What about the Annex?

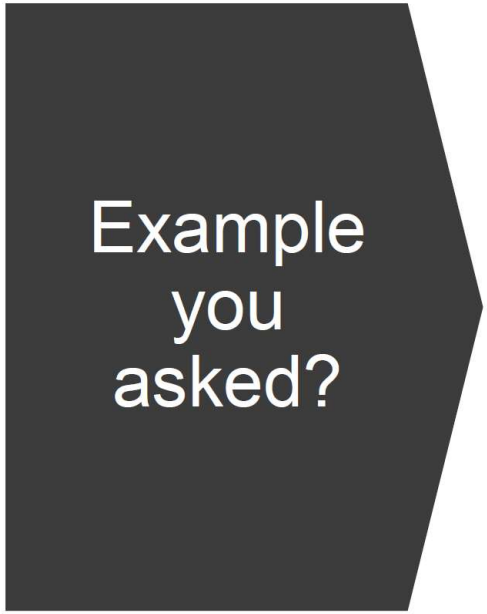
Annex: the technique and its application(s)

- Show you understand the basics of the technique
- Give 6 examples (including proper references), where the technique has been used in:
  - 3 in Academia…
  - 3 Outside academia (industry, medicine, finance, etc)

- **Project 1:**
  - Random walks
  - Monte Carlo simulations
  - Random numbers

- **Project 2:**
  - Integration (with any of the different techniques discussed in the course)
  - Runge-Kutta for solving differential equations (can also include examples of finite differences)
  - Fourier Transforms and/or other similar time-series techniques.

Total of 18 examples per project!



A2 Random walks in finance and industry

Outside of academia, random walks are often used for a variety of applications in finance and industry. As outlined in Fama (1965), the random walk theory is used extensively in economics in order to model stock markets. This hypothesis postulates that stock market prices evolve randomly over time with each movement being independent of the previous and the next (ie. historical trends cannot be used to predict future stock market movements). As a result, Monte Carlo simulations are often used by financial analysts to model this hypothesis.

The stock market is not the only area of economics that can be modelled via a random walks process, it has been suggested that a country's Gross National Product (GNP), ie. the total value of goods and services produced by the country within a year, can be modelled with random walks simulation methods (Cochrane (1988)). Since GNP is a value produced via stochastic processes, it is dependent on all sorts of random factors from population change to climate aspects. Because of the large degree of randomness in GNP values, they are ideal to be modelled by random walk methods.

A further intriguing industry application of the random walk method comes from computer science, in which Bar-Yossef & Gurevich (2008) attempted to estimate the size of the web in order to