., central bank digital currency), alternative financing (e.g., peer-to-peer or marketplace lending, crowdfunding, crowd equity financing, initial coin offering), new business models (e.g., open banking like Starling Bank, API marketplace, financial ecosystem player like Ant Financial), payment innovations (e.g., blockchain-based payments like Ripple, peer-to-peer payments like TransferWise), and technology platforms (e.g., digital payment processor like Wirecard, banking-as-a-service like One Connect, Backbase, etc.).

Note 2: The list of fintech development above is not mutually exclusive and non-exhaustive. Also, you are free to focus on any one of fintech developments or more.

**Evaluation criteria**

1. Qualitative analysis of all factors relevant to the problem.
2. Quantitative analysis (if appropriate) and explanation of the approach.
3. Explicit recommendations, reasoning, and implications of such, including discussion of implementation and expected consequences of the recommendations.
4. Clarity, logic, creativity, exposition.

**Guidelines on deliverables**

1. Your write-up should be single spaced and maximum 10 pages long (excluding appendices). Please use text fonts no smaller than 12.
2. You need to collaborate synchronously and asynchronously with your study group. Useful team collaboration tools include Zoom (real-time video-based communication), Microsoft Teams (real-time text-based and video-based communication), and Miro (brainstorming).
3. Please turn in your written assignment and slide deck electronically via LumiNUS.

4. Every graph or table/spreadsheet in the Appendix to your report showing the results of computations must be accompanied by both a clear description of what all numbers shown represent qualitatively and a detailed explanation of how they are computed, including a statement of all the relevant mathematical formulas or algorithms.

## Assessment 4: Bootcamp Problem Sets (Group)

Your codes and texts, in the form of a Kaggle notebook, are your answers to the problem sets for each Bootcamp. The problem sets test on how you implement theories, concepts, or models to solve problems in finance.

**Evaluation criteria**

1. Qualitative analysis of all factors relevant to the problem.
2. Quantitative analysis (if appropriate) and explanation of the approach.
3. Explicit recommendations, reasoning, and implications of such, including discussion of implementation and expected consequences of the recommendations.
4. Clarity, logic, creativity, exposition.

**Guidelines on deliverables**

1. You learn asynchronously from the pre-recorded Bootcamps. So, you need to synchronize and collaborate, either synchronously or asynchronously, with your study group. Kaggle notebook is a cloud-based collaborative coding tool. Other useful team collaboration tools include Zoom (real-time video communication), Microsoft Teams (real-time text and video communication), and Miro (brainstorming).
2. Work in your study group and submit your joint work in the form of a Kaggle notebook by sharing the work with me.
3. A performance bonus is available for the group that outperforms others in a quest. The maximum score for this component is 30%.
4. The *voluntary* presentation of your work at the start of the following class counts towards class participation. Priority goes to groups that have not presented.

**Bootcamp Overview**

| Topic | Week | Date (Day) | Time | Activity | Focus |
|---|---|---|---|---|---|
| Efficient Market Hypothesis | 1 | #Aug 10 (Mon) | 1000-1130 | Bootcamp 1 | Implement the variance ratio test |
| Behavioral Finance | 2 | Aug 17 (Mon) | 1000-1130 | Bootcamp 2 | Test overreaction hypothesis |
| Event Studies | 3 | Aug 24 (Mon) | 1000-1130 | Bootcamp 3 | Test underreaction hypothesis |
| Monte Carlo Simulation | 4 | Aug 31 (Mon) | 1000-1130 | Bootcamp 4 | Simulate optimal portfolio weights |
| Modern Portfolio Theory | 5 | Sep 07 (Mon) | 1000-1130 | Bootcamp 5 | Find optimal portfolio weights analytically |
| AI in Finance | 6 | Sep 14 (Mon) | 1000-1130 | Bootcamp 6 | Predict corporate bankruptcy |

Note: If you have any coding issues, go to the Microsoft Teams #python_clinic. In the channel, you can be both a 'patient' and a 'doctor.' Your activities here count toward your class participation.


**Assessment 5: Tests (Individual)**

There are two open-book tests scheduled throughout the course. Please note that make-up test is not available. The tests will run on either LumiNUS assessment or ExamSoft. Bonus questions are available for each test. Your score for each test will be recalibrated based on the best score in the class. More details will be available in due course.

## COURSE ROADMAP

[Face-to-face (F2F): BIZ1 5-4); DataCamp, Pre-recorded and Zoom: Anywhere]

| Session | Week | Date (Day) | Time | Activity | Learning Objectives | Related Papers | Plan |
|---|---|---|---|---|---|---|---|
| Course Overview & Efficient Market Hypothesis | 1 | Aug 10 (Mon) | 0830-1000 | Seminar 1 | Describe random walk | Maloney & Mulherin (2003), Lo & MacKinlay (1988), Do, Lee, and Nguyen (2017) | F2F$^{All}$+Zoom |
| | 1 | Aug 10 (Mon) | 1000-1130 | Bootcamp 1 | Test random walk hypothesis | | Pre-recorded |
| Behavioral Finance | 2 | Aug 17 (Mon) | 0830-1000 | Seminar 2 | Review behavioral finance basics | Shiller (1984), DeBondt and Thaler (1988) | F2F$^{All}$+Zoom |
| | 2 | Aug 17 (Mon) | 1000-1130 | Bootcamp 2 | Test overreaction hypothesis | | Pre-recorded |
| Event Studies | 3 | Aug 24 (Mon) | 0830-1000 | Seminar 3 | Conduct event studies | Ball & Brown (1968), Goh, Lee, and Yang (2019), Do, Lee, Nguyen, and Nguyen (2020) | F2F$^{All}$+Zoom |
| | 3 | Aug 24 (Mon) | 1000-1130 | Bootcamp 3 | Test underreaction hypothesis | | Pre-recorded |
| Monte Carlo Simulation | 4 | Aug 31 (Mon) | 0830-1000 | Seminar 4 | Calculate option prices | Black and Scholes (1973) | F2F$^{All}$+Zoom |
| | 4 | Aug 31 (Mon) | 1000-1130 | Bootcamp 4 | Simulate optimal portfolio weights | | Pre-recorded |
| Modern Portfolio Theory | 5 | Sep 07 (Mon) | 0830-1000 | Seminar 5 | Review optimal portfolio choice | Markowitz (1952) | F2F$^{All}$+Zoom |
| | 5 | Sep 07 (Mon) | 1000-1130 | Bootcamp 5 | Calculate the optimal portfolio weights analytically | | Pre-recorded |
| AI in Finance | 6 | Sep 14 (Mon) | 0830-1000 | Seminar 6 | Review machine learning basics | Theodossiou, Kahya, Saidi, and Philippatos (1996) | F2F$^{All}$+Zoom |
| | 6 | Sep 14 (Mon) | 1000-1130 | Bootcamp 6 | Predict corporate bankruptcy | | Pre-recorded |

| Session | Week | Date (Day) | Time | Activity | Learning Objectives | Related Papers | Plan |
|---|---|---|---|---|---|---|---|
| Factor Models | 7 | Sep 28 (Mon) | 0830-1000 | Seminar 7 | Discuss factor models | Fama & McBeth (1973) | F2F$^{All}$+Zoom |
| | 7 | Sep 28 (Mon) | 1000-1130 | Guest Speaker | Discuss AI use cases in financial services | Moneylion CTO (TBC) | F2F$^{All}$+Zoom |
| Test 1 & Algorithmic Trading | 8 | Oct 05 (Mon) | 0830-1000 | Test 1 | | | F2F$^{All}$+Zoom |
| | 8 | Oct 05 (Mon) | 1000-1130 | Seminar 8 | Describe algorithmic trading | | F2F$^{All}$+Zoom |
| Blockchain in Finance | 9 | Oct 12 (Mon) | 0830-1000 | Seminar 9 | Explain cryptography | Deng, Lee, and Zhong (2018) | F2F$^{All}$+Zoom |
| | 9 | Oct 12 (Mon) | 1000-1130 | Seminar 10 | Discuss blockchain mechanics and cryptocurrency | | F2F$^{All}$+Zoom |
| Fintech | 10 | Oct 19 (Mon) | 0830-1000 | Seminar 11 | Explain disruption theory | Christensen, Raynor, and McDonald (2015) | F2F$^{All}$+Zoom |
| | 10 | Oct 19 (Mon) | 1000-1130 | Seminar 12 | Review fintech drivers and digital transformation | | F2F$^{All}$+Zoom |
| Fintech | 11 | Oct 26 (Mon) | 0830-1000 | Seminar 13 + Class Debate | Discuss strategic responses and real option framework | | F2F$^{All}$+Zoom |
| | 11 | Oct 26 (Mon) | 1000-1130 | Guest Speaker | Discuss blockchain in financial services | IBM Singapore CTO (TBC) | F2F$^{All}$+Zoom |
| Test 2 & Class Brainstorm | 12 | Nov 02 (Mon) | 0830-1000 | Test 2 | | | F2F$^{All}$+Zoom |
| | 12 | Nov 02 (Mon) | 1000-1130 | Class Brainstorm with Miro | Assemble ways to leverage financial analytics and fintech for the financial services sector | | F2F$^{All}$+Zoom |
| Final Project Presentation | 13 | Nov 09 (Mon) | 0830-1000 | Final Presentation | | | F2F$^{All}$+Zoom |
| | 13 | Nov 09 (Mon) | 1000-1130 | Final Presentation | | | F2F$^{All}$+Zoom |

Note 1: This is the default delivery plan, where there is face-to-face instruction for all students with live Zoom streaming (for those experiencing travel restrictions or stay-at-home notices). With the ongoing COVID-19 pandemic, there are contingency plans for face-to-face and virtual instruction alternatives if policies and guidelines change during the semester. Stay tuned to LumiNUS and Microsoft Teams announcements.

Note 2: August 10 is a public holiday. The date/time for the replacement class will be announced in due course.

## SUPPLEMENTARY MATERIALS

### Optional Textbook

1. Yves Hilpisch (2019), "Python for Finance", 2$^{nd}$ edition, O'Reilly
2. Campbell, John Y., Andrew W. Lo, and A. Craig MacKinlay. *The Econometrics of Financial Markets*. Princeton, NJ: Princeton University Press, 1996. ISBN: 9780691043012.
3. Lewis, Antony. *The Basics of Bitcoins and Blockchains*. Mango Publishing, 2018. ISBN 978633538009.
4. Murphy, Kevin P. *Machine Learning, A Probabilistic Perspective*. MIT Press, 2012. ISBN: 9780262018029.
5. Boehmer, E., Broussard, John P., and Kallunki, J. *Using SAS in Financial Research*. SAS Institute, 2002. ISBN 978- 1590470398.

### Datacamp Supplementary Materials

| DataCamp Skill Track | Related Bootcamps | Duration |
|---|---|---|
| Finance Fundamentals | Bootcamp #1 to #6 | 25 H |
| Applied Finance | Bootcamp #4 to #6 | 16 H |

1. You can tailor your learning journey according to your needs. These Skill Tracks prepare you for the Bootcamps and tests. Also, the rewards for your effort are statements of accomplishment from DataCamp.
2. This class is supported by DataCamp, the most intuitive learning platform for data science. Learn R, Python, and SQL the way you learn best through a combination of short expert videos and hands-on-the-keyboard exercises. Take over 100+ courses by expert instructors on topics such as importing data, data visualization, or machine learning and learn faster through immediate and personalized feedback on every exercise.
3. Spread the word about DataCamp's initiative to spread data science education around the world by sharing your DataCamp for the Classroom use and activities on social media (LinkedIn, Twitter, etc.).

### Optional Post-readings

1. B. Malkiel, *A Random Walk Down Wall Street*. W. W. Norton & Company, 2015. ASIN: B00QH9NTSI.
   - Malkiel offers interesting insights on investing, especially for the non-financially inclined. This book is one of the best-sellers in investing.
2. P. Gupta & T. Mandy Tham, *Fintech: The New DNA of Financial Services*. De|G Press, 2018. ISBN: 9781547417087.
   - The authors explore the various aspects of FinTech and its impact in the future.

**ACADEMIC HONESTY & PLAGIARISM**

Academic integrity and honesty is essential for the pursuit and acquisition of knowledge. The University and School expect every student to uphold academic integrity & honesty. Academic dishonesty is any misrepresentation with the intent to deceive, or failure to acknowledge the source, or falsification of information, or inaccuracy of statements, or cheating at examinations/tests, or inappropriate use of resources.

Plagiarism is 'the practice of taking someone else's work or ideas and passing them off as one's own' (The New Oxford Dictionary of English). The University and School will not condone plagiarism. Students should adopt this rule - You have the obligation to make clear to the assessor which is your own work, and which is the work of others. Otherwise, your assessor is entitled to assume that everything being presented for assessment is being presented as entirely your own work. This is a minimum standard. In case of any doubts, you should consult your instructor.

1. Additional guidance:
   http://www.nus.edu.sg/registrar/adminpolicy/acceptance.html#NUSCodeofStudentConduct
2. Online Module on Plagiarism: http://emodule.nus.edu.sg/ac/

**PROFESSIONAL STANDARDS AND CLASSROOM NORMS**

1. Absences, except in cases of personal/family emergencies, risk reduction in participation grades for the face-to-face, live and pre-recorded sessions. If you experience any excruciating circumstances, please notify me beforehand.
2. Repeated usages of electronic communication devices for purposes *unrelated* to the course are prohibited. Please respect your classmates. Turn off or silent your mobile phone during classes. Use laptops and tablets use solely for the course.
3. Please be punctual. Late arrivals create an inappropriate distraction to your fellow students.
4. Please be prepared. Pick up the necessary asynchronous learning materials before every class.
5. For any technical issue with LumiNUS, Kaggle, DataCamp, Microsoft Teams, or Zoom, please use Microsoft Teams #technical_issue.
6. For any formal communication on the course, please email me. For an informal discussion or question related to the components of the course, please use the relevant Microsoft Teams channels, e.g. #python_clinic, #bootcamp_discussion, #datacamp_discussion, #live_class, #food_for_thought.
7. Check out Microsoft Teams #weekly_gameplan every Monday morning for a summary of the agenda for the week.
8. Please participate actively in face-to-face classes, Zoom sessions, and Microsoft Teams discussions. You learn better!
9. Please use your name and turn on your Zoom video during Zoom sessions.

## TECHNICAL ON-BOARDING

| Platform | Purpose |
|---|---|
| LumiNUS | The course outline, group list, seminar presentation slides, and Bootcamps (and quizzes) are available here. Please submit your slide decks for Bootcamp problem sets and the final project here. |
| Kaggle | The Bootcamps run on Kaggle notebooks, which consist of a series of cells, where each cell is either a Markdown (text) or a code. The baseline notebooks for each Bootcamp will be available here. Please submit your solutions (Kaggle notebooks with Python codes and comments) to Bootcamp problem sets and the final project by sharing your work with me. You will receive an invitation to join Kaggle before the course starts. Please note your Kaggle ID on Google Sheet here (the link will be available soon). |
| DataCamp for the Classroom | This is a supplementary platform for self-paced learning. There are a variety of tools available for you to learn financial analytics with Python (e.g., in-browser guided coding, coding practice, coding project, assessments) on DataCamp. If you complete the recommended DataCamp Skill Tracks, you will receive statements of accomplishment from Datacamp.<br>Finally, you will receive an invitation to join DataCamp before the course starts. |
| Microsoft Teams | Microsoft Teams app has a Whatsapp-like chatroom feature that facilitates student-to-instructor and student-to-student communications. The feature organizes conversations by #channels. Your activities here (e.g., supporting a point of view<br>with facts, challenging a point of view with respect, synthesizing new ideas or arguments, troubleshooting your peers' technical problem at #python_clinic, encouraging class discussion with thought-provoking insights/articles at #food_for_thought) count towards class participation. You will receive an invitation to join Microsoft Teams before the course starts. |
| Zoom | The seminars and presentations (i.e., Bootcamp problem sets and final projects) run in a hybrid format. The default class format, or Plan A, is face-to-face instruction with live Zoom streaming. Under Plan B, half of you will be physically in class and the other half through Zoom. The presenting group will be physically in class unless group members cannot physically be there (e.g., due to excruciating circumstances). In the worst-case scenario, all face-to-face sessions will be delivered virtually via Zoom. Stay tuned to LumiNUS and Microsoft Teams announcements. |
| Miro | This app is a real-time online collaborative (infinite) whiteboard platform that allows all participants to both see the big picture and zoom into the details. We will use this in week 12 "Class Brainstorm with Miro." |
| Investopedia | The "Warren Buffett Million Dollar Challenge" is one of Investopedia's Simulator Games. Please sign up at https://www.investopedia.com/simulator/. Please note your Investopedia Simulator Game ID on Google Sheet here (the link will be available soon). |

## ACKNOWLEDGMENTS

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1. Ideas and inspirations
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   **Antony Lewis** (iss.nus.edu.sg/about-us/staff/detail/15aaf18b-7c0e-44f7-9c89-177a0b67f651/Antony%20LEWIS)
   **Johan Sulaeman** (https://bizfaculty.nus.edu.sg/faculty-details/?profId=372)

2. Open-source notebooks
   **Ricky Kim** (https://github.com/tthustla) for the notebook on portfolio optimization
   **Rohan Joseph** (https://github.com/tthustla) for the notebook on Monte Carlo Simulation

3. Learning and platforms
   **Datacamp** (datacamp.com) for the access to Datacamp for Classrooms
   **Investopedia** (investopedia.com) for the access to Investopedia Simulator Game

4. Datacamp for Classroom learning modules