# Actuarial Research Centre: Student experience

## *A brief account of my work as a PhD student*

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# My ARC project

Started in November 2012

Supervision:

Andrew Cairns, Alexander McNeil & Alex Veys

Initial Focus:

data driven methods for establishing liquidity premia on corporate bonds

Support from IFoA to present and discuss my work at many events

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# Liquidity Premium on Corporate Bonds

- The work is an attempt to extract liquidity premia on the single issue level, with high frequency (daily), using readily available information about bonds.

- Winner best paper award at the Inernational Congress of Actuaries 2014, Washington

- Published in Annals of Actuarial Science, September 2015

- Presented work at ICA (2014), Risk & Investment IFoA conference (2014), CISI bond group (2014), IFoA sessional research event (2014) and seminars

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# Liquidity Premium on Corporate Bonds:
## *Paper in a nutshell*

- What is a Liquidity Premium?

- Illiquidity Premium of Liquidity Premium?

- Why do we care about Liquidity Premium Estimates?

- Wat is the liquidity of financial instruments / markets?

  – Theory & empirical proxies

  – Recently: Bank inventories? Regulation? Liquidity?

- Previous modelling efforts:

  – Structural models ($\rightarrow$ Bank of England)

  – CDS-based approach, model-free

  – Statistical models

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# Liquidity Premium on Corporate Bonds:
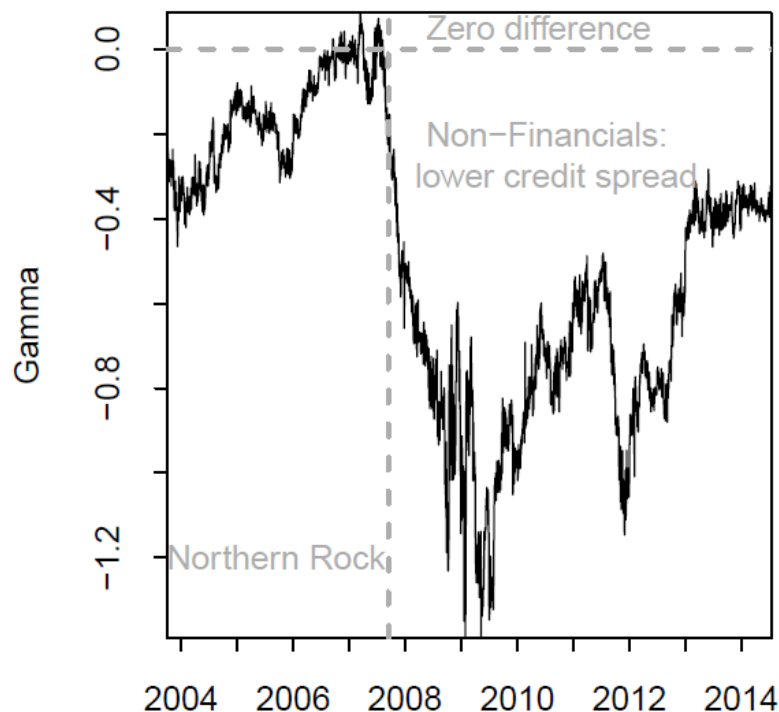## *Paper in a nutshell (ii)*

- Extensive, yet accessible Markit Iboxx IG GBP dataset

  - Daily data for ~1500 bonds, from 2003 - now

- Two stage statistical modelling using just linear regression:

  - Derive a relative liquidity proxy, related to the bid-ask spread

  - Model credit spread as a function of bond characteristics, inclusing RBAS

  - Derive liquidity premium estimate

- We fit daily cross-sectional regression models, no explicit time component

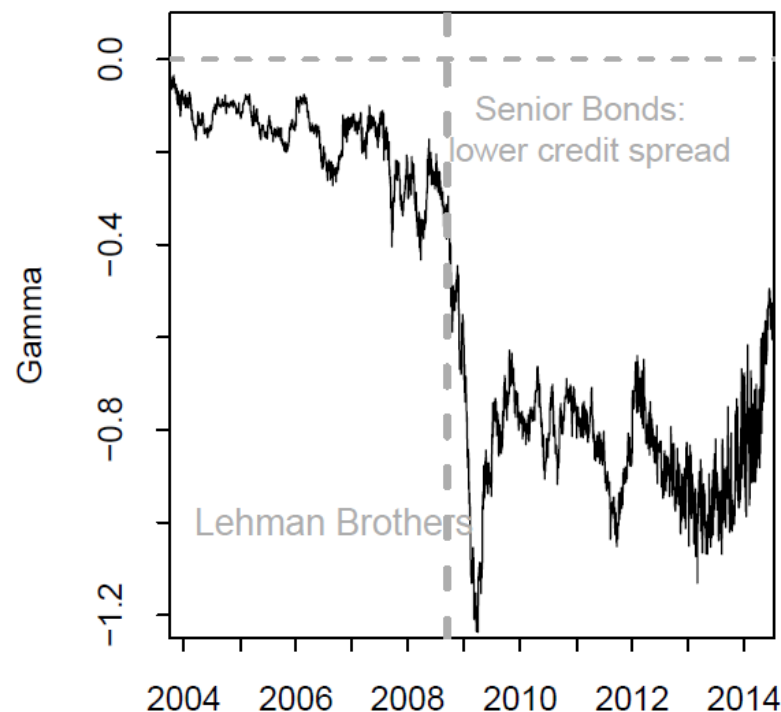- Stitching the estimated coefficients together, we get an interesting and intuitive picture of model dynamics

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# Liquidity Premium on Corporate Bonds:
## *Paper in a nutshell (iii)*

- Ultimately, we have an estimate of Liquidity Premia for each bond, on each day, based on a model which is both robust and intuitive. An example of model dynamics;



**A−rated Bonds: Gamma Coefficient Non−Financial Indicator**

Zero difference

Non−Financials: lower credit spread

Northern Rock

**A−rated Bonds: Gamma Coefficient Seniority Indicator**

Senior Bonds: lower credit spread

Lehman Brothers

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# Liquidity Premium on Corporate Bonds:
## *Paper in a nutshell (iv)*

- What is so useful?

    - Frequent estimates

    - Daily distributions of premia, rather than market-wide (point) estimates

    - Robust extrapolation; in the regression, RBAS is, by definition, uncorrelated to other covariates, which allows the perfectly liquid equivalent to be estimated

    - Only readily available, bond-only, information is used, but can be extended if needed

# Liquidity Premium on Corporate Bonds:
## *Current work*

- Exploring the extent to which structural models can be used in a similar way

- Complex, subjective, parameterisation in a 'model of the firm' to arrive at a fair credit spread

- Liquidity Premium simplified to be the difference between observed spread and fair spread (model estimate)

- 'Re-creating' the Bank of England's implementation of the Leland & Toft model
  - Update estimates on the Markit Iboxx dataset
  - Sensitivity analysis
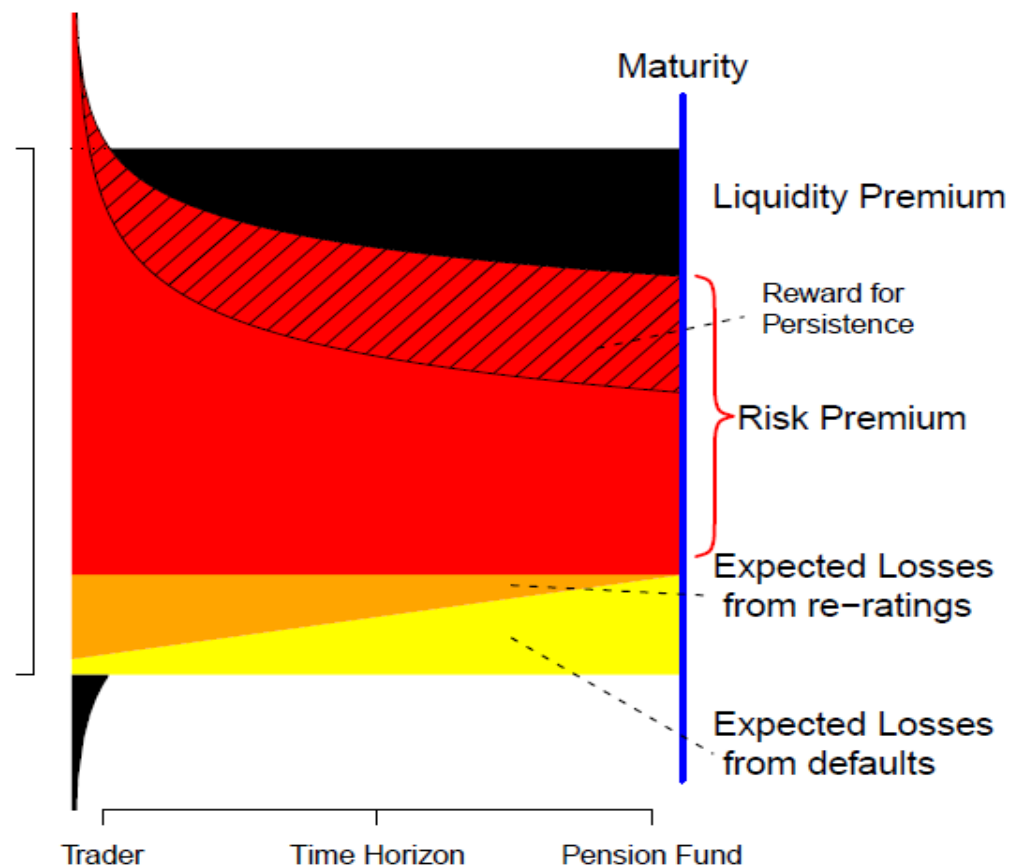  - Extend to bond level analysis

# Liquidity Premium on Corporate Bonds:
## *Future work?*

- Holding period effect and Liquidity Premia:
  - What is the expected value of the liquidity premium?
  - Considers turnover of a portfolio
  - Considers stochastic evolution of premium estimates
  - Considers premium accrual over time

- Explicitly model a liquidity term structure
- Not imposing a functional form



**Decomposing the Credit Spread**

Maturity

Liquidity Premium

Reward for Persistence

Risk Premium

Expected Losses from re-ratings

Expected Losses from defaults
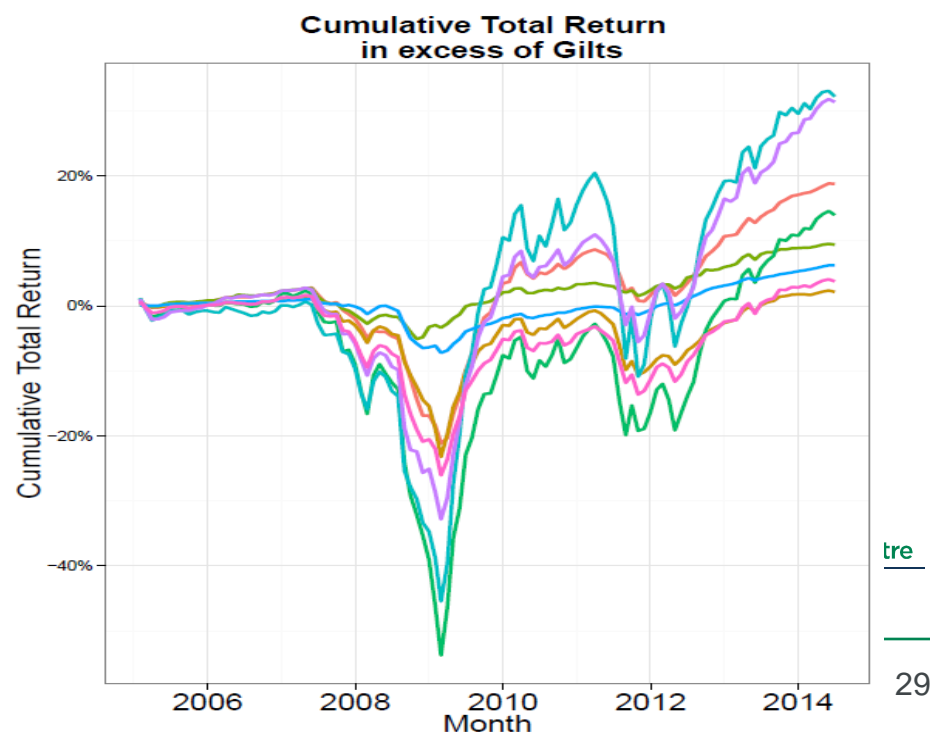
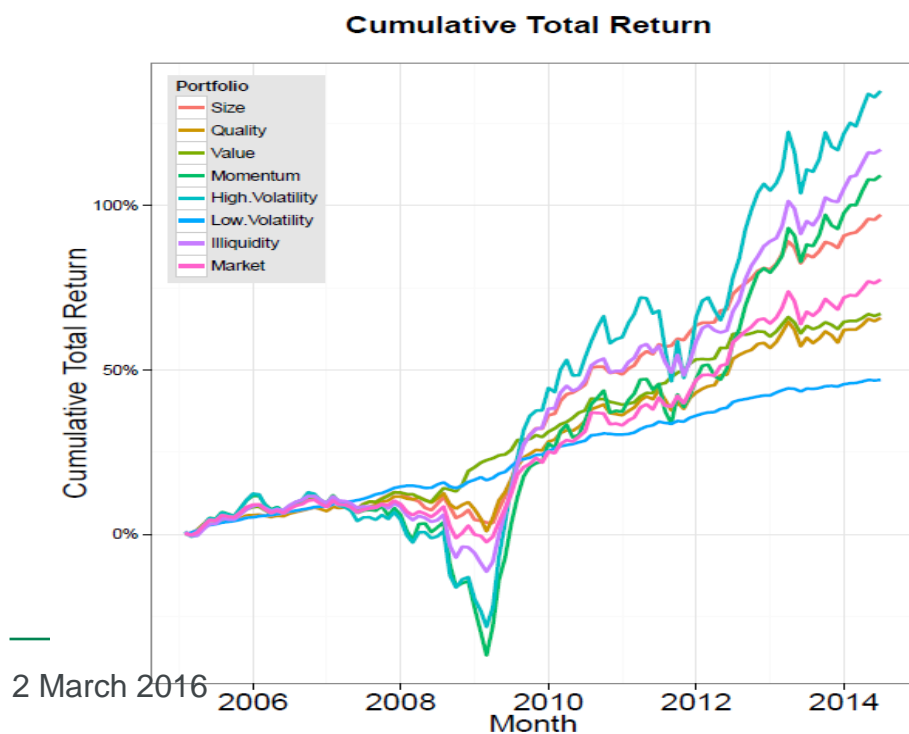Trader — Time Horizon — Pension Fund

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# Quantitative Factor Investing in Corporate Bonds

- Investigate whether we can define factor portfolios, common in equity markets, using bond-only information, that have attractive features

- Presented as work in progress at the Actuarial Teachers and Researchers Conference (2015)

- Paper in submission



**Cumulative Total Return**

Portfolio
- Size
- Quality
- Value
- Momentum
- High.Volatility
- Low.Volatility
- Illiquidity
- Market

**Cumulative Total Return in excess of Gilts**

# Many smaller projects

- Currently finishing a paper that look at stochastic credit models and model risks embedded in rating migration matrices

- Most of my time spent, did not make this very short presentation

- Most of my time spent, did not 'amount to anything'

- An opportunity and obligation to explore subjects (only loosely) related to the outlined PhD project

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