Vilnius Gediminas Technical University
Financial Engineering Dept. — Summer 2021
Financial Engineering and Modeling

https://www.savickas.education/VTFI/

Section #: 1
CRN: VVFRM20201
Class time: Mo.–Th.; 18:10–21:30
Class room: Online; please see the URL above

Professor: Robert Savickas, Ph.D.
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Description: Financial engineering involves pricing financial risks and designing tools for sharing those risks, as well as for sharing the accompanying cash flows. The practice also involves designing the ways of manage those risks. In this process, identifying and measuring risks is of paramount importance. Risks are the adverse outcomes that *might* happen in the future; however, we can not know whether they will actually happen. Our inability to know the future makes it very difficult to deal with risk. Therefore, we must use theoretical, logical, and quantitative methods to approximately identify and measure risks. Then, we must use these same methods to devise ways of controlling, managing, and sharing the risks we have identified. Using theories, logic, and science to identify, measure, and manage risks is the purpose and the essence of financial modeling. This course introduces VGTU graduate students to the basics of financial engineering and modeling. The context of this course consists of some of the most basic questions routinely faced in the practice of financial engineering: pricing of derivative instruments, portfolio management, credit risk management. The modeling tool of choice for this study is the Python scripting language, which is literally taking over the industry of quantitative finance.

Text: Recommended: *Options, Futures, and Other Derivatives* by John C. Hull, Pearson Prentice Hall, 2006, or a later edition. Recommended: Various online resources for learning Python. Details given in class and in the download area of the course's online platform at the URL, prvided above.

Preparation: Good familiarity with at least the basics of financial forward, future, and option contracts, as well as with the basics of the Python scripting language will be very helpful to students in coping with the quickly intensifying nature of the course material.

Student Support: In addition to the office hours, students are welcome to ask questions before, during, and after each class, as well as by email.

Grading: Final Exam: 100% weight.

Participation: Students should NOT regard themselves as passive viewers of the lectures, as spectators in a theatre. On the contrary, they should feel free to actively take part in the class discussion, to ask questions or request clarifications, to offer insights, as well as to share their prior knowledge and experience, etc.

Class portal: `Please see the URL at the top of this syllabus.` The portal serves as a medium for online lectures and exams and for posting of handouts, possible extensions to the lecture material, class announcements and materials, etc. Additionally, it can serve as a small online community for the class, complete with user profiles, class chat, blogs, etc. Please note: this portal is built, hosted, and maintained by R. Savickas and is not associated with the Prometheus or Blackboard.

Schedule: According to the usual VGTU practice, classes will be held in pairs of 45–minute periods, with five-minute breaks between two consecutive periods in each pair, and 10-minute breaks between two consecutive pairs.

R.S. = taught by Prof. Robert Savickas
N.M. = taught by Prof. Nijolė Maknickienė

May 17	R.S.	**Lecture:** Introduction to financial modeling. Review of forwards, futures, options. Review of Python.
May 18	N.M.	**Lecture:** Options. Synthetic options. The Binomial Option Pricing Model.
May 19	R.S.	**Practicum:** Object–oriented structures of Python code for financial applications.
May 20	R.S.&N.M.	**Office hours:** Attendance optional. Instructors are available to answer students' questions.
May 24	R.S.	**Lecture:** Synthetic option contracts using the underlying asset for hedging.
May 25	N.M.	**Practicum:** Options. Synthetic options. The Binomial Option Pricing Model.
May 26	R.S.	**Lecture:** Synthetic options with the underlying, continued.
May 27	R.S.&N.M.	**Office hours:** Attendance optional. Instructors are available to answer students' questions.
May 31	R.S.	**Practicum:** Building a synthetic option with the underlying in Python.
June 1	N.M.	**Lecture:** Credit Derivatives. Disruptive Innovation in Financial Sector.
June 2	R.S.	**Practicum:** Synthetic option contracts using a futures contract for hedging.
June 3	R.S.&N.M.	**Office hours:** Attendance optional. Instructors are available to answer students' questions.
June 7	R.S.	**Practicum:** Building a synthetic option with a futures contract in Python.
June 10	R.S.&N.M.	**Office hours:** Attendance optional. Instructors are available to answer students' questions.
June 15	R.S.&N.M.	**Examination.**
June 17	R.S.&N.M.	**Office hours:** Review of the results of the examintion.