

Modelling the Liquidity Premium on Corporate Bonds

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Partnership

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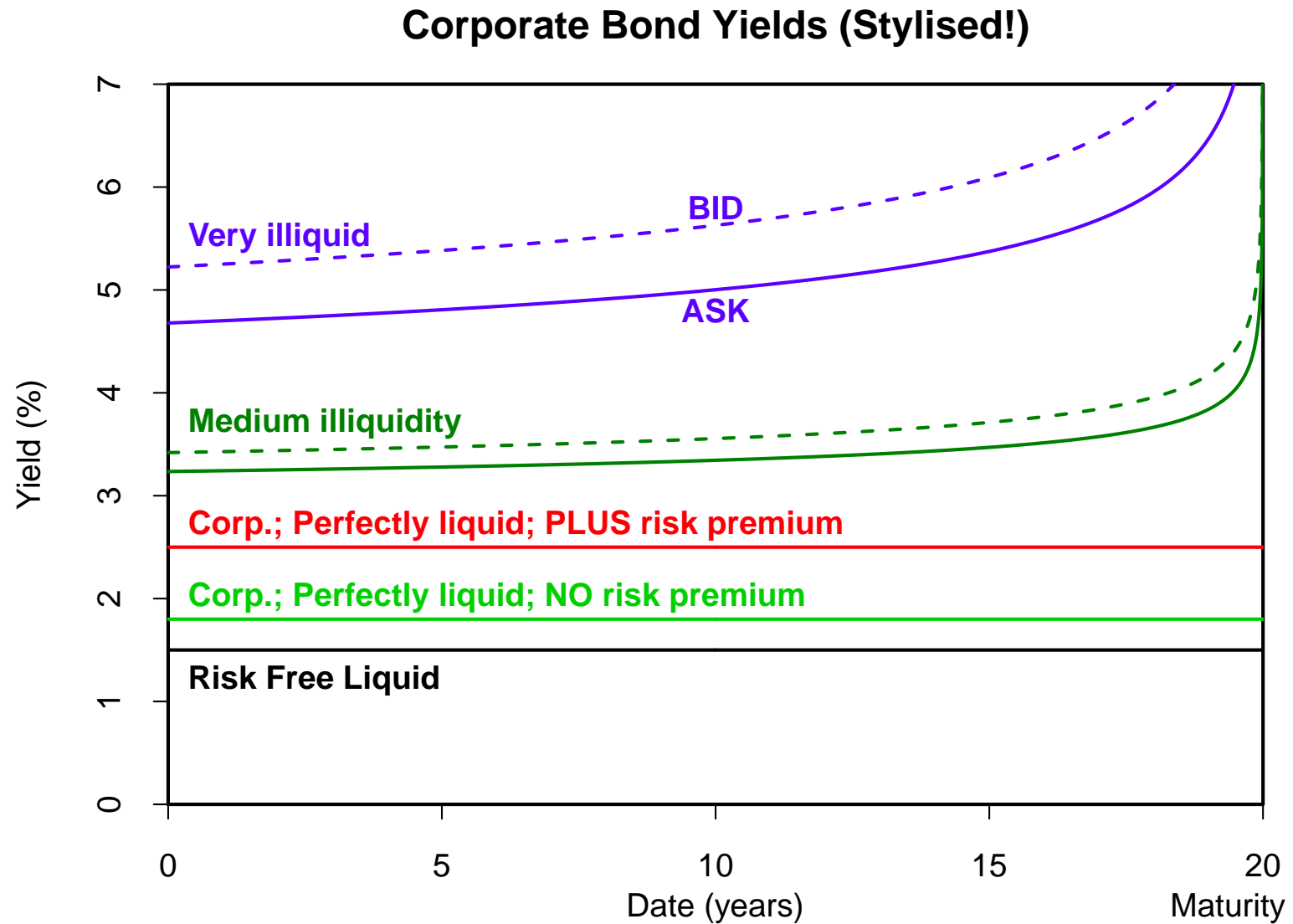
Plan

- The problem
- Stylised decomposition of bond prices and spreads
- Modelling the Bid-Ask Spread
- Modelling the Credit Spread
- Discussion

The problem

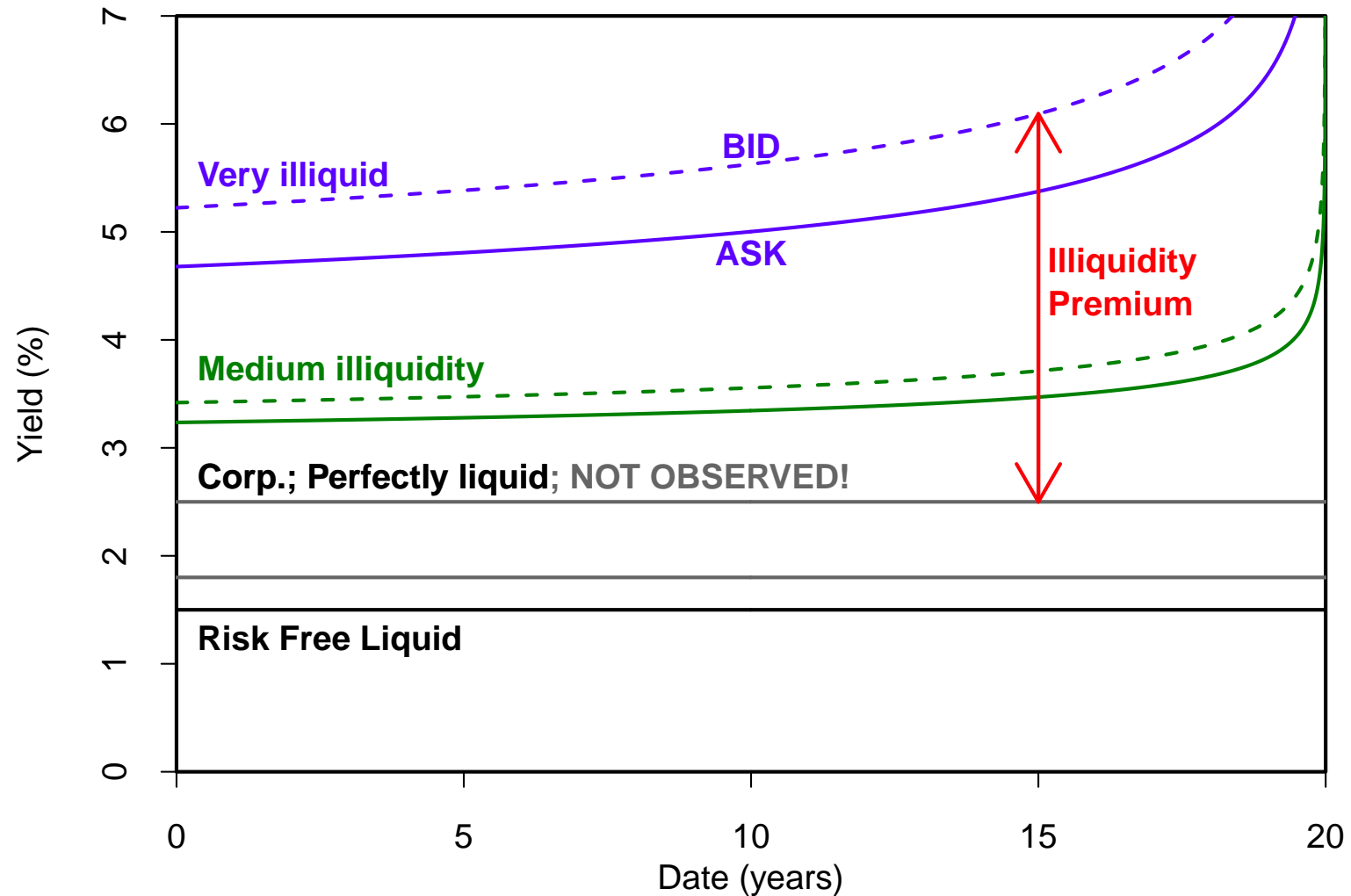
- How to decompose the credit spread on a corporate bond?
 - Expected default and rerating losses
 - Risk premium for default/rerating risk
 - Illiquidity premium
 - Other factors
- **Hold to maturity** *versus* sell before maturity
- Impact on liability valuation

Equivalent Bond Yields



Illiquidity Premium (LQP)

Corporate Bond Yields (Stylised!)



Data

Markit: GBP investment grade corporate bonds

- Daily from 2003 to 2013 ($\approx 2500 \times 1000 \times 50 = 125$ million items)
- Contractual data:
e.g. coupon rate, maturity, issuer, seniority etc.
- Unpredictable, time dependent data
 - Bid and Ask prices (quotes not transactions!)
 - Credit rating
 - Credit spread
 - etc.

Modelling Summary

Stage 1:

- Model the Bid-Ask spread as a function of various inputs
- Output: Relative Bid-Ask Spread for each bond (**RBAS**)

Stage 2:

- Model the Credit-Spread as a function of various inputs

Stage 3:

- Estimate the price of each bond as if it was perfectly liquid
- **Difference in yield = illiquidity premium**

$$BAS(i, r, t) = (\text{Ask Price} - \text{Bid Price}) / \text{Bid Price}$$

$$I_X(i, t) = \text{characteristic X indicator: 0 or 1}$$

$$\log BAS(i, r, t) = c(r, t)$$

$$+ \beta_{1,F}(r, t) \times \log \text{duration}(i, t) \times I_{Fin}(i)$$

$$+ \beta_{1,NF}(r, t) \times \log \text{duration}(i, t) \times I_{NF}(i)$$

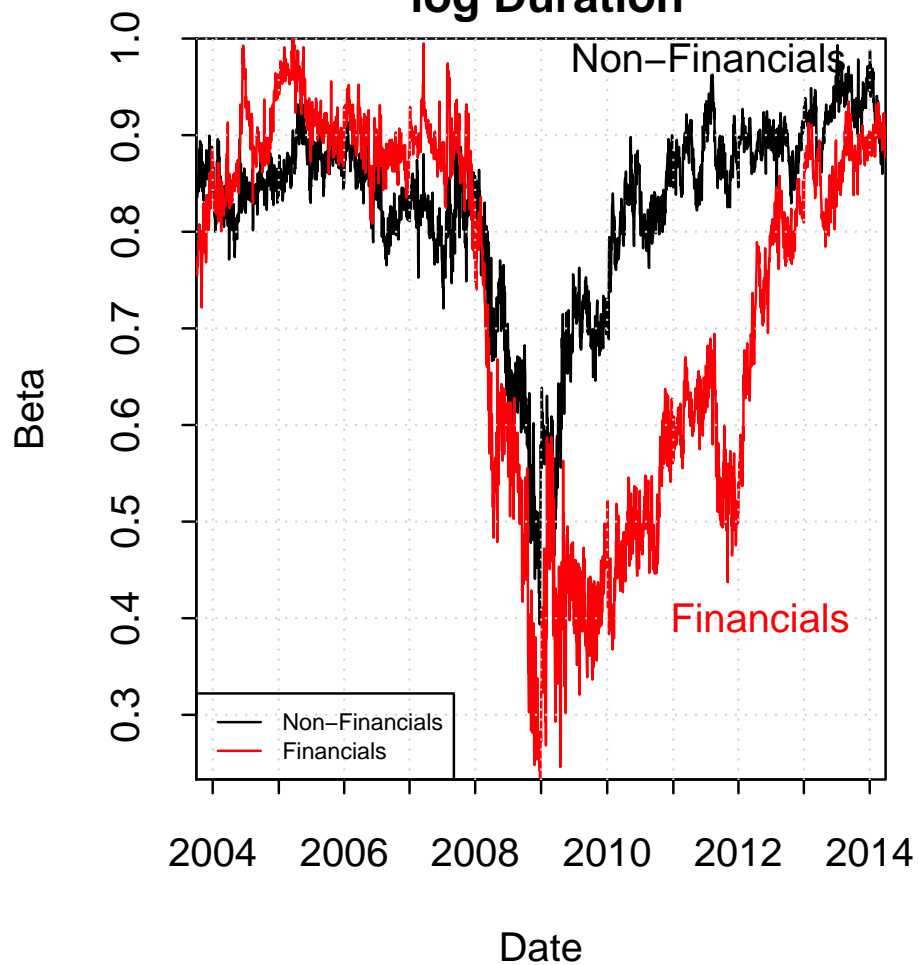
$$+ \beta_2(r, t) \times \log \text{notional}(i, t)$$

$$+ \sum_k \beta_k(r, t) \times I_k(i, t)$$

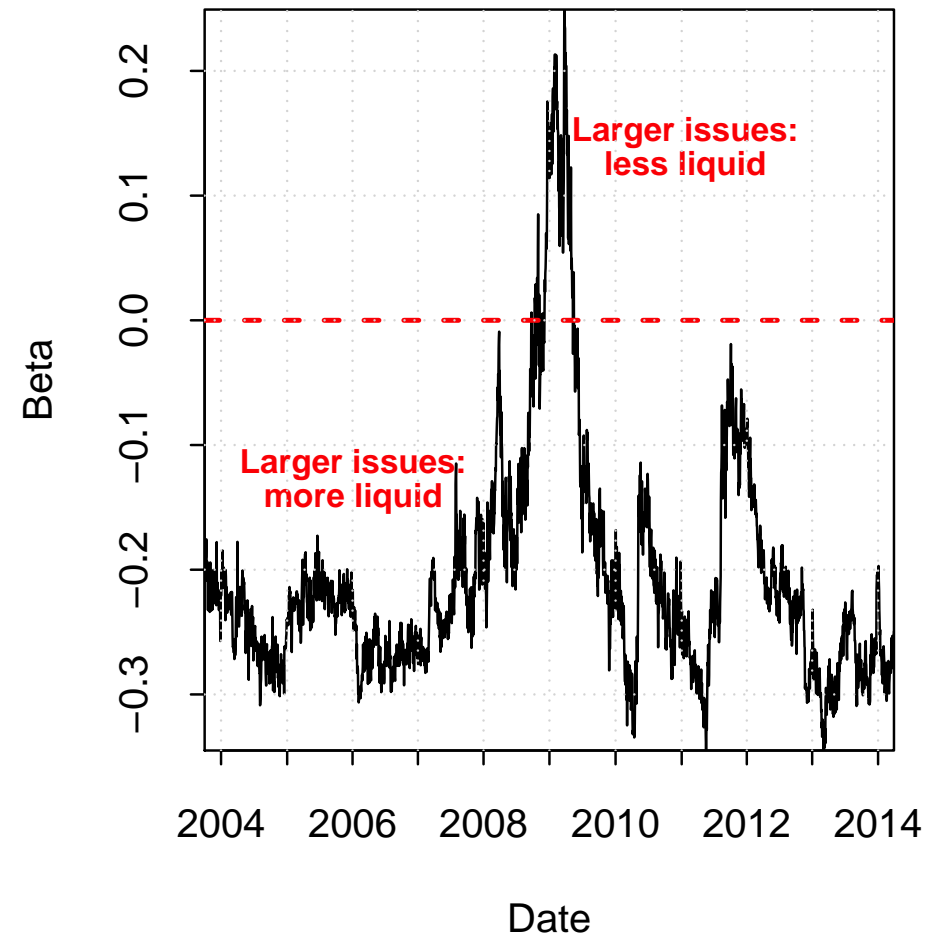
$$+ \log RBAS(i, t) \quad (\text{residual}).$$

Indicators: Financials; Sovereign; Senior; Collateralised; Bond age ...

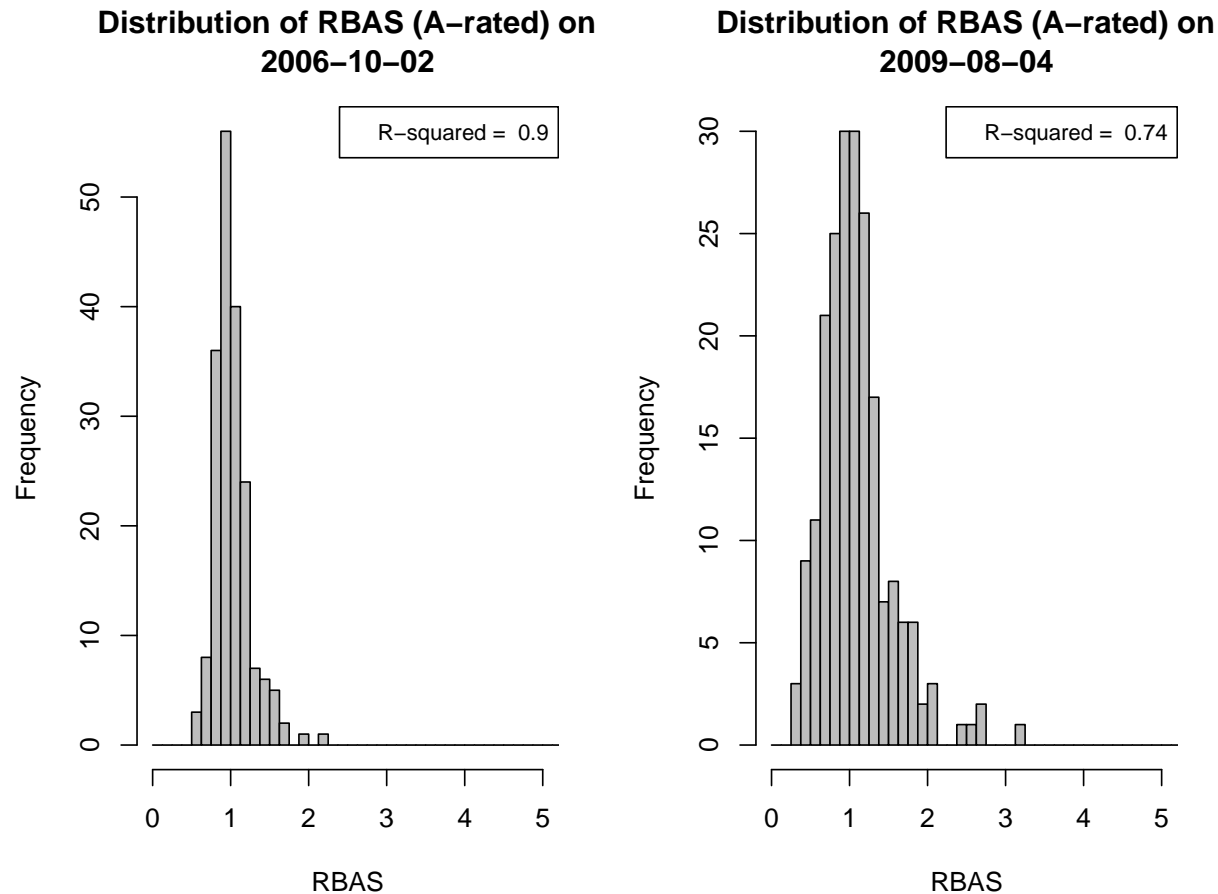
**A-rated Bonds: Beta Coefficient
log Duration**



**A-rated Bonds: Beta Coefficient
log Notional Amount**



x-axis: e.g. “2008” means 1 January 2008



e.g. $RBAS = 2 \Rightarrow BAS$ is $2 \times$ the predicted BAS
 $RBAS = 0 \Rightarrow BAS = 0$; perfectly liquid

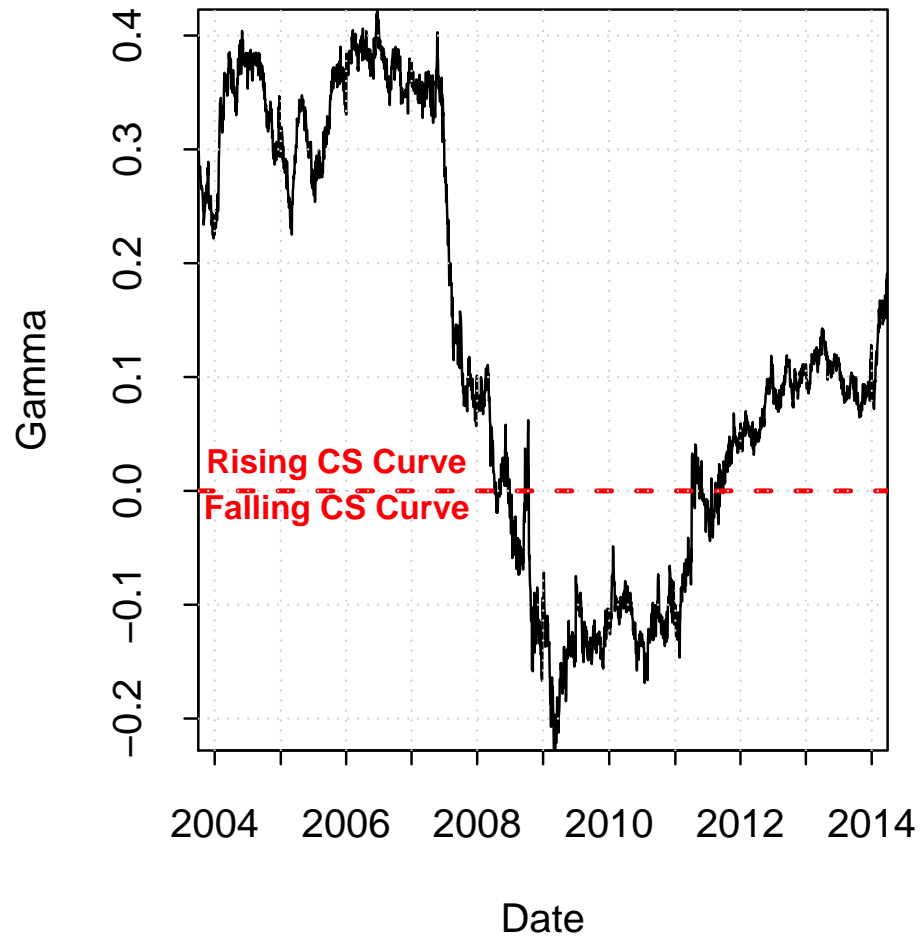
RBAS uncorrelated with inputs

Credit Spreads

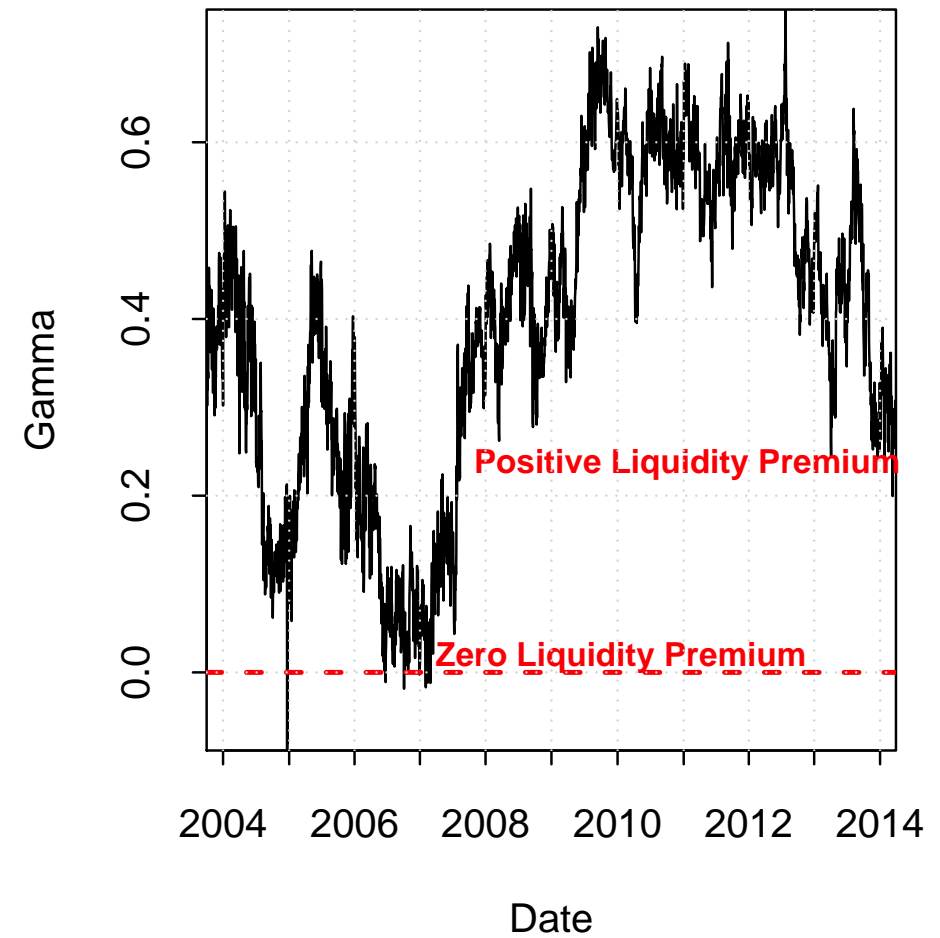
$$\begin{aligned}\log CS(i, r, t) = & d(r, t) \\ & + \gamma_1(r, t) \times \log \text{duration}(i, t) \\ & + \gamma_2(r, t) \times \text{RBAS}(i, t) \\ & + \gamma_3(r, t) \times I(\text{bond age}(i, t) < 1) \\ & + \gamma_4(r, t) \times \text{coupon}(i, t) \\ & + \sum_k \gamma_k(r, t) \times I_k(i, t) \\ & + \epsilon(i, t) \quad \text{(residual).}\end{aligned}$$

Indicators: Financials; Senior; Collateralised;...

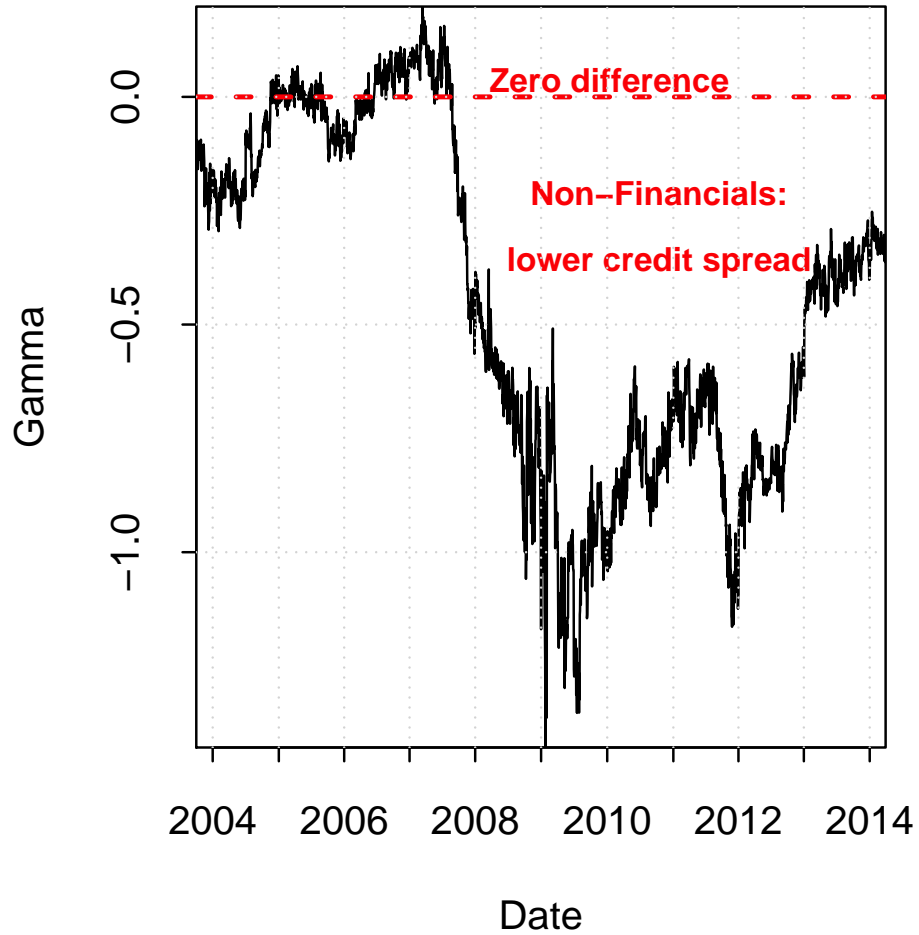
**A-rated Bonds: Gamma Coefficient
log Duration (Non-Financials)**



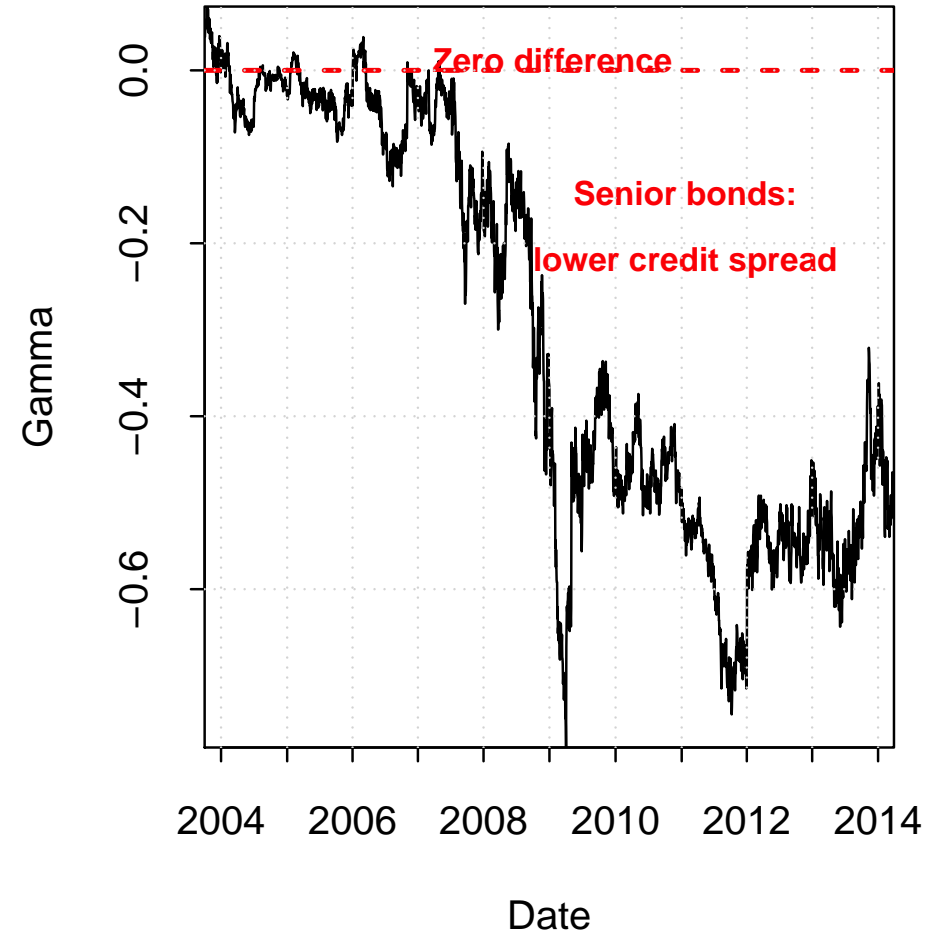
**A-rated Bonds: Gamma Coefficient
Relative Bid-Ask Spread (RBAS)**



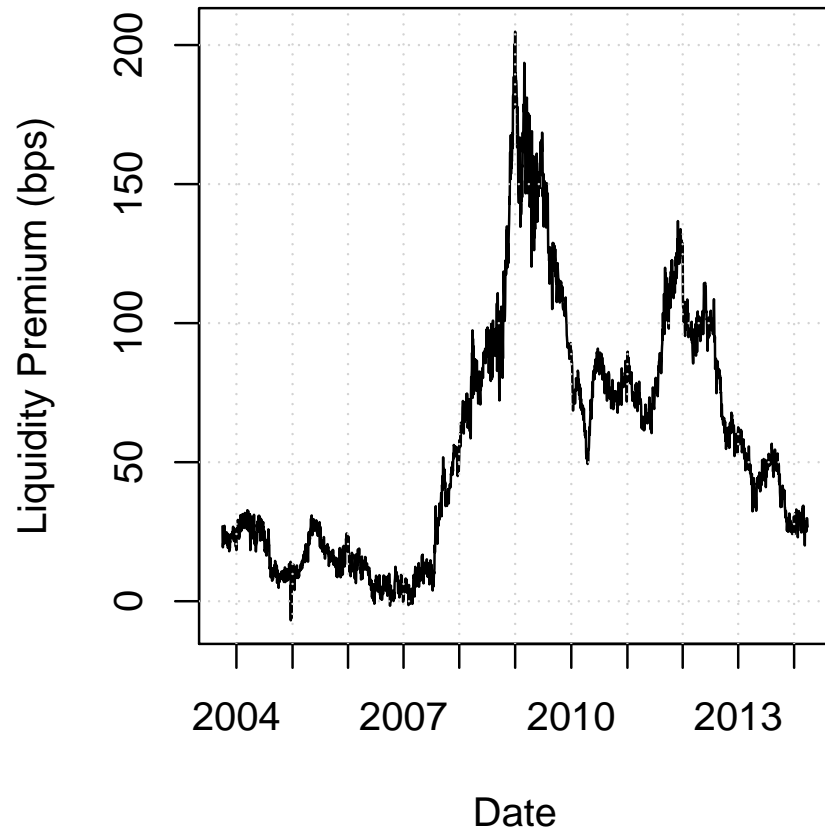
**A-rated Bonds: Gamma Coefficient
Non-Financial Indicator**



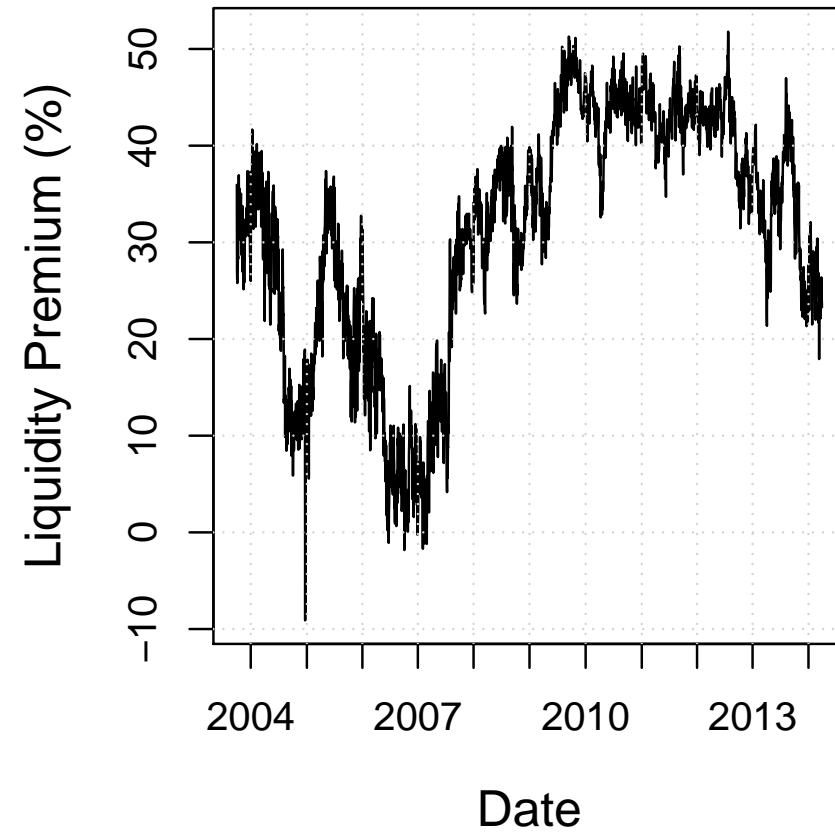
**A-rated Bonds: Gamma Coefficient
Seniority Indicator**



**Median Liquidity Premium
in bps (A-rated)**



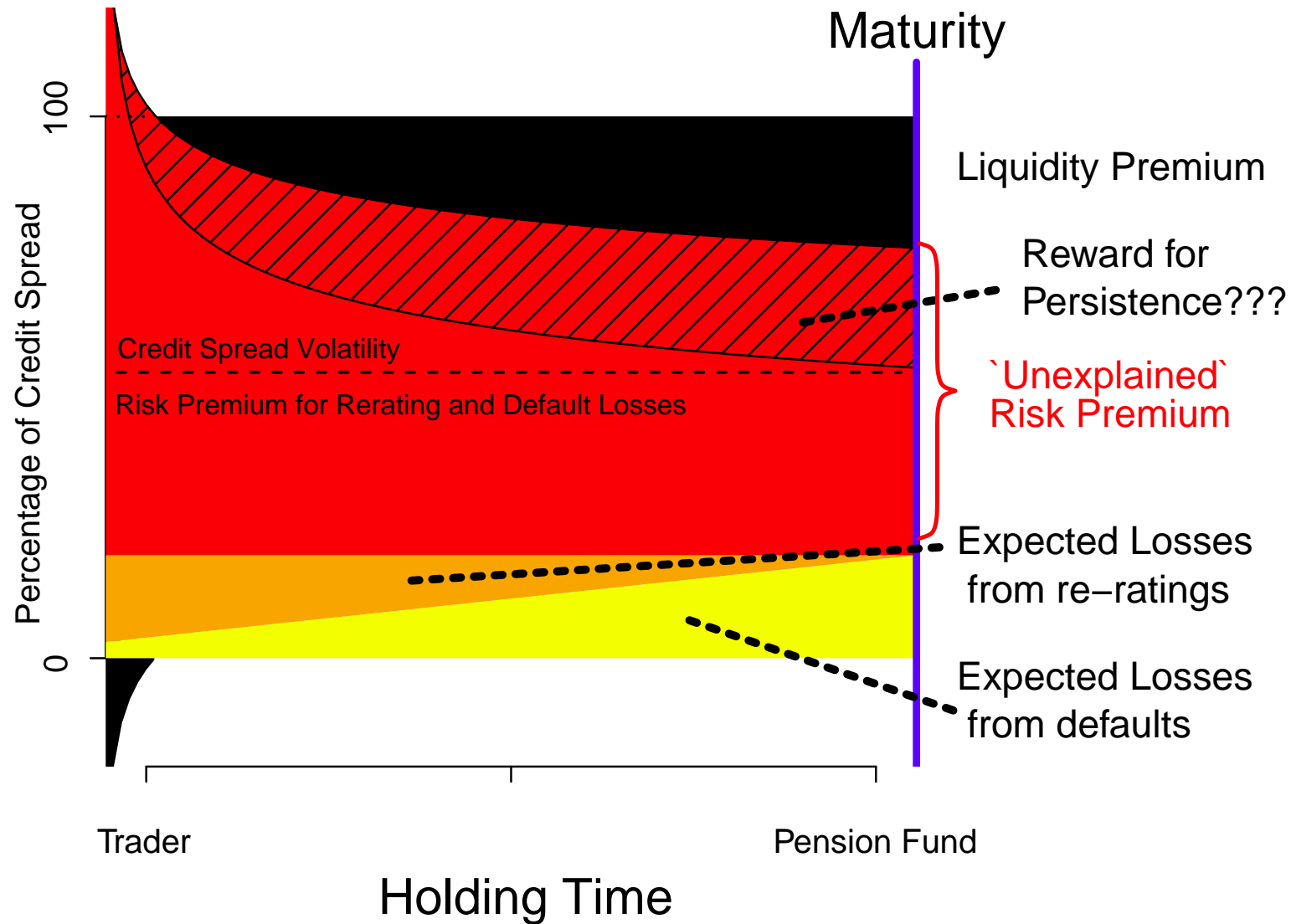
**Median Liquidity Premium
in % (A-rated)**



Observations

- Method applies to all quoted bonds on individual basis
- Objectivity: Method requires no subjective inputs
- Parameter estimates are robust
- Parameter dynamics consistent with market events
- Illiquidity premium (LQP) *as a percentage of credit spread*
 - Varies considerably: between bonds; over time; rating
 - e.g. A-rated bonds during 2011:
Median $LQP \approx 40\%$; 10% quantile $\approx 32\%$; 90% $\approx 55\%$
 - More generally: LQP ranges from 20% to $> 70\%$
 - Exception: much lower just before Northern Rock collapse

Decomposing the Credit Spread (Stylised)



Discussion and Future Work

- Markit data: quotes, not actual transactions
- Ongoing work:

Compare *hold-to-maturity* with *sell-on-BB-downgrade*:

How much of the Illiquidity premium do we sacrifice?