Do Central Bank Liquidity Operations Affect Interbank Lending Rates?

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Background

- During Summer 2007 markets experienced significant disruptions:
    - ▶ Subprime meltdown in mid June (Bear Stearns hedge fund defaults)
    - ▶ Credit spreads widened in July 16-30 (IG spreads doubled)
    - ▶ Quant strategies breakdown August 3-10 (25 std deviation event!)
    - ▶ BNP suspends redemption in some of its funds on Aug 9
    - ▶ Interbank and ABCP markets show signs of tremendous stress
    - ▶ ECB and Fed inject 150bln euros and 24 bln dollars on Aug 9-10

- Events continued to deteriorate in the Fall (e.g., Northern Rock)

- The FED cut rates several times and, on December 12, launched the Term Auction Facility (TAF) to *allow the efficient dissemination of liquidity by allowing the FED to inject term funds through a broader range of counterparties and against a broader range of collateral*

- **Q?** Evaluate the effectiveness of the TAF at improving lending conditions in interbank markets.

- **Q?** Distinguish liquidity risk from credit risk. (TAF is expected to mainly affect liquidity risk and possibly indirectly credit risk).

Existing Studies

- Two earlier papers use event-study methodology (compare LIBOR around TAF annoucement/operation days controlling for credit risk using bank CDS) to investigate impact of TAF on LIBOR rates and find conflicting results.

  ▶ Taylor and Williams focus on level of LIBOR (TAF has no effect)

  ▶ Andrews, Sarkar and Wang focus on changes in LIBOR (TAF improves liquidity/reduces LIBOR rates)

- This paper revisits the question using different methodology:

  ▶ Estimates a 6-factor non-linear affine arbitrage-free asset pricing model.

  ▶ Allows for regime-shift pre and post TAF.

  ▶ Looks a 'counterfactual' path of LIBOR rates.

$\Rightarrow$ Finds substantial impact of TAF in decreasing LIBOR rates.

Methodology

- Data on ∼53 time series from January 1995 to July 25, 2008:
  - 8 Treasury bond zero-coupon yields from 3mths to 10 year maturity
  - 3, 6, and 12 mths LIBOR rates
  - BBB, A, AA rated US bank and A and AA financial corporation zero-coupon yield for 8 maturities each
- 6-factor Gaussian affine model of three term structures:
  - 3-factor term structure model for Treasury curve with parameter restrictions on risk-neutral dynamics to generate Nelson-Siegel yield curve shapes.
  - 5-factor Gaussian model for the BBB-AA yield curves (3 treasury + 2 independent credit spread factors).
  - LIBOR rates are equal to the short end of the AA-curve + 1 independent factor capturing *LIBOR liquidity*
- Very general *essentially affine* risk-premium structure (time-varying).
- Estimation using the Kalman Filter, allowing for regime change in parameters of the LIBOR liquidity factor after first TAF auction on Dec 14 2007

Results

- Find statistical evidence in favor or regime shift.

- Plot the path of the counterfactual LIBOR rate by setting the LIBOR factor equal to its long-term mean (its variation is only driven by the 3 term structure and 2 credit risk factors).

- Find that counterfactual LIBOR rate matches relatively well prior to August 2007 but would have been much higher than actual observed LIBOR especially after the first TAF auction of December 17.

- Conclude that TAF has been effective in improving liquidity in the LIBOR market and in particular at reducing LIBOR rates.

Questions on model specification and data

- Why restrict the Q-dynamics to obtain Nelson-Siegel? Restrictions could be tested:
  - ▸ Non-stationary interest rates
  - ▸ Same persistence for all factors

- Hypothesis of zero-correlation between credit spreads and risk-free term structure?

- Why is there a persistent spread between 3-month LIBOR and AA 3-month bank yields in the data?
  - ▸ Is it that the specific members of the LIBOR pool, which used to be the better than the average AA financials, are suddenly worse credit quality?
  - ⇒ How should we interpret/specify the LIBOR specific factor?

- Why do we need BBB, BB etc... yields?

Is the Affine model well-suited to identify the regime shift?

- To reliably estimate the 6-factor model needs lots of data.

- Given all the action at the end of the data set, no doubt the model will pick up a regime shift.

- The questions are:
  - Can we reliably identify when the shift occurred?
  - Can we limit the regime shift to one factor (the LIBOR specific factor)?
  - Can we establish causality (that TAF caused the regime switch)?
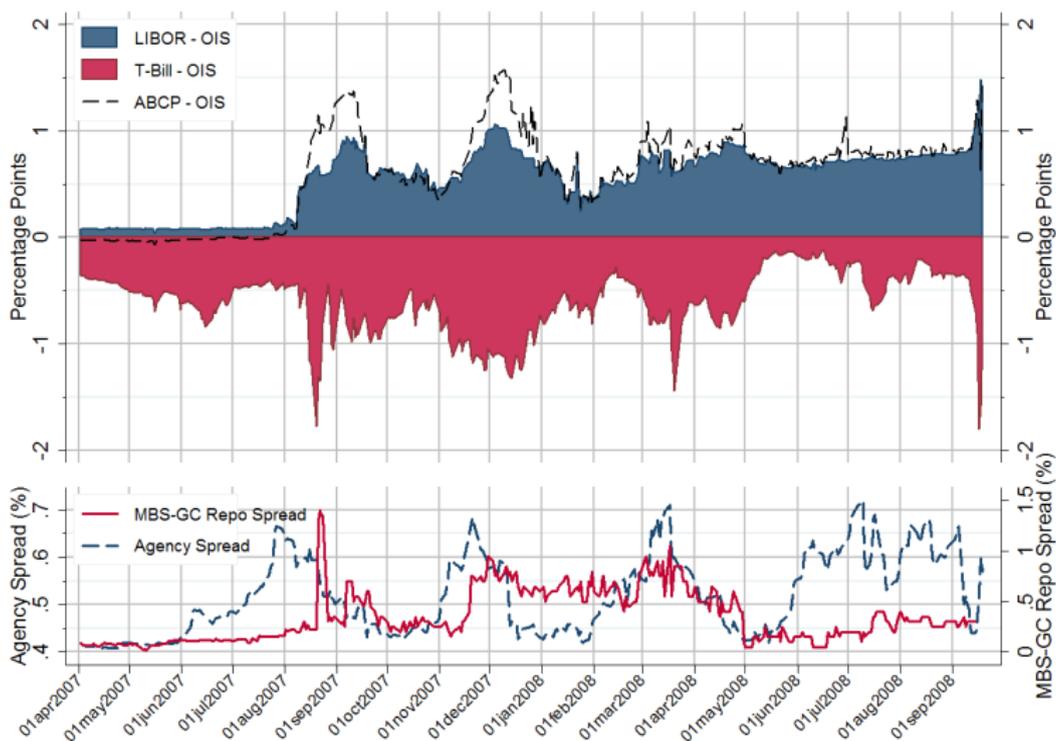
source: Markus Brunnermeyer

Conjectures and Questions

- You will pick up a regime shift wherever you put the break point.
- Is it possible to estimate where/when the break occurred?
- Eye-conometrics suggests:
  - ▶ break occurred in August of 2007, but
  - ▶ it was partly anticipated by agency-Treasury spread.
  - ▶ there was a break also in Treasuries.
- It seems difficult for the affine framework to reliably establish causality. Too many other 'events' happened in the December 2007-July 2008 period that might affect estimation results:
  - ▶ On March 11 2008, the Term Securities Lending Facility (TSLF)
  - ▶ On March 14, the FED provided emergency funding to Bear Stearns
  - ▶ On March 16 (Sunday), the FED offered a loan guarantee to JPM and launched the Primary Dealers Credit Facility (PDCF) to give access to the discount window to investment banks.
- Event study methodology seems better suited for that.

The counter-factual experiment

- Difficulty with counterfactual experiments: the Lucas critique.

- Is an affine term structure model a structural model?

- Can we think of the parameters of the 3 term structure factors and the 2 credit factors as independent of the policy experiment?

$\Rightarrow$ Affine models are fancy VAR (which impose - weak - no-arbitrage restrictions!).

- Statistical significance of counterfactual vs. actual?

General issues in assessing success of the TAF

- What was the TAF set up to achieve?
  - ► Lower LIBOR rates (the focus of this study and the two previous ones)
  - ► Increase lending in interbank market
  - ► Increase ABCP market activity
  - ► Reduce Treasury specialness
  - ► Prevent Money-market collapse
  - ► Prevent major bankruptcies
  - ► Save the quantitative hedge funds.

- My guess is (almost) all of the above.

⇒ Would be helpful to look at other measures (amount of lending, repo-specialness,...).

The issue of Credit Risk versus Liquidity Risk

- Seems difficult to answer without:
    - ▶ different data or
    - ▶ more structure on the model

- Reduced-form models of default don't distinguish between credit and liquidity risk factors in spreads.

- Similarly, in event studies when correct for credit spread by putting CDS spread in the regression, if widening in CDS is due to liquidity risk then could over estimate benefit of TAF.

$\Rightarrow$ Is it clear we want to focus on TAF's impact on liquidity risk and not credit?

Conclusion

- Ambitious paper: 6 factor model of 53 yields!

- Clear evidence that a regime shift happened.

- Would be interesting to test when it occurred.

- Not clear the methodology can reliably establish causality of TAF for reduced LIBOR rate relative to counter-factual.