

# Financial Mathematics Reading Group 2015

Seminars are listed in reverse chronological order, most recent first.

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## **Tuesday 8 December**

Discussion led by Abdulla Al-Othman (LSE): equilibria in financial markets

## **Tuesday 1 December**

Discussion led by Jose Pasos (LSE): equilibria in financial markets

## **Tuesday 24 November**

Discussion led by Thomas Bernhardt (LSE): equilibria in financial markets

## **Tuesday 17 November**

Discussion led by Junwei Xu (LSE): equilibria in financial markets

## **Tuesday 10 November**

Discussion led by Denis Schelling (LSE): equilibria in financial markets

## **Tuesday 3 November**

Discussion led by Michael Kusnetsov (LSE): equilibria in financial markets

## **Tuesday 20 October**

Discussion of Michaelmas Term 2015 topic: equilibria in financial markets

## **Tuesday 13 October - Denis Schelling (LSE)**

### **Portfolio Optimisation**

I will be presenting my master thesis supervised by Johannes Muhle-Karbe, where I worked with a continuous-time self-financing condition taking into account features of high-frequency markets developed in Carmona and Webster (2013). The first part of the talk will be dedicated to the derivation of this equation and the empirical phenomena it relies on. I will then introduce the problem of mean-variance portfolio selection in a simple buy-and-hold setup and discuss utility maximisation when using this model. I will conclude my presentation by giving the main results obtained in this thesis.

## **Tuesday 17 March - Yavor Stoev (LSE)**

Presented his current work

## **Tuesday 10 March - Jose Pasos (LSE)**

**A model for Long-term Irreversible Capital Investment**

We consider a model for a company's project where an economic indicator (such as a price) measures how favourable market conditions are for the company's products. Depending on the state of the indicator, the investor can increase the project's capital until default or bankruptcy time is reached, however decreasing capital is not allowed. The problem consists of determining the strategies which optimal profit once the cost of investment is discounted. Mathematically, this model is a singular stochastic control problem which, under suitable assumptions, admits explicit solutions.

**Tuesday 3 March - Michael Kusnetsov (LSE)**

Presented his current work

**Tuesday 24 February - Junwei Xu (LSE)**

**Optimal liquidation in the Almgren-Chriss framework with Levy processes**

We consider an optimal liquidation problem in the Almgren-Chriss framework with infinite time horizon. The unaffected asset price is driven by a Levy process. The temporary price impact is described by a general function. We maximise the utility of an investor with constant absolute risk aversion, showing that the problem can be reduced to be over a set of deterministic admissible strategies. The optimal liquidation strategy is solved out explicitly by an optimal control approach. Moreover, we derive a Levy process which is a linear approximation to an exponential Levy process. Then starting from exponential Levy price, by using linear approximation, we show that the widely used power-law temporary impact function gives out an impractical strategy such that it is optimal to sell almost all shares in an extremely short time period. Hence, a new type of impact function, as a combination of power and exponential laws, is suggested.

**Tuesday 17 February - Thomas Bernhardt (LSE)**

**An Existence Theorem for Weak Solutions of Homogeneous SDEs with time-dependent Boundaries**

No abstract available

**Tuesday 10 February - [Dr Yerkin Kitapbayev](#) (University of Manchester)**

**Swing options**

Swing options are particular financial derivatives that may be described as American options with multiple exercises. They are widely traded in the energy markets and usually the option's underlying asset is the price of a given commodity. In mathematical terms the price of an option of this kind is described by the value function of an optimal stopping problem with multiple stopping times.

We assume that the dynamics of the price is a geometric Brownian motion and study the Swing put option on finite time horizon and two exercise rights. An

important parameter of this problem is the so-called refraction period. It can be interpreted as the minimal period that the option's seller needs to deliver a new portion of asset. The double optimal stopping problem reduces to standard single optimal stopping problem. Analysis of optimal exercise region gives a remarkable result: unlike the American put option problem with single optimal exercise boundary our problem has two boundaries, one is below the strike price, other one is above.

Using the local time-space calculus we derive a closed form expression for the option's price in terms of the optimal exercise boundaries for both exercise rights and show that the couple of optimal exercise boundaries for the first exercise can be characterised as the unique solution to system of nonlinear integral equations. This system is then evaluated numerically.

**Tuesday 3 February - Mathieu Dubois (LSE)**  
**Switching Stochastic Volatility Models and Option Pricing**

**Tuesday 27 January - Christoph Czichowsky (LSE)**  
Presented his current work

**Tuesday 20 January - Abdulla Al-Othman (LSE)**  
Presented his current work