The yield curve impact of government debt issuance surprises and the implications for QT

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Motivation

- There is now a large literature quantifying the impact of QE policies, but much less on QT
- There are reasons to expect the effects to be **weaker**:
  1. Potentially not all QE **channels** operate: signaling, confidence, liquidity, market functioning
  2. QT is implemented during **calm** market conditions
  3. QT intentions **communicated** well in advance, minimising the news content of announcements
- D'Amico and Seida 2023, Smith and Valcarel 2023, BoE 2023, Du et al. 2024

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In this paper

- Instead of inferring from previous QE/QT announcements, we learn from previous **bond issuance announcements**
  - Changes in **net supply** inducing portfolio re-balancing, isolated from other QE channels
  - Provides a longer sample, with many events, allowing us to examine state dependence
  - Granular security level information
- We estimate yield easticities to unexpected changes in the supply and simulate the impact of supply events that mimic QT announcements. We also compare active vs passive QT Wei 2022, Du et al. 2024

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Literature

- The **preferred habitat** framework of Modigliani and Sutch 1966, Vayanos and Vila 2009, 2021 sets out how bond supply affects yields through the interaction of arbitrageurs and preferred habitat investors. The literature that studies bond supply through this lens is rich (Kuttner 2006, Swanson 2011, Hamilton and Wu 2012, Greenwood and Vayanos 2014, Chadha et al. 2013, etc..)

- Central Bank sales/purchases and debt issuance transmits to yields through two distinct channels:
  1. **Duration risk channel**: compensates arbitrageurs for holding duration risk. Affect yields globally
  2. **Local supply channel**: for preferred habitat investors bonds are imperfectly substitutable (limits to arbitrage). Supply shocks can have localized effect on yields

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Literature

- Many empirical papers studied these channels during specific **QE events** (D'Amico et al. 2012, D'Amico and King 2013, Cahill et al. 2013, Altavilla et al. 2021, Froemel et al. 2022). Some open questions remain:
  - Transmission outside of QE/QT event days?
  - Relative importance of the two channels?
  - State dependence of the effects?
  - Which segments have localised effects?
- To answer these questions we take this analysis to the much richer government **bond issuance** data, similar to Ray et al 2021, Phillot 2021, Lengyel 2022

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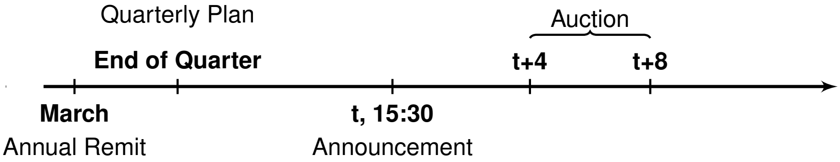
Timeline of an upcoming gilt auction



Estimating supply elasticities

- To estimate the elasticity of yields to bond supply, we proceed in **two steps**:
  - Step 1: **Isolate** the **unexpected component** of the announcements
    - Most of the announced supply is anticipated and priced in advance
    - Use exogenous instrument: high-frequency market reaction
  - Step 2: **Estimate** the **elasticity** of yields to the supply surprise
    - 2.1: Calculate *duration risk* and *local supply* effects of the surprise
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Isolating the unexpected component

- The exogenous instrument: high-frequency yield surprises around the announcements Ray et al. 2021, Lengyel (2022), Phillot (2022)

$$Z_t^{(m)} = y_{+10m,t}^{(m)} - y_{-5m,t}^{(m)} \quad \text{for: } m = 1Y, 2Y ... 30Y$$

- Regress announced volumes on these. The variation explained by the high-freq surprises is the surprise component

$$AnnouncedSupply_t = \alpha_t^{(Short)} + \alpha_t^{(Medium)} + \alpha_t^{(Long)} + \beta \mathbf{Z_t} + \varepsilon_t$$
$$SurpriseSupply_t = \hat{\beta} \mathbf{Z_t}$$

▸ Table

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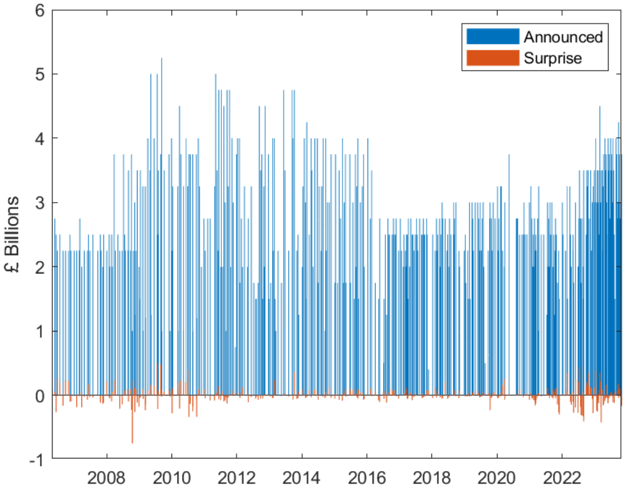

Source: DMO and authors calculations

Duration risk proxy

- To see how the surprise affect yields of outstanding gilts, we construct bond level proxies for surprise to the aggregate **duration risk** and **local supply** effects similar to Cahill et al. (2013)
- **Duration risk** effect on bond j due to announced bond i:

$$dr_{j,t} = \frac{SurpriseSupply_{i,t} \times d_i}{\sum_k FreeFloat_{k,t} \times d_k} f(d_j)$$

- where $f(d_j)$ is the exposure of bond j to aggregate duration risk:

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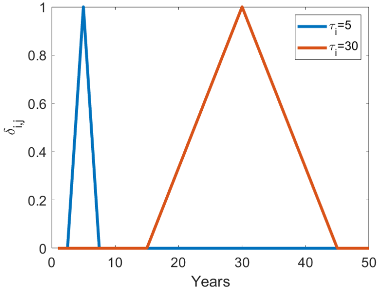
Local supply proxy

- To calculate **local supply** we assume a functional form for substitutability between *i* and *j*

$$\delta_{i,j} = \left(1 - \frac{|\tau_i - \tau_j|}{\tau_i \theta}\right) \mathbf{1}_{\{|\tau_i - \tau_j| \leq \theta \tau_i\}}$$



Local supply proxy

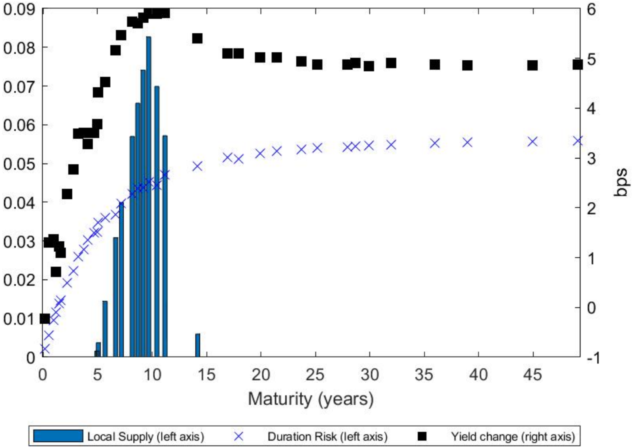
- The local supply shock is the change in the **local free float**, taking into account substitutability:
- The **local supply** shock for bond *j* after announced bond *i*:

$$ls_{j,t} = \frac{\delta_{i,j} SurpriseSupply_{i,t}}{\sum_k \delta_{j,k} FreeFloat_{k,t}}$$

- We set $\gamma = 0.2$ and $\theta = 0.5$ as in Cahill et al 2013, but the likelihood surface is flat
- Panel regression of daily yield changes on the duration risk and local supply shocks

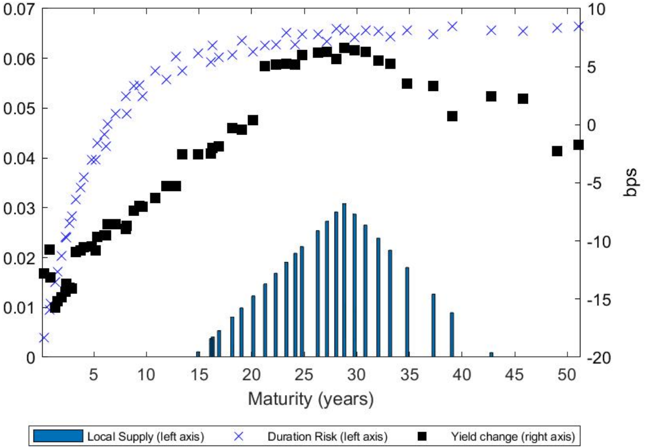
$$\Delta y_{i,t} = \mu_t + \delta_1 ls_{i,t} + \delta_2 dr_{i,t} + controls + \varepsilon_{i,t}$$

Example 1: 29-Dec-2010



Source: Daily yields from Tradeweb

Example 2: 11-Oct-2022



Source: Daily yields from Tradeweb

Regression results

	(1)	(2)	(3)
Local Supply	0.027***		
	(0.004)		
Local Supply - Short		0.037***	
		(0.006)	
Local Supply - Medium		0.010	
		(0.007)	
Local Supply - Long		0.032***	
		(0.010)	
Local Supply - High Stress			0.037***
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Local Supply - Low Stress			0.014**
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Duration Risk	0.014***	0.014**	
	(0.005)	(0.006)	
Duration Risk - High Stress			0.016**
			(0.007)
Duration Risk - Low Stress			0.013*
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time FE	✓	✓	✓
T	424	424	424
N	133	133	133
R^2	0.801	0.801	0.801

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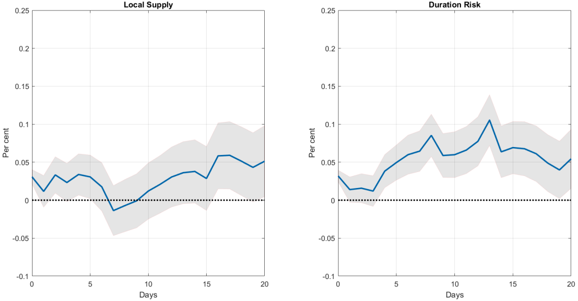
Persistence of the two channels

$$y_{i,t+h} - y_{i,t-1} = \mu_t^h + \delta_1^h ls_{i,t} + \delta_2^h dr_{i,t} + \text{controls} + \varepsilon_{i,t+h}$$



Regression results

Summing up the regression results:

- Both channels have a significant, positive effect on yields
- The impact of both is stronger in periods of market stress
- Local supply is stronger at the short and the long end of the curve, broadly consistent with the location of preferred habitat investors Giese et al. 2023
- Duration risk effects seem to be more persistent than local supply effects
- Results robust to controlling for macro news, bond characteristics, AR term, alternative buckets, different stress threshold Table

Case study: 18 Oct 2022 skew announcement

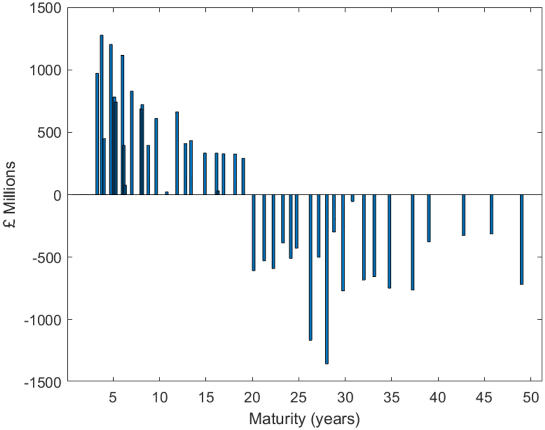


Figure: Changes in individual bond supply

Source: Intraday yields from LSEG

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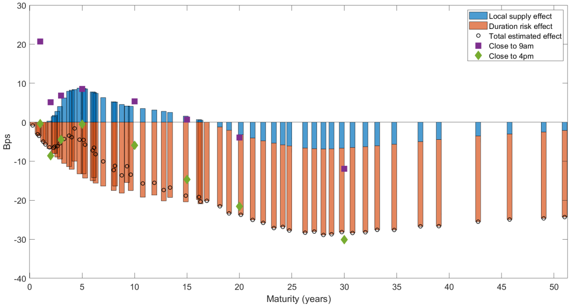
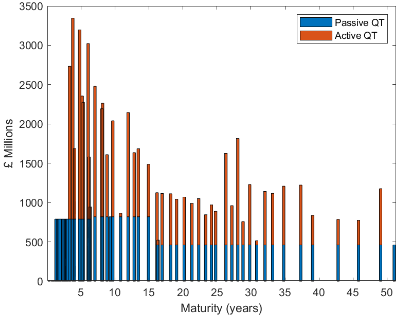


Figure: Predicted and actual change in yields

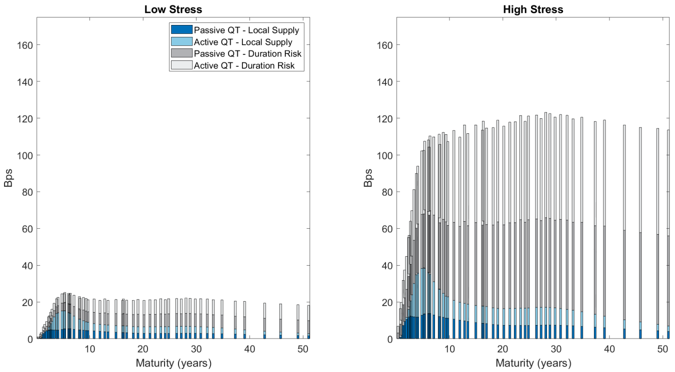
Source: Intraday yields from LSEG

QT exercise

- We construct a shock mimicking the **BoE's 2022/23 QT** plan and use our elasticities to estimate its potential impact, with info up to August 2022
- Assume: bonds rolling off refinanced according to DMO Remit (**passive**), Bank sales within buckets proportional to holdings (**active**)



QT impact



Low Stress
Passive QT - Local Supply
Active QT - Local Supply
Passive QT - Duration Risk
Active QT - Duration Risk
Bps
160
140
120
100
80
60
40
20
0
10
20
30
40
50
Maturity (years)
High Stress
Bps
Maturity (years)

Conclusions

- We study how the market absorbs surprises from bond issuance to quantify the potential impact of QT
- We focus on two channels: duration risk and local supply.
- Both have a material impact, which becomes larger in times of market stress.
- Local supply is stronger at short and long maturities
- Duration risk effects seem to be more persistent than local supply effects
- Passive roll-off and active sales are broadly similar on a pound-for-pound basis