# Discussion of "Credit and Liquidity in Interbank Rates: A Quadratic Approach" by Simon Dubecq, Alain Monfort, Jean-Paul Renne and Guillaume Roussellet

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# Main Findings

- Proposes a two-factor quadratic Gaussian model for the Euribor-OIS spread.
  - The OIS curve is assumed to be the risk-free curve.
  - The Euribor curve is modeled using a reduced-form model of default.
  - Under the assumption that the default intensity is independent of the short rate, the Euribor-OIS spreads are shown to only depend on the default intensity $\lambda_t$.
- Empirically one factor captures 96% of the variation in the spreads.
- Assume that $\lambda_t = \text{Quadratic}(x_t)$ where $x$ follows one-dimensional Gaussian AR1 process to get one-factor no arbitrage model of spreads: $S(x_t) = \text{Quadratic}(x_t)$.
- Estimate the liquidity and credit component of $x = x_c + x_l$ where $x_c$ and $x_l$ are both Gaussian AR1 processes.
- Use empirical proxies:
  - $P_c$ for $x_c$: the first PC of European banks' CDS.
  - $P_l$ for $x_l$: the first PC of KfW-Bund spread and Tbill-Repo spread and ECB Bank lending standard survey.
- Assume observation equations $P_c = \text{Quadratic}(x_c)$ and $P_l = \text{Quadratic}(x_l)$
- Estimate the system using Augmented Kalman Filter and find:
  - Good fit
  - spread mostly driven by liquidity risk (as opposed to credit risk).

# Quadratic-Gaussian Models are Affine Models.

- Consider $\lambda_t = \lambda_0 + \lambda_1 x_t + \lambda_2 x_t^2$ where

$$dx_t = \kappa x_t dt + \sigma dz_t$$

- If define $y_t = x_t^2$ then

$$dy_t = (2\kappa y_t + \sigma^2)dt + \sigma x_t dz_t$$

- Clearly, $(x_t, y_t)$ is an affine process that nests the quadratic-Gaussian framework (the latter imposes $y_0 = x_0^2$).
- Definition of affine process: it has an exponential affine characteristic function (Duffie Filipovic, Schachermeyer).

$\Rightarrow$ A quadratic Gaussian model is a restricted affine model!

- This is minor 'semantics' issue (but makes running horse races between quadratic and affine processes a non-starter).

# Model Specification

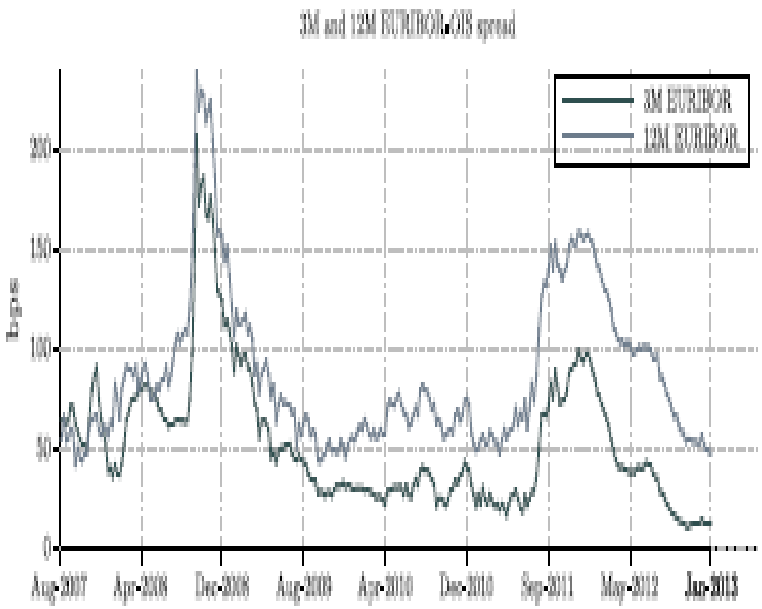
- EURIBOR bond is priced assuming that with probability $\lambda_t dt$ it pays **nothing** in crisis state (i.e., when $d_t$ jumps from 0 to 1)
- Proposed interpretation
  - default event (borrower defaults).
  - liquidity event (lender needs his money back early and incurs costs?).
- In addition model assumes:
  - Crisis state does not affect state price density (and short rate).
  - $\lambda_t$ is independent of interest rate.
- Both of these assumptions seem difficult to justify on economic grounds:
  - default of large financial institutions seems systemic,
  - liquidity crisis associated with flight to liquidity/quality and contagion risk.
- Might be useful to test them empirically (if not model them explicitly):
  - Allow for $\lambda_t^Q \neq \lambda_t^P$ (Jump to default risk).
  - Allow for jumps in short rate and correlation with intensity ($d\lambda_t dd_t \neq 0$ and $d\lambda_t dr_t \neq 0$).

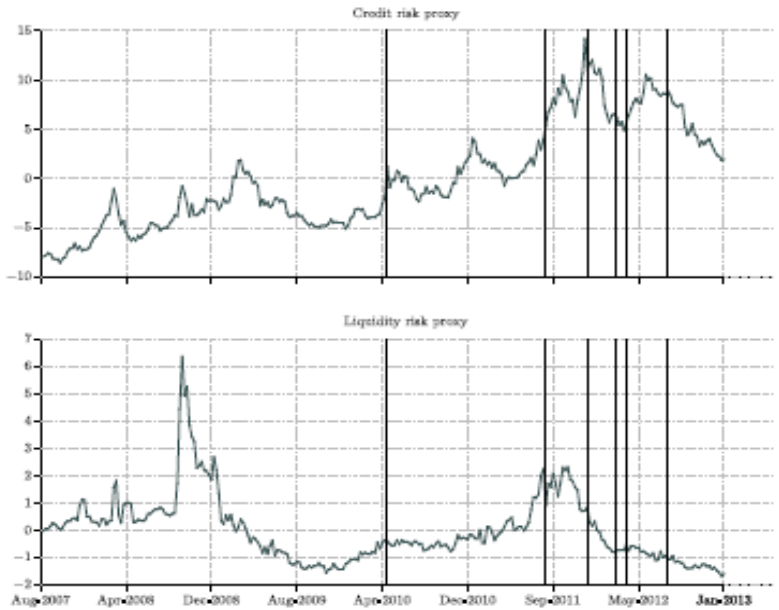
# Empirical Design

- Can we distinguish (bank) credit risk from liquidity risk?
  (see Duffie's description of failures of large dealer banks, such as Bear Stearns, and Lehman).
- Interesting fact that EURIBOR spreads are mostly driven by one-factor empirically is suggestive that both liquidity and credit factors are highly correlated.
- Empirically the paper distinguishes both component by imposing that they are unconditionally correlated (through the drift) and conditionally uncorrelated (through contemporaneous shocks). However since $x_c, x_l$ are latent variables they could be equivalently rotated so as to be unconditionally uncorrelated and driven by conditionally correlated shocks.
- Econometric identification is achieved by using observables that are assumed to depend solely on one or the other variable, e.g., $P_c = Q(x_c)$ and $P_l = Q(x_l)$. However, it seems unlikely that credit spreads do not depend on liquidity and vice-versa.
- It might be good to relax these assumptions, and for example allow for $P_c = Q_c(x_c, x_l)$ and $P_l = Q_l(x_c, x_l)$.

# Last comment

- Using Eyeconometrics it seems clear that liquidity proxy explains most of the variation in the Euribor-OIS spread.




- How good is the proxy for credit risk at capturing **Refreshed credit quality** component of the Euribor panel?
- Perhaps a simpler test would we warranted:
  - estimate one factor latent variable model of credit spread ($S(x_t)$) with $x_t$ AR1.
  - 'Regress' $x_t$ on credit and liquidity proxies.

# Conclusion

- Great econometrics.
- Might be good to test (and/or) relax several of the modeling assumptions.