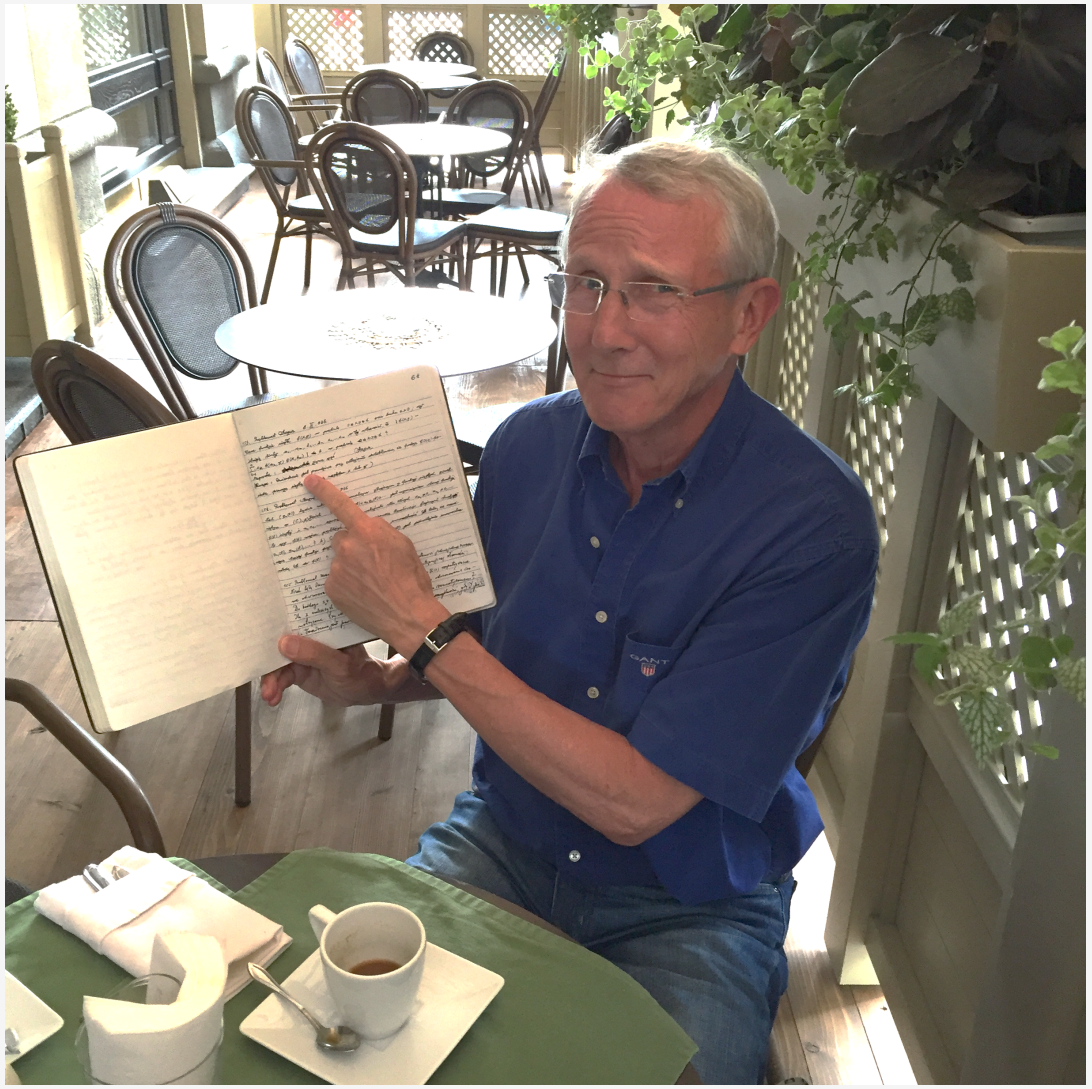
Tomas Björk

On his career and beyond

“Life can only be understood backwards; but
it must be lived forwards.”
— **Søren Kierkegaard**

Tomas the mathematician

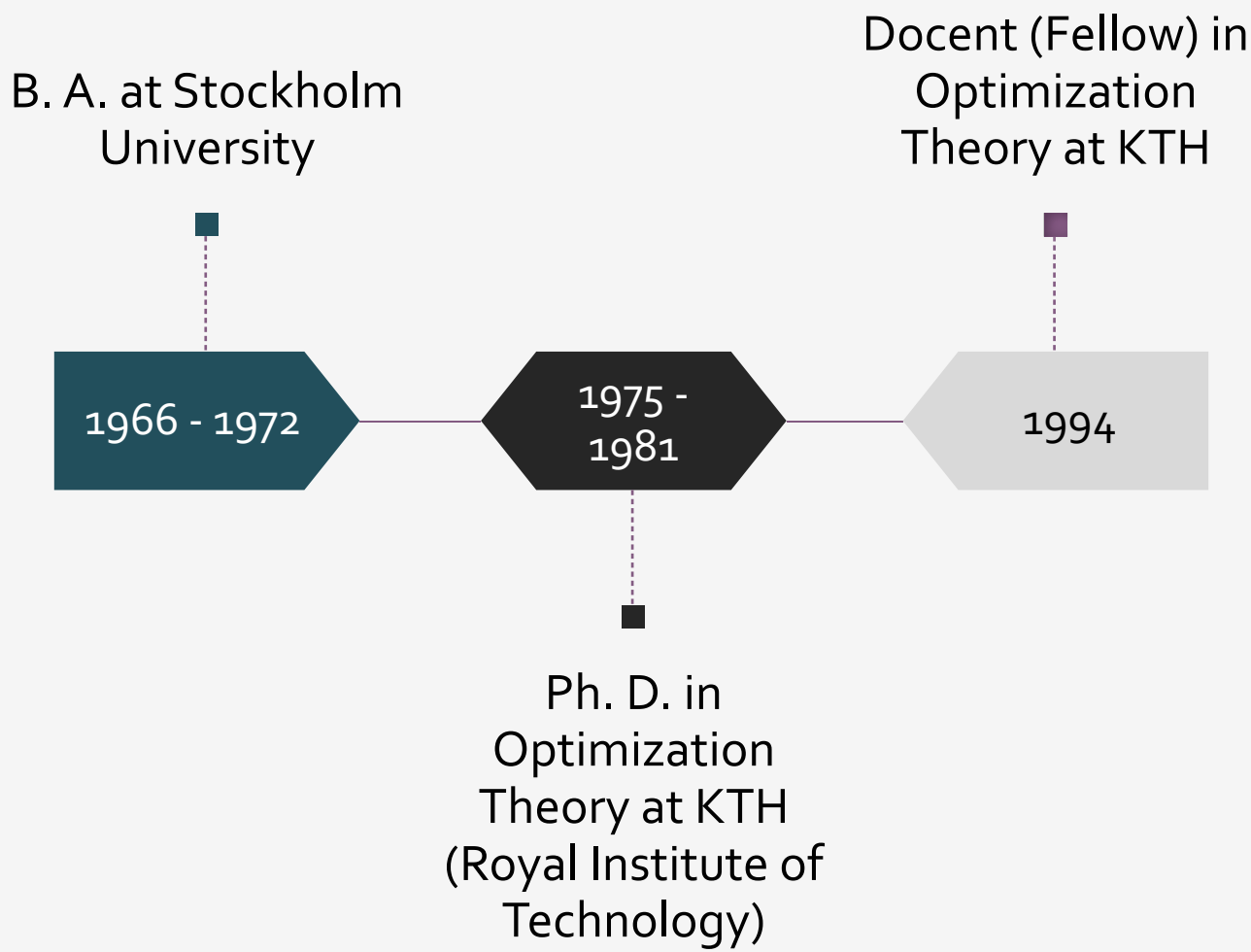
"He was doing high level influential mathematics while being a finance faculty in a business school."
— **Ali Lazrak**



2016 – Tomas pointing to problem 153 in the Scottish Book, for solving which Stanisław Mazur offered (and awarded) the prize of a live goose.

Academic degrees

Tomas's Ph.D. thesis, under the supervision of Bengt Rosén and Lars Erik Zachrisson, was titled *On Finite Dimensional Filtering, Prediction and Smoothing.*



Career journey

At the beginning of his career, mathematical finance was an emerging field, an intersection of stochastic analysis and control, financial economics, and engineering.

Tomas started his career at KTH (Royal Institute of Technology) at the division of Optimization and Systems Theory.

In 1995, he moved to the Department of Finance at the Stockholm School of Economics.

In 1998, he became Professor of Mathematical Finance at SSE.

From 2014, Professor Emeritus.

Research

"Tomas had an **outstanding career**; his research and contributions had a huge impact on the community."

— from BFS obituary

Main Problem:

When does a given interest rate model possess a finite dimensional realisation, i.e. when can we write r as

$$\begin{aligned} z_t &= \eta(z_t)dt + \delta(z_t) \circ dW(t), \\ r(t,x) &= G(z_t, x), \end{aligned}$$

where z is a **finite-dimensional** diffusion, a

$$G : R^d \times R_+ \to R$$

or alternatively

$$G : R^d \to \mathcal{H}$$

$\mathcal{H}$ = the space of forward rate curves

Main Insight

There exists a finite dimensional realization.

iff

There exists a finite dimensional invariant manifold.

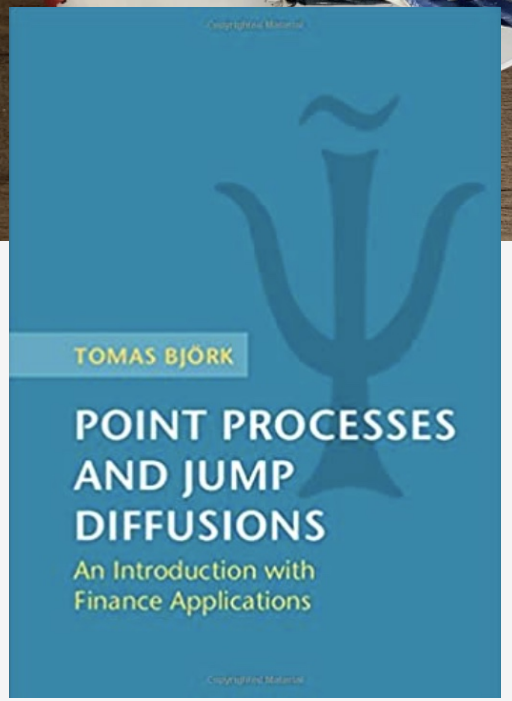
Interest rate theory	Point process–driven models Consistent forward-rate curves	Geometric view of the term structure Finite-dimensional realizations
Other topics in arbitrage pricing and derivatives	General theory of good-deal bounds Derivative pricing	Optimal investment Optimal filtering
Time-inconsistent control	General theory in discrete time	General theory in continuous time

Research in numbers

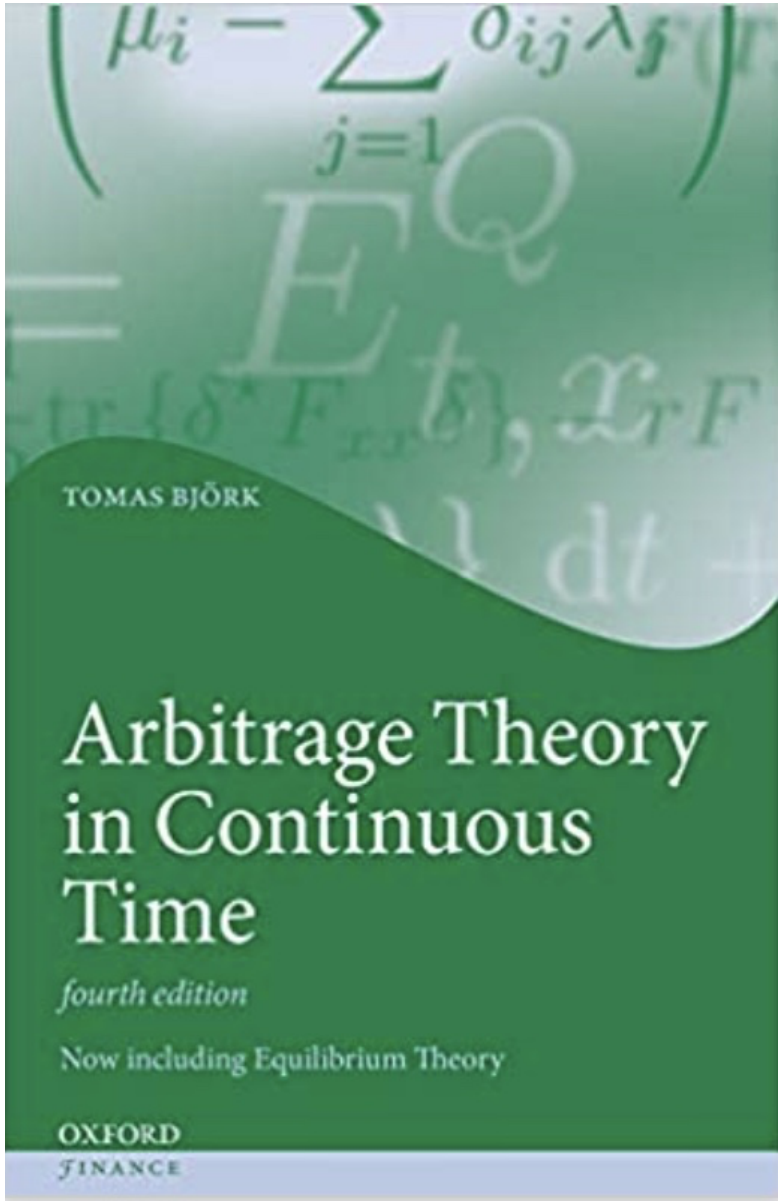
- 3 books and multiple book chapters
- 42 papers
- 30 co-authors
- 100+ conference and seminar presentations
- 7710 citations and counting

Books

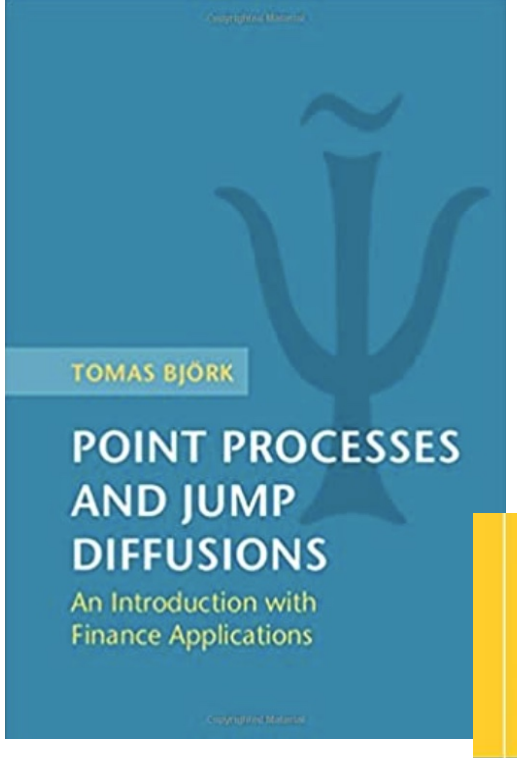

KUNGL TEKNISKA HÖGSKOLAN
STOKASTISK KALKYL
OCH
KAPITALMARKNADS
av
Tomas Björk
Del I:
Arbitrage
in Contin
Time
TOMAS BJÖRK
Arbitrage T
in Continu
Time
second edition
OXFORD
FINANCE
TOMAS BJÖRK
Arbitrage
in Contin
Time
third edition
OXFORD
FINANCE
TOMAS BJÖRK
Arbitrage Theory
in Continuous
Time
fourth edition
Now including Equilibrium Theory
OXFORD
FINANCE

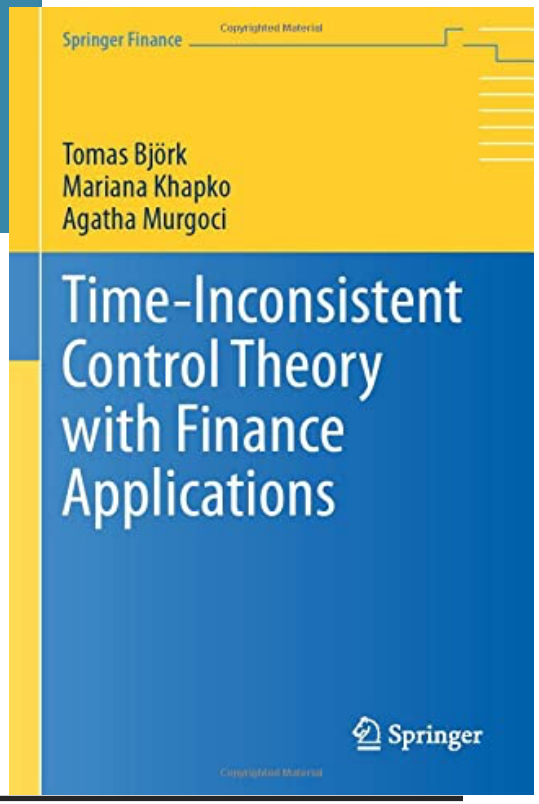

TOMAS BJÖRK
POINT PROCESSES
AND JUMP
DIFFUSIONS
An Introduction with
Finance Applications


Björk · Khapko · Murgoci
Time-Inconsistent Control Theory
with Finance Applications



- The first edition of *Arbitrage Theory in Continuous Time* was published in 1998, and the **fourth edition** came out in early 2020.
- **Used worldwide** in many graduate financial mathematics classes.
- The book grew from notes for graduate and Ph.D. courses that Tomas taught in the 1990s at KTH in Stockholm and ETH summer school in Ascona.
- " *The book is a **pedagogical masterpiece**; it is written in a lucid style that makes continuous-time mathematical finance easy – and easy in the best possible way*." — Rolf Poulsen (Dept. of Mathematical Sciences, University of Copenhagen)





- "He was still active in his beloved mathematics up to the last day." — from BFS obituary
- Indeed, in the fall of 2020 Tomas was **finalizing two(!) books**.
- The **book on point processes** provides an introductory overview of stochastic calculus for marked point processes and jump diffusions with applications to filtering, stochastic control and finance.
- The **book on time-inconsistent control** puts together a decade of his interest in time-inconsistent problems.

Role in math finance community

"Tomas influenced, motivated and accompanied many members of our community."

— from BFS obituary

President of the Bachelier Finance Society (2009-2011)

Co-editor of Mathematical Finance (2000-2004)

Associate editor of Finance and Stochastics

Associate editor of Annals of Applied Probability (2000-2003)

Organizer of math finance conferences and workshops

Referee for numerous journals

Tomas the teacher

"He had the ability to make complex continuous-time mathematics easy, accessible, and intuitive."

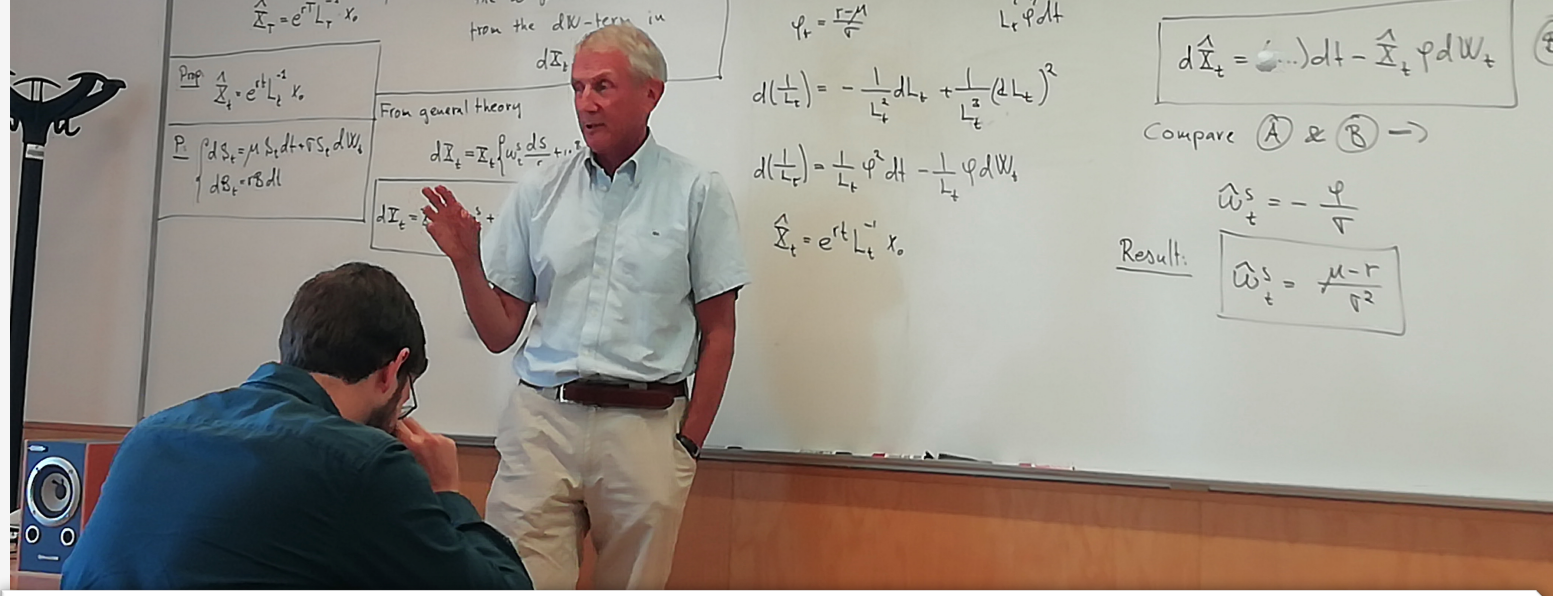
— **Per Strömberg**

Tomas with students at ISEG Lisbon School of Economics & Management

Teaching philosophy

"He was a gifted speaker … leaving long lasting impressions of clarity, understanding and depth."

— from BFS obituary

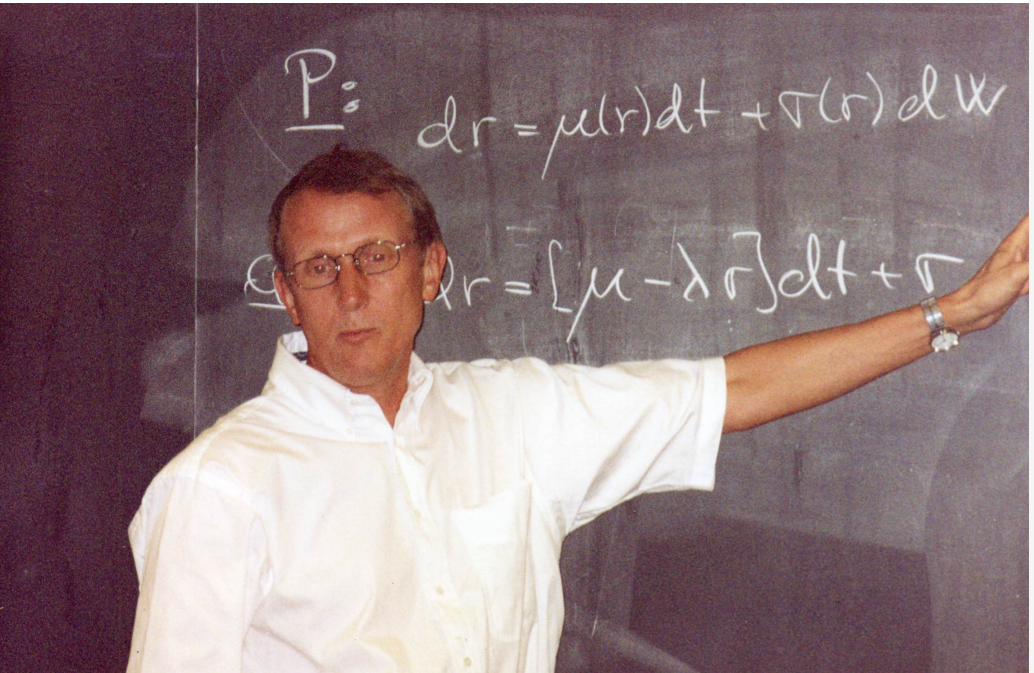


The pedagogical approach is that I have tried to provide as much intuition as possible while being reasonably precise.

- Tomas **loved** teaching students and students loved him … so much that they elected him as **KTH Teacher of the Year.**
- He was always **clear and structured**. Look at his board organization!
- He was **generous with his time** (e.g., often giving one-on-one lectures to his Ph.D. students).
- His advice for internalizing the work of others was to rewrite (and resolve) everything in your *own* notation.
- Tomas's **famous question** was "*What exactly do you mean?*".

Lecture series

Tomas traveled the world visiting leading academic institutions, giving lectures, and inspiring generations of students.



Lisbon

Vienna

Aarhus

Oxford

Barcelona

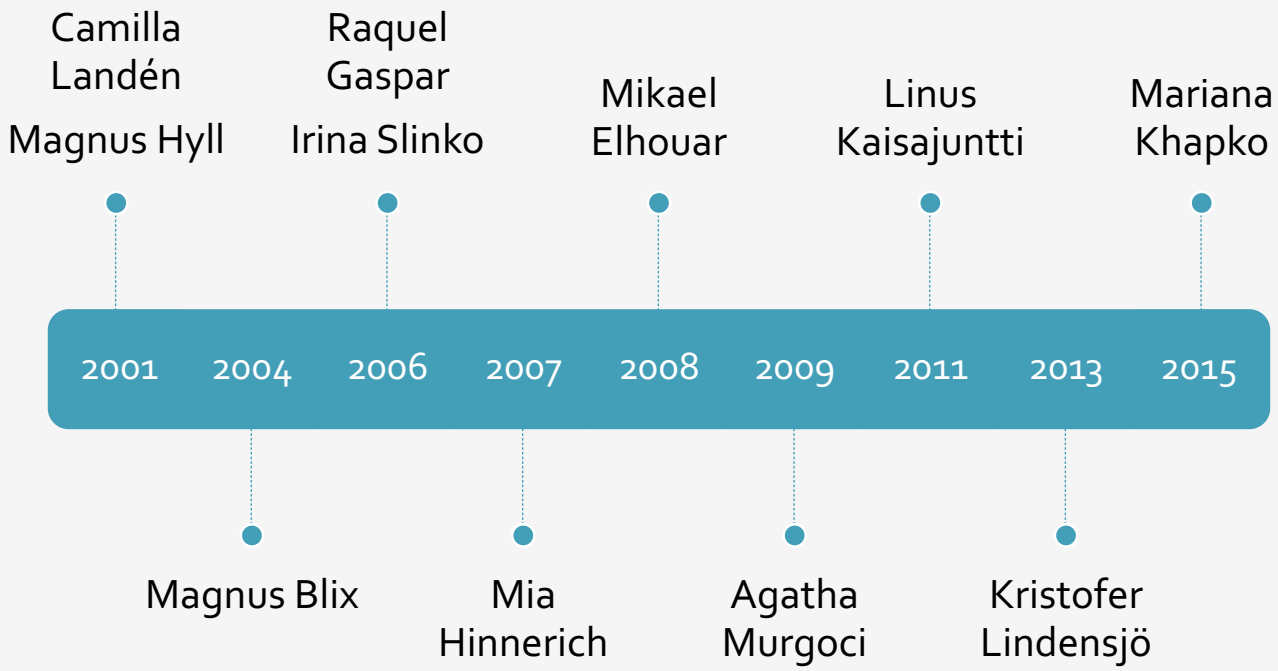
Sydney

Also, Linköping, Ascona, Bressanone, Lahtis, Budapest, Eindhoven, Dubrovnik, Amsterdam, Kaiserslautern, Princeton, Coimbra, Bologna, Austin, Kyoto, New York, Marrakesh, Montreal, and Toronto.

Academic kids

The Math Finance Gang

To us he was more than our academic advisor, he was our *role model*, our *mentor*, and a *close friend*.



Tomas the eternal student

"The endeavor to understand is the first and only basis of virtue."
— **Baruch Spinoza**

- While studying at KTH Tomas also took courses at SU in **philosophy** and in **Swedish literature**.
- After joining SSE as an Associate Professor, he took **elementary courses in economics and finance**.
- Tomas has written **many lecture notes**, among which *Equilibrium Theory in Continuous Time* (nearly 200 pages partly incorporated in the latest edition of his book).
- When Piketty's best-selling book *Capital in the Twenty-First Century* became the talk of the town, Tomas wrote ***Piketty for the Pedestrian***.

Abstract

These are merely my personal notes on some parts of the Piketty book [2]. The notes are written mainly in order to explain the theory to myself and to my old friend Lasse.

- Tomas remained curious and eager to learn new things up to the last day…