How to become a quant?

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EPFL (MFE), UBS

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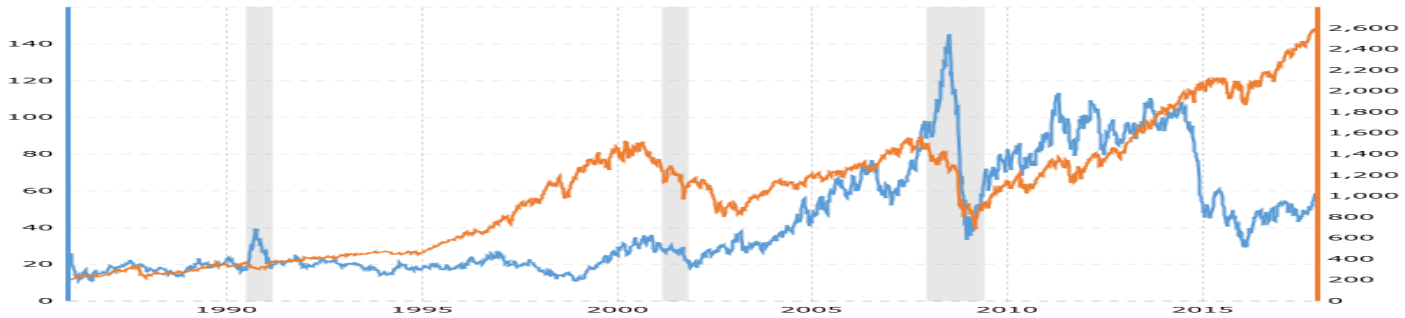


Resume

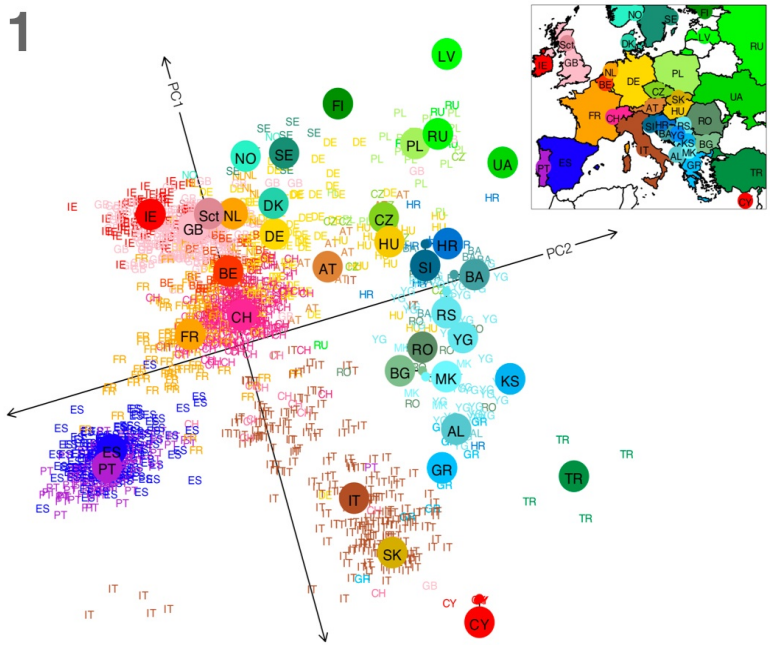
- 2004-2008, B.Sc. in mathematics, Kyiv National Taras Shevchenko University
- 2008-2010, M.Sc in mathematics, joint degree from University Bordeaux I and University of Padova
- 2010-2015, PhD in mathematics (geometric group theory), University of Geneva
- 2015-2016, Postdoc, University Paris Sud (Orsay)

... and then I decided to apply to financial institutions

- 2016-2017, Masters in Financial Engineering (EPFL)
- from January 2018, Quantitative Analyst (UBS)

Who hires PhD's in maths?

- Data Science
- Quantitative Finance
- IT companies
- probably many others . . .



What I learnt

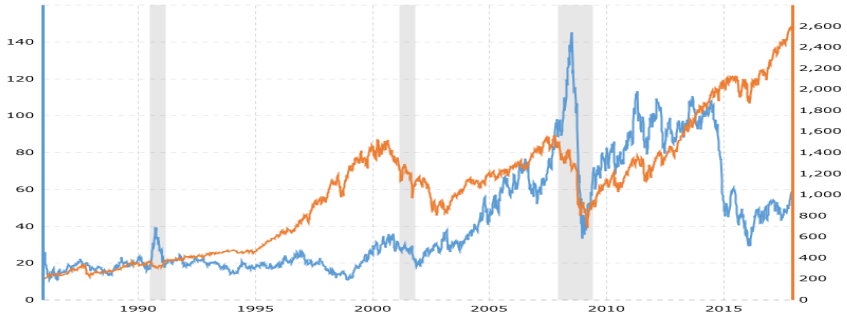
- PhD is appreciated
- need to research job thoroughly before applying
- math is good (but not everything), other important things are: intuition, presentation, coding
- prepare the interview well!
  books with interview questions, Glassdoor, *etc*.

It can be interesting, but it can be hard.

Application process

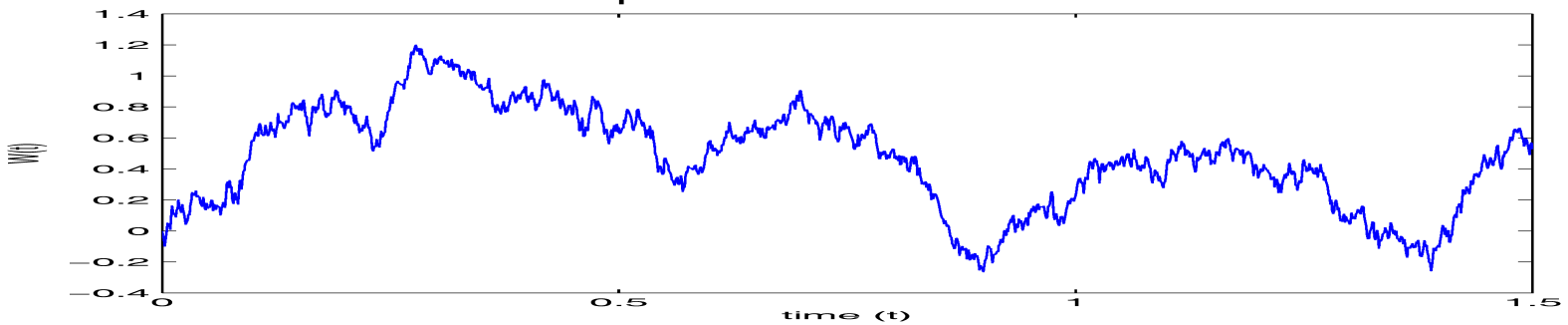
- PhD as a job experience: research, teaching assistance, talks, long-term research stays, etc.
- "Selected publications", especially if relevant to the job
- Each line in resume $\rightarrow$ industry oriented

Modeling stock prices



Goal: find a process modeling the prices

1st step: Brownian motion



Brownian motion: Brown (1827), Thiele (1880) and Bachelier (1900), Einstein (1905), *et al.*

What do quants do?

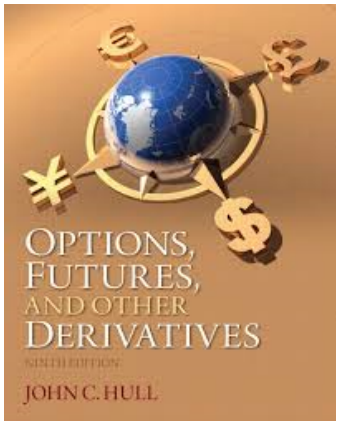
Goal: based on a model, find a "fair" price of a financial instrument

Example:

- suppose r_t is an interest rate (if you have 1chf at time 0, you will have $1 \times e^{r_t t}$ chf at time t)
- bond price: at time T you receive 1chf - what is the price at $t < T$?
- if $r_t = r = const$ then $B(t, T) = e^{-r(T-t)}$
- if r_t is stochastic, then $B(t, T) = E^Q[e^{-\int_t^T r_u du} | F_t]$.

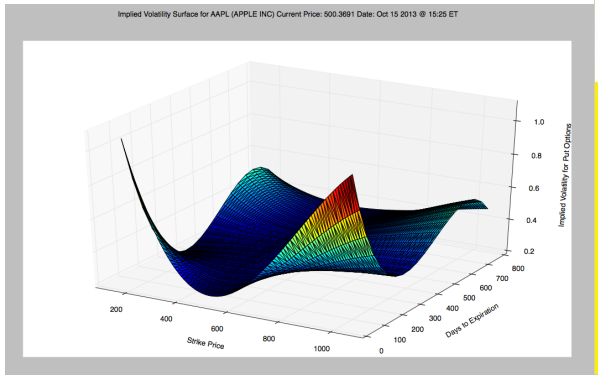
What do you need to know?

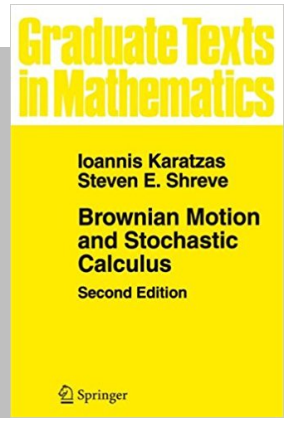
- probability (brain teasers, CLT, LLN)
- statistics (normal & *t*-Student distribution, linear regression, *etc*)
- stochastic calculus, option theory
- coding! (Python, Matlab, R, C++)
- company, position, motivation



The Black-Scholes Formulas

$$c = S_0\, N(d_1) - K\, e^{-rT} N(d_2)$$
$$p = K\, e^{-rT}\, N(-d_2) - S_0\, N(-d_1)$$
$$\text{where} \quad d_1 = \frac{\ln(S_0/K) + (r+\sigma^2/2)T}{\sigma\sqrt{T}}$$
$$d_2 = \frac{\ln(S_0/K) + (r-\sigma^2/2)T}{\sigma\sqrt{T}} = d_1 - \sigma\sqrt{T}$$





Good luck!