**Financial Engineering and Risk Management Part I**

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This course provides an introduction to various classes of derivative securities and we will learn how to price them using "risk-neutral pricing". In the follow-up to this course (FE & RM Part II) we will consider portfolio optimization, risk management and more advanced examples of derivatives pricing including, for example, real options and energy derivatives.

**Workload:** 7-10 hours/week

**Taught In:** English

**Subtitles Available In:** English

Financial Engineering is a multidisciplinary field involving finance and economics, mathematics, statistics, engineering and computational methods.  The emphasis of **FE & RM** **Part I** will be on the use of simple stochastic models to price derivative securities in various asset classes including equities, fixed income, credit and mortgage-backed securities. We will also consider the role that some of these asset classes played during the financial crisis. A notable feature of this course will be an interview module with **Emanuel Derman**, the renowned ``quant'' and best-selling author of "My Life as a Quant".    
  
We hope that students who complete the course and the follow-up course (**FE & RM** **Part II**) will have a good understanding of the "rocket science" behind financial engineering. But perhaps more importantly, we hope they will also understand the limitations of this theory in practice and why financial models should always be treated with a healthy degree of skepticism.

## Course Syllabus

We plan to cover the following topics in **FE & RM** **Part I**:

* Introduction to forwards, futures and swaps
* Introduction to options and the 1-period binomial model
* The multi-period binomial model and risk-neutral pricing
* Term structure models and pricing fixed income derivative securities
* Introduction to credit derivatives
* Introduction to mortgage mathematics and mortgage-backed securities

## Recommended Background

Students should at some point have taken intermediate to advanced undergraduate courses in: (i)  probability and statistics (ii) linear algebra and (iii) calculus.    
  
With regards to programming, we have designed the course (**FE & RM Part I**) so that all required "programming" questions can be completed within *Excel*. However students are welcome to use whatever software / languages they prefer in order to complete the assignments.

## Suggested Readings

The course will be largely self-contained but a nice reference is [Investment Science](http://books.google.com/books?id=luD5jwEACAAJ&dq=investment+science+luenberger&hl=en&sa=X&ei=o9AbUY3XJILp0gGxnYGgDw&ved=0CEYQ6AEwAg), by David G. Luenberger; Oxford University Press, 2013.

## Course Format

The class will consist of lecture videos each of which will typically have a duration of 10 to 20 minutes. Most of the lectures will contain integrated quiz questions.   
  
There will also be standalone assignments that are not part of the video lectures. There will be approximately n=6 such assignments and students will need to complete n-1 of them in order to complete the course.

## FAQ

* **Will I get a statement of accomplishment after completing this class?**

Yes. Students who successfully complete the class will receive a statement of accomplishment signed by the instructors.