Forward Guidance, Quantitative Easing, or both?

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Broad Research Question

- Unconventional monetary policy
    - Foward Guidance (FG)
    - Quantitative Easing (QE)
- Both were pursued, hoping at least one would work
- Did they?

- Our analysis boils down in large part to novel evaluation of QE (QE - here: not credit easing)

Evidence and rationale for QE

- Recent evidence supports the scope for portfolio balance / preferred habitat effects on interest rates
- *corr* (bond supply, yield) > 0
  - d'Amico, English, Lopez-Salido and Nelson (2012), Krishnamurthy and Vissing-Jorgensen (2011), Greenwood, Hanson and Vayanos (2015), d'Amico and King (2013), ...
- Importance?
  - Standard NK DSGE models $\implies$ QE irrelevant
  - However, if bond quantities outstanding determine yields
  - Then a central bank faced with the ZLB
  - Can reduce long term interest rates
  - By lengthening maturity of its balance sheet

QE: Evidence

- While the **interest rate** evidence is there
  - *corr* (bond supply, yield) > 0

- The **real effects** of QE through a portfolio channel appear absent
  - *corr* (bond supply, GDP) ≈ 0
  - Chen, Cúrdia & Ferrero (2012)

Estimating real effects of QE fraught with difficulty

- Challenges
  - Multiple government agencies act on the same instrument (maturity of outstanding public debt)
  - FG and QE often implemented simultaneously
  - Announcement effects (both FG and QE)

- ... and how we address them

Estimating real effects of QE

- Challenge 1
    - QE = central bank steering maturity of debt outstanding
    - Central bank is not the only one affecting maturity
    - Primarily: Treasury
    - US: Data suggests Treasury and Fed worked in opposite directions (Greenwood, Hanson, Rudolph and Summers, 2015)

- $\Rightarrow$ *Data*: study debt of different maturities outstanding ($\approx$ central bank balance sheet size)
- $\Rightarrow$ *Model*: rich structure for government debt maturity policy

Estimating real effects of QE

- Challenge 2
  - Announcement ahead of implementation is an important feature of actual policy
  - Difficult to account for in (S)VAR-analysis

- $\Rightarrow$ *Model*: DSGE enables accounting for anticipation

Estimating real effects of QE

- Challenge 3
  - FG and QE implemented simultaneously
  - Evaluating one policy in isolation may pick up the real effect of the other implemented (but unmodelled) unconventional policy

- $\Rightarrow$ *Model*: encompass both FG and QE

Contribution & preview of findings

- Building on Chen, Cúrdia & Ferrero (2012)
- Provide structural empirical framework which embeds
  - Maturity supply: policy rule
  - Maturity demand: preferred habitat, portfolio balance channel
  - Anticipation in both interest rate and maturity policy

- **Key finding**: Fluctuations in maturity *do* matter for yield curve and macroeconomy
- **Implication**: QE has significant expansionary real effects

- Outline: highlight non-traditional structural elements, and quickly turn to policy evaluation

Financial block

- Household rate

$$\hat{r}_t^h = \frac{\delta}{1+\delta} E_t \hat{R}_{t+1}^L + \frac{1}{1+\delta} \hat{r}_t^S + \hat{\varepsilon}_t^b$$

- Term spread

$$E_t \hat{R}_{t+1}^L - \hat{r}_t^S = \frac{1+\delta}{\delta} \chi \left(\overset{\wedge}{\bar{b}}_t^L - \hat{b}_t^S - \rho_\chi \left[\overset{\wedge}{\bar{b}}_{t-1}^L - \hat{b}_{t-1}^S \right] \right)$$

- Novel:
  - Financial sector demand for different maturity bonds
  - Preferred habit(at): preferred maturity structure, desired maturity can change
  - Fluctuations in quantities outstanding matter for term structure (and real decisions)

Fiscal block

- Debt accumulation equation: long and short bonds
- Debt maturity:

$$\overset{\wedge}{\bar{b}}{}^L_t - \hat{b}^S_t = f\left(\Omega_t\right) + \sum_{j=0}^{M} \varepsilon^{MAT,j}_{t-j} + \nu \varepsilon^{TD}_t$$

- Novel:
    - Govt. bonds of different maturities: maturity supply rule
    - Endogenous maturity policy: $f\left(\Omega_t\right)$
    - Maturity policy shocks: $\varepsilon^{MAT,0}_t$
    - Policy announcement ahead of implementation: $\varepsilon^{MAT,j}_{t-j}$ $(j > 0)$
    - Debt shocks ε^{TD}_t: debt expansions not necessarily maturity-neutral

Confronting the new blocks with the data

- Embed in broader structural (DSGE) empirical framework:
- Smets and Wouters (2007): macro-fluctuations
- De Graeve, Emiris and Wouters (2009): term structure of interest rates (EH)

$$+$$

- Blocks: term structure (EH+PH), financial & fiscal
- Observables: Term structure of interest rates and debt (r^L, b^L, r^S, b^S)
- Estimation on US data 1975-2015

Key intermediate finding

- Joint empirical model of $\begin{cases} \text{macroeconomy} \\ \text{term structure of interest rates} \\ \text{term structure of govt. debt} \end{cases}$

- *Is* compatible with data

- Why key?
  - Earlier research finds dichotomy (Chen, Cúrdia & Ferrero, 2012)
  - $\implies$ QE irrelevant

The (unconditional) role of maturity

- Uncoordinated maturity actions by Treasury and Fed during the Great Recession
- Dubious role of maturity fluctuations for GDP
- $\implies$ unconditional maturity contribution not the best measure to assess unconventional *Fed* policy

Contribution to GDP
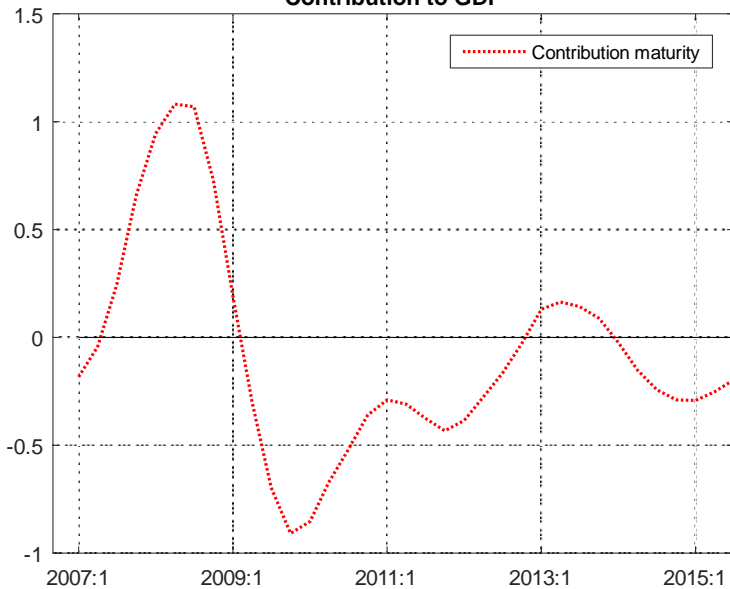
Policy evaluation I: Quantitative Easing

- Cleaner policy counterfactual:
  - Suppose Fed did not implement QE
  - (but all other maturity fluctuations remained the same)
  - How would maturity have contributed to GDP?

- Evaluate one policy intervention: Operation Twist (Again)
  - On 21 September 2011, the Fed announced *"... the Committee decided today to extend the average maturity of its holdings of securities. The Committee intends to purchase, by the end of June 2012, $400 billion of Treasury securities with remaining maturities of 6 years to 30 years and to sell an equal amount of Treasury securities with remaining maturities of 3 years or less"*

- Model counterpart: Anticipated maturity shocks

Contribution to GDP

Legend:
- Contribution maturity (red dotted)
- Contribution maturity: no Twist 1 (green dashed)
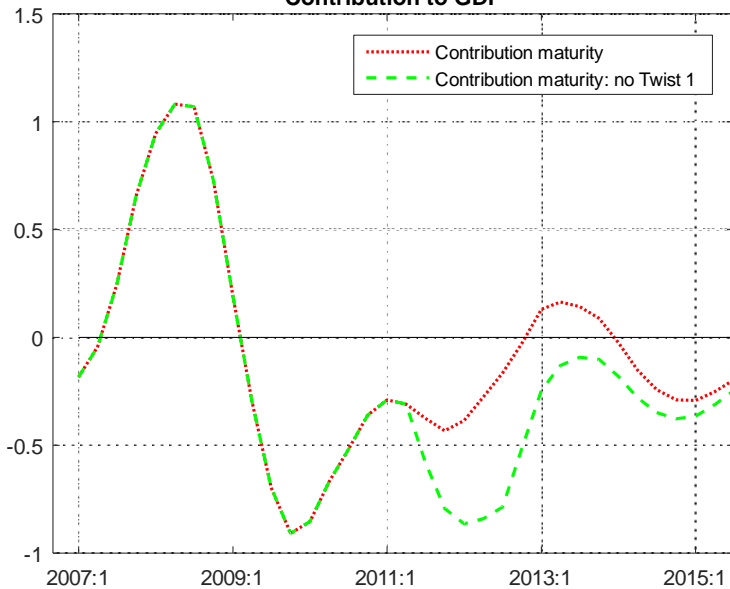
Policy evaluation I: Quantitative Easing

- Comparison with literature:
    - The policy we evaluate is smaller in size
    - The real effect is much bigger
    - Even without lower-for-longer

Study	Program: size	Peak GDP	Only FG	Only QE
CCF	QE2: $600 bn	$+0.3\%$	$\approx 0.3\%$	$\approx 0\%$
DT	Twist: $400 bn	$+1.2\%$	$\approx 0.6\%$	$\approx 0.6\%$

CCF: Chen, Cúrdia and Ferrero (2012)
DT: De Graeve and Theodoridis (2016)

Policy evaluation II: Forward Guidance

- Forward Guidance $\sim$ Anticipated interest rate shocks

$$\hat{r}_t = r\left(\Omega_t\right) + \varepsilon_t^r + \sum_{j=1}^{M} \varepsilon_{t-j}^{r,j}$$

- Pre 2009: policy constrained by the ZLB
  - Positive anticipated shocks
  - $\Rightarrow$ Actual policy rate $>$ rule-implied rate $r\left(\Omega_t\right)$
- Post 2009: effective FG
  - Negative anticipated shocks
  - $\Rightarrow$ Policy lower (for longer) than implied by rule
- Comparison with literature: similar effects

Policy rate and anticipated policy shocks
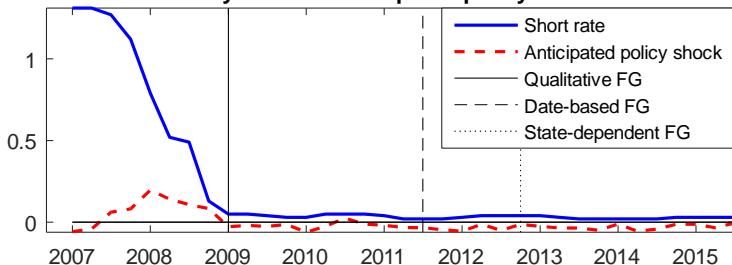
Contribution to GDP
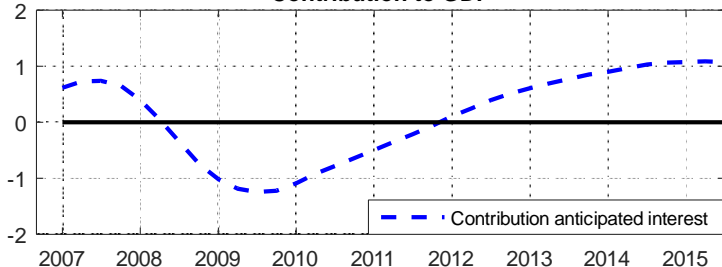
Recovery contribution unconventional policy

- Forward Guidance:
  - +2%-points GDP over period 2009-2015
  - Coincides with timing of Fed's forward communication
  - Quantitative effect similar to literature (e.g. FRB NY, FRB CHI)
- Quantitative Easing:
  - Operation Twist 1: +0.6%-points GDP
  - Conservative estimate, since:
  - Evaluation without lower-for-longer effect (main reason why literature finds *any* effect)
  - Twist < QE2