

The Issuance Cost of UK Government Debt: 1987-2022

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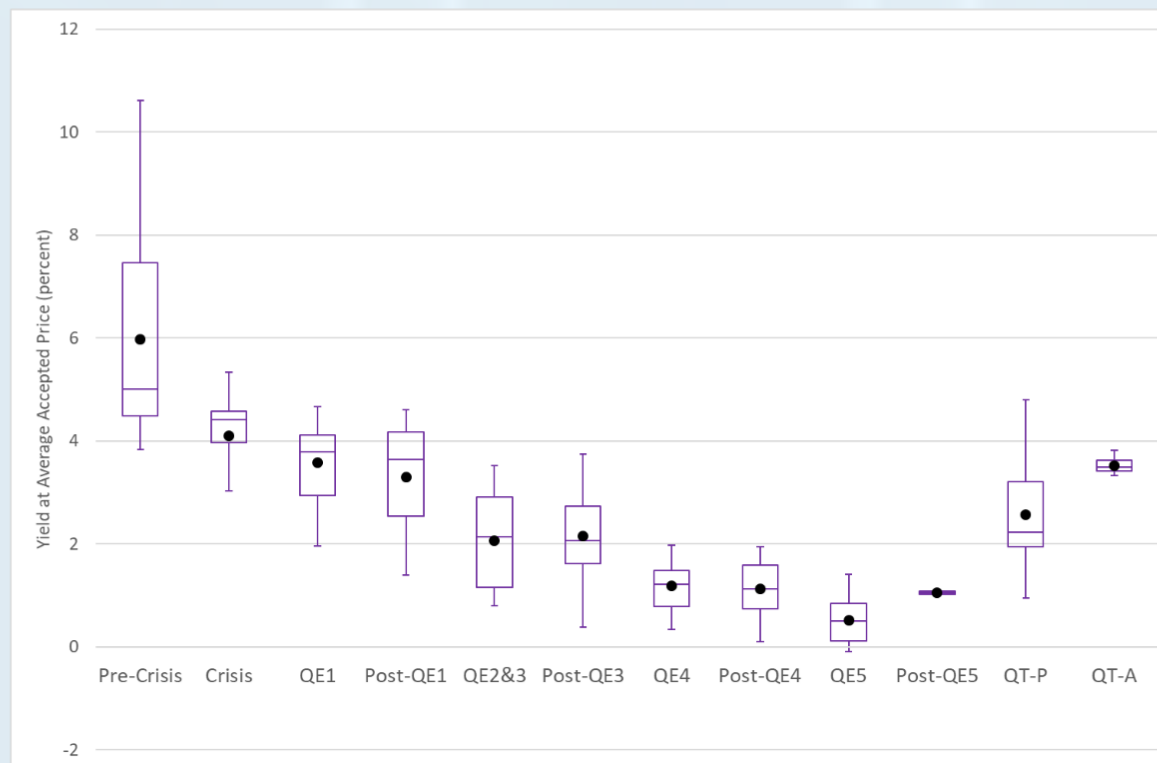
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The debt management objective, as set out in the ‘Charter for Budget Responsibility’ (HM Treasury, November 2022), is:

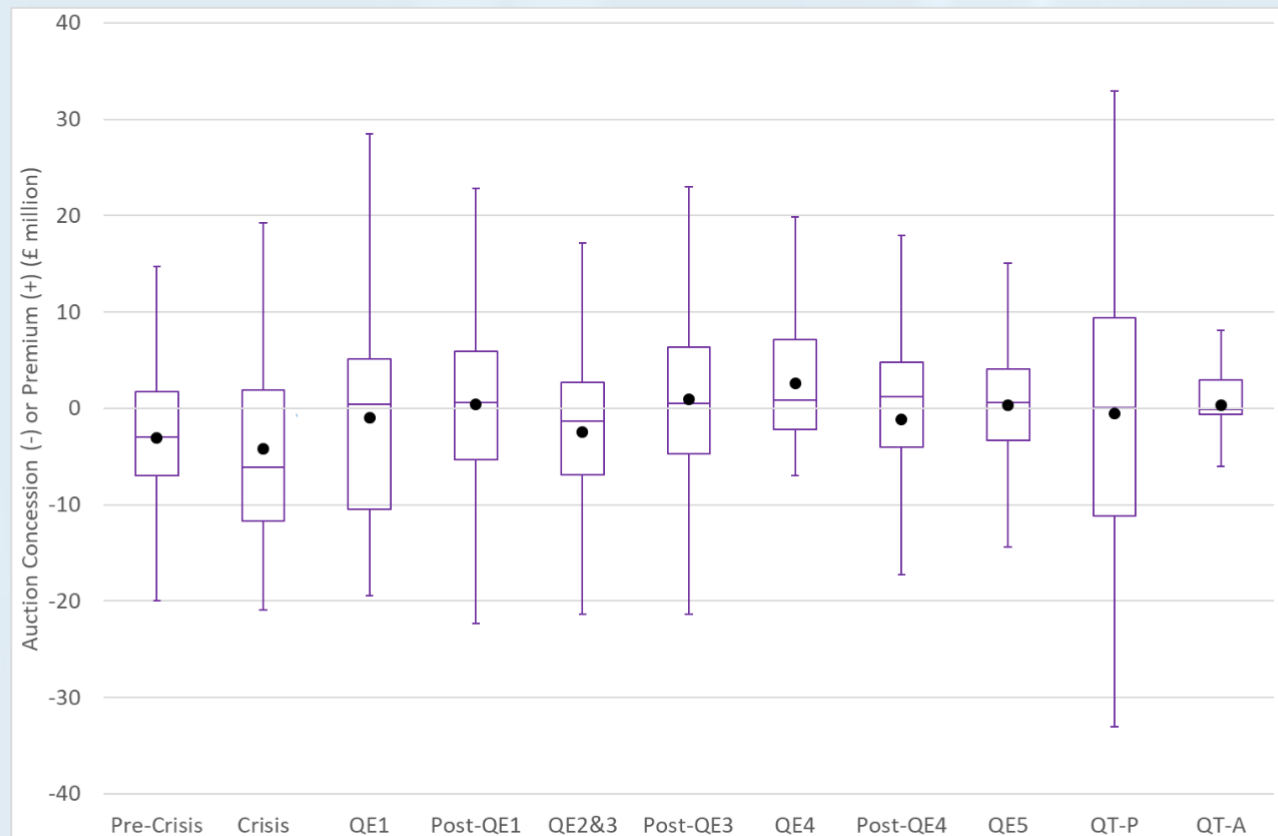
“to minimise, over the long term, the costs of meeting the government’s financing needs, taking into account risk, while ensuring that debt management policy is consistent with the aims of monetary policy.”

The main cost elements are the payments of coupon and repayments of principal, where coupon rates on new issues are set at or around the prevailing level of interest rates. Here is the distribution of yields at issue on gilts since 1987. Yields have been low in recent times, but have recently increased dramatically.



But, there are many other aspects of the costs of debt, and this paper focuses on one of them: the costs of issuance of debt, and in particular the difference between the price at which gilts were sold and the prevailing market (clean) price.

Is this of economic significance? During 2021, the recorded concession on two gilt issues exceeded £500 million, or around 20% of the value of the issued debt, but its typical range (IQR) is +/- £5 million (so 0.2%), rising to +/-£10 million in 2020. But c.£500 billion debt has been issued since March 2020.



Objective

The objectives of this paper are:

- To model the determinants of auction concession;
- To investigate the Impact of QE on the Cost of Issuing UK Government Debt.

Closely related papers

Steeley (2015)

an indirect study of the costs of issuance, by modelling the patterns in gilt returns. Persistent exploitable inefficiencies could distort incentives to participate in gilt sales, leading to different price bids, that could lead to an increased concession. Inefficiencies were found, during QE1, that were exploitable ex-ante in QE2, but had disappeared by QE3. There was also evidence that bid ask spreads narrowed during QE relative to the period prior to QE1

Breedon (2018)

used the yield (to maturity) concession as a measure of issuance costs and also APF purchase costs during QE1 to QE3.

This paper

Focusses on issuance

Uses a direct measure of issuance cost

Covers the period from 1987 to 2022 (to include all of the QE phases, and now QT)

Develops the modelling

Research on the impacts of QE on the gilt market

➤ Impact on yields

- QE1: Meaning and Zhu (2011), Joyce et al (2011), Glick and Leduc (2012), Joyce and Tong (2012))
- QE2: Bannerjee et al (2012), Churm et al (2018), Meaning and Zhu (2011), Goodhart and Ashworth (2012))

➤ Impact on secondary market liquidity

- QE1: Steeley (2015), Benos and Zikes (2016), Boneva et al (2019). Grimaldi (2021), Christensen and Gillan(2022)
- Endogeneity: Ferdinandusse (2017), Song and Zhu (2018), Schlepper et al (2020)

Government debt issuance auction outcomes

➤ Under-pricing, and its determinants

- Breedon and Ganley (2000) under-pricing in gilt auctions (data <1996), in non-fungible issuance.
- Under-pricing causes: Nyborg et al (2002), Goldreich (2003), Scalia (1998), Bikchandani and Huang (1998), Massa and Drudi (2001), Spindt and Hoffmeister (1998), Sundaresan (1994), Eisl et al (2019), Boyarchenko et al (2021), Albuquerque et al (2022).

➤ Auction cycles (pre-auction upward (post-auction downward) drift in yields)

- Vassal (1998), Fleming and Rosenberg (2007), Lou et al (2013), Oprea (2021), Beetsma (2018), Ahmad and Steeley (2008), Albuquerque et al (2022).

Optimal government debt portfolio management

► Theory on an optimal mix

- Tobin (1961,1963,1969), Brunner and Meltzer (1973), Culbertson (1957), Modigliani and Sutch (1966), Vayanos and Vila (2009) and Greenwood and Vayanos (2010); Angelos (2002), Barro (2003), Nosbusch (2008) and Lustig et al (2009), Buera and Nicolino (2004) and Faraglia et al (2010)

► Evidence on an optimal mix

- Ellison and Scott (2020), Coe et al (2005), Faraglia et al (2017), Faraglia et al (2019)

Modelling the determinants of the issuance cost of debt

From both the theoretical and empirical literature on auction under-pricing, The following regression is constructed to identify the possible determinants of auction concession:

$$Y_i = c + b_1SIZE_i + b_2LIQ_i + b_3BENCH_i + b_4VOL_i + b_5ACT_i + b_6DEM_i + b_7MED_i + b_8LONG_i + b_9CRISIS_i + b_{10}PHASE_i + b_{11}DAY_i + b_{12}MONTH_i + b_{13}BOE_i + b_{14}APF_i + \varepsilon_i$$

The sample period has been divided into 12 partitions:

Sub-period	Description
Pre-crisis	the start of the sample (12 th May 1987) until the collapse of the Northern Rock bank on September 14 th 2007
Crisis	September 14 th 2007 to March 10 th 2009
QE1	March 11 th 2009 to 26 th January 2010
Post-QE1	27 th January 2010 to 9 th October 2011
QE2&3	10 th October 2011 to 30 th October 2012
Post QE3	31 st October 2012 to 7 th August 2016
QE4	8 th August 2016 to 1 st February 2017
Post QE4	2 nd February 2017 to 18 th March 2020
QE5	19 th March 2020 to 15 th December 2021
Post QE5	16 th December 2021 to 2 nd February 2022
QT-P	3 rd February 2022 to 31 st October 2022;
QT-A	1 st November 2022 to 31 st December 2022

Dependent variables

➤ Concess: (2014 to 2022)

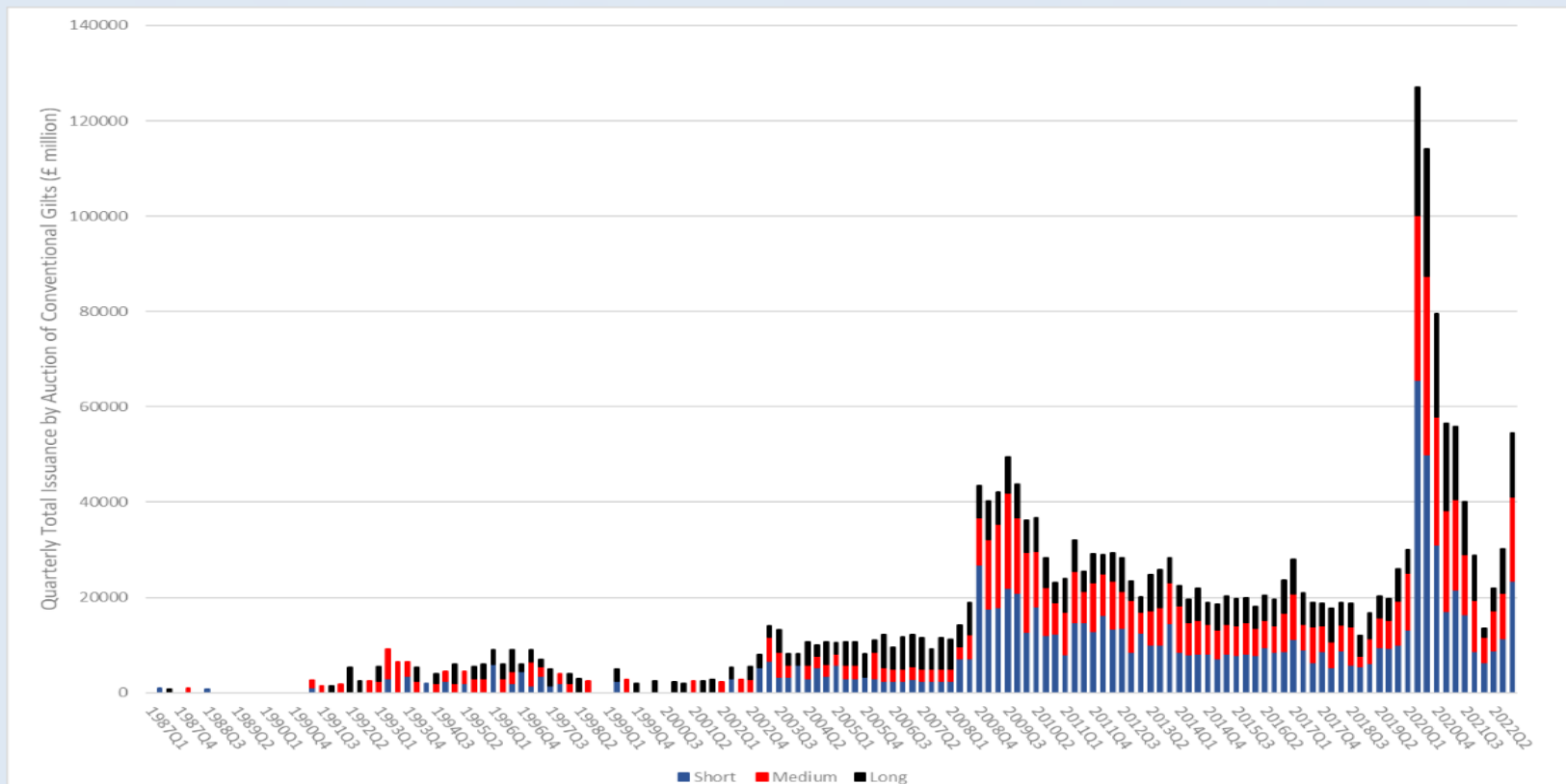
This is the DMO Concession data and calculated by the difference between the mid-price and the average accepted price at the auction. This is a new measurement of concession cost applied by DMO after 2014.

➤ Concess2: (2002 to 2022)

This is also the DMO Concession data, but Calculated by using clean price on day before auction instead of mid-price. (the first definition of concession before 2014)

➤ Concess3: (1987 to 2022)

Since the data from DMO is not available before 2002, we used Data-stream to create an estimation of concession. This is measured by the difference between clean price on day before the auction and the average price at auction. After 2002, we used Concess2.



Explanatory variables

Continues Variable:

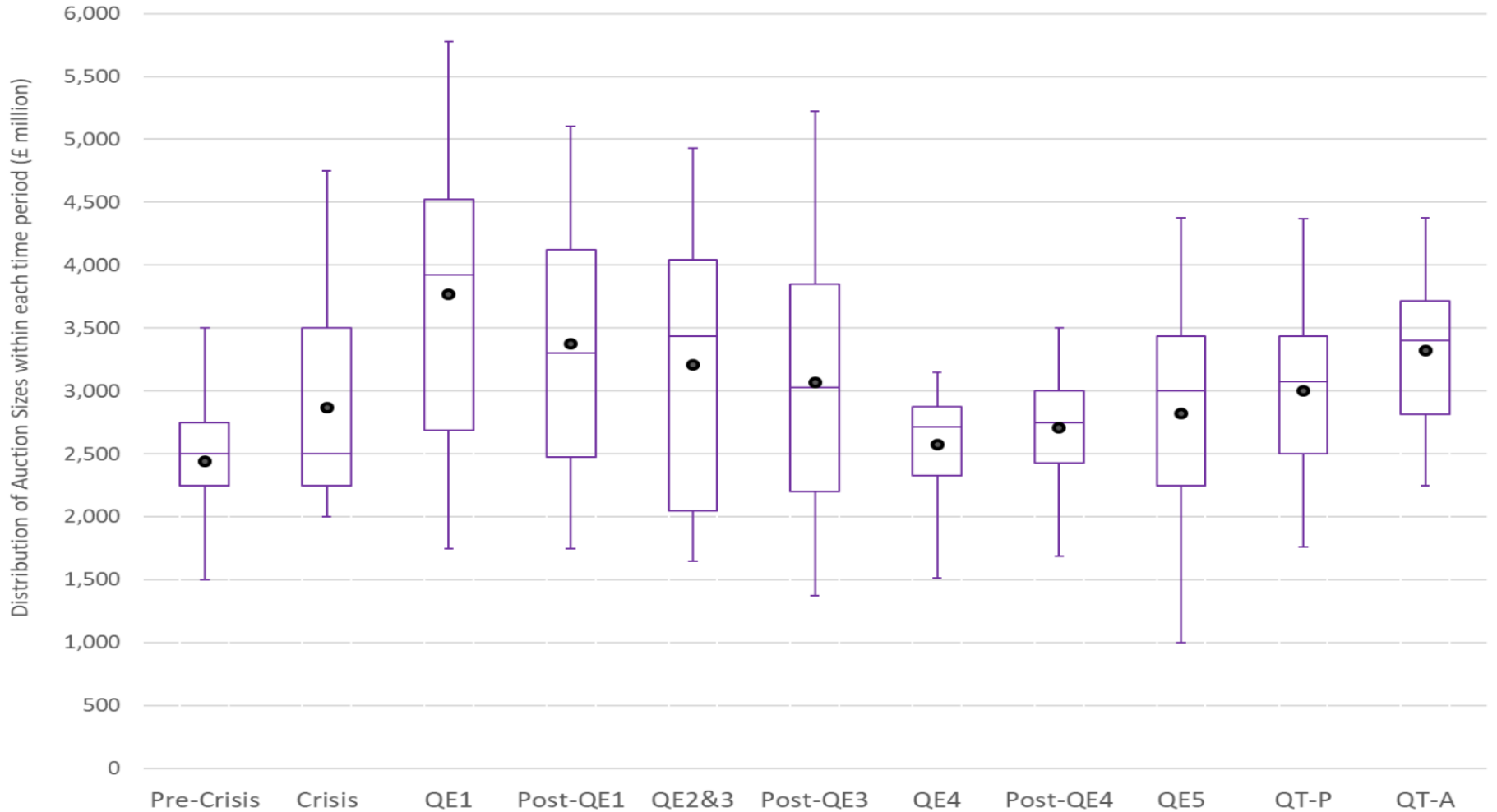
Variable	Description
SIZE	This is measured as the size of the auction divided by the outstanding size of the gilt, including the auctioned amount;
LIQ	This is measured as the size of the outstanding gilt that is being auctioned (again including the auctioned amount) divided by the average size outstanding of all other (conventional) gilts.
BENCH	This is an indicator that takes the value unity if the issuance is of or into a 5,10 or 20-year benchmark issue
VOL	This is the at-the-money implied volatility of the nearest maturity call option on the nearest maturity long gilt futures contract
ACT	This It is the number of days since the last conventional gilt issuance
DEM	This is the cover of the previous auction
BOE	This is the share of the gilt owned by the Bank of England, purchased under the Asset Purchase Scheme, at the point of the auction
APF	This is the number of (working) days since a previous APF purchase by the Bank of England.

Dummy Variables:

Variable	Description
MED	This takes the value unity if the maturity is medium
LONG	This takes the value unity if the maturity is long
CRISIS	This equals one during the sub-sample corresponding to the financial crisis period before the onset of QE1.
QEPHASE	This includes twelve separate dummy variables for each of sub-period (1=yes)
DAY	This includes three dummy variables for the days of week, using the auction day (1=yes)
MONTH	This includes twelve dummy variables for the months of year, using the auction month (1=yes)

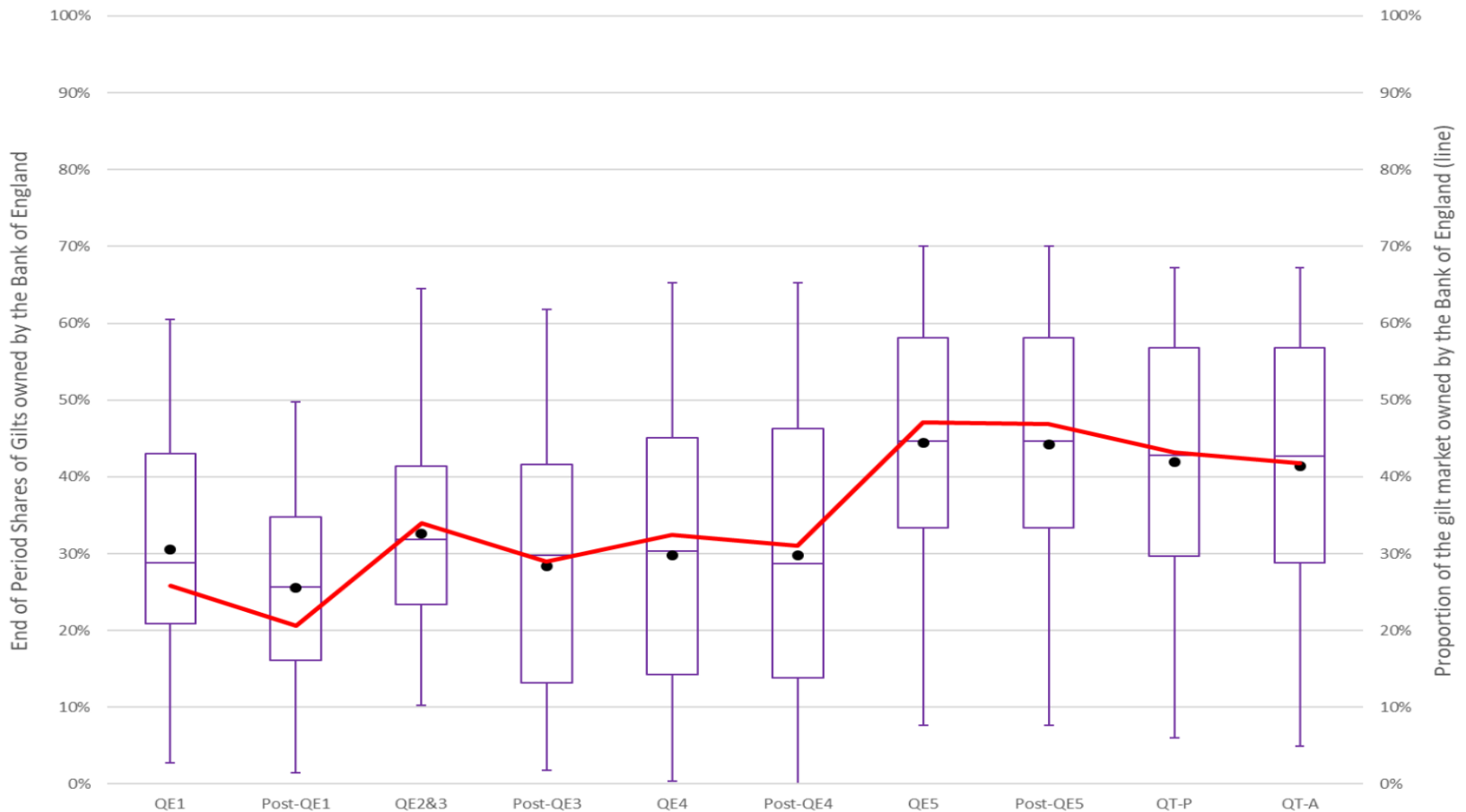
Auction Size

The box plots show the distribution of the auction size (£ million) for all conventional gilt auctions from May 1987 to December 2022 during each of the sub-periods indicated.



Bank of England Ownership Shares

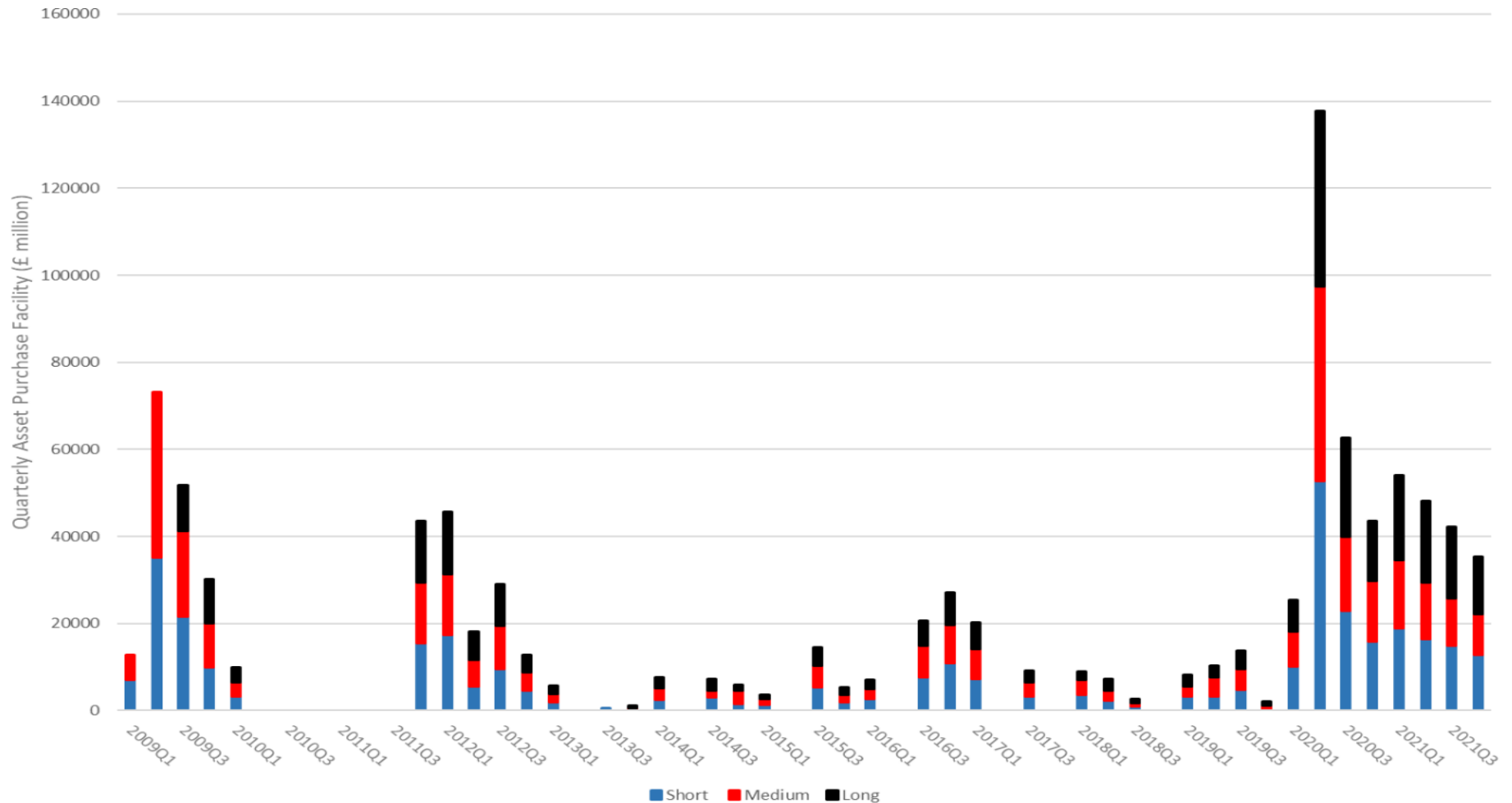
The box plots show the distribution of ownership shares of individual gilts held by the Bank of England at the end of each of the sub-periods indicated. The line chart (using the right hand scale) shows the overall proportion of the conventional gilt market held by the Bank of England at the end of these same sub-periods.



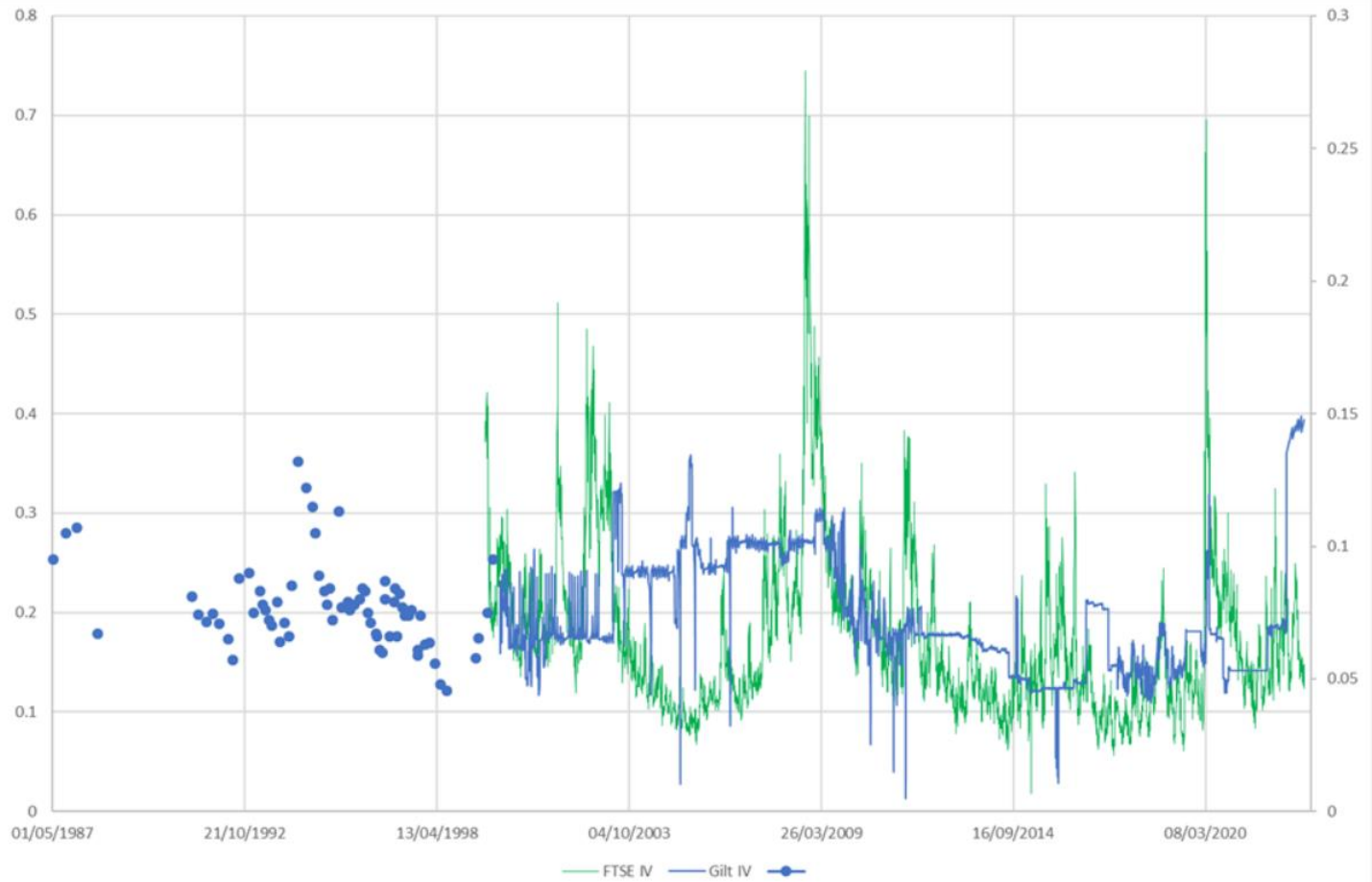
Asset Purchase Facility

Three indicators are created for this variable:

- 1- The number of days since APF purchase in that specific gilt
- 2- The number of days since APF purchase in the QE maturity bucket which the gilt is in.
- 3- The number of days since any APF ipurchase



volatility measure



Auction Concession and Auction Size

This table contains the average auction size (£ million), the number of auctions, the average auction concession (£ million) and the issuance cost (-) or premium (+) as a percentage of the average auction size. The sub-periods are: Pre-crisis - the start of the sample until the collapse of the Northern Rock bank on September 14th 2007; Crisis – September 14th 2007 to March 10th 2009; QE1 – March 11th 2009 to 26th January 2010; Post-QE1 – 27th January 2010 to 9th October 2011; QE2&3 – 10th October 2011 to 30th October 2012; Post QE3 – 31st October 2012 to 7th August 2016; QE4 – 8th August 2016 to 1st February 2017; Post QE4 – 2nd February 2017 to 18th March 2020; QE5 – 19th March 2020 to 15th December 2021; Post QE5 - 16th December 2021 to 2nd February 2022; QT-P- 3rd February 2022 to 31st October 2022; QT-A-1st November 2022 to 31st December 2022. The maturity buckets use the standard market convention of Short (< 7 years), Medium (7 to 15 years), and Long (>15 years).

Maturity	Statistic	Pre-crisis	Crisis	QE1	Post-QE1	QE2 & 3	Post-QE3	QE4	Post-QE4	QE5	Post-QE5	QT-P	QT-A	Full Sample
Short	Average Auction Size (£m)	2540	3559	4896	4421	4297	4073	2945	3035	3509	3000	3477	3904	3538
	Average Concession (£m)	-1.01	-2.30	-0.58	0.18	-2.10	-0.36	-1.63	2.36	0.69	3.27	-0.31	0.24	-0.03
	Percent cost (-) premium (+)	-0.04%	-0.06%	-0.01%	0.004%	-0.05%	-0.01%	-0.06%	0.08%	0.02%	0.11%	-0.01%	0.01%	-0.001%
	Number of Auctions	44	17	14	20	14	34	5	35	60	1	9	4	257
Medium	Average Auction Size (£m)	2504	2865	3785	3376	3361	3270	2602	2758	3061	3125	3134	3250	3006
	Average Concession (£m)	-3.77	-2.40	-3.28	-1.67	-4.76	-1.36	6.12	-0.86	0.28	-1.97	3.10	-3.25	-1.31
	Percent cost (-) premium (+)	-0.15%	-0.08%	-0.09%	-0.05%	-0.14%	-0.04%	0.24%	-0.03%	0.01%	-0.06%	0.10%	-0.10%	-0.044%
	Number of Auctions	50	13	15	21	11	32	6	30	53	1	9	3	244
Long	Average Auction Size (£m)	2322	2176	2306	2213	1904	2026	2236	2276	1989		2370	2625	2164
	Average Concession (£m)	-3.36	-7.63	-7.50	0.99	-1.10	3.32	2.58	0.70	-0.54		3.19	3.94	-0.79
	Percent cost (-) premium (+)	-0.14%	-0.35%	-0.33%	0.04%	-0.06%	0.16%	0.12%	0.03%	-0.03%		0.13%	0.15%	-0.037%
	Number of Auctions	67	17	11	18	13	39	6	30	65		9	3	278
All	Average Auction Size (£m)	2437	2867	3767	3375	3207	3068	2573	2707	2820	3062	2993	3324	2881
	Average Concession (£m)	-2.85	-4.20	-2.74	-0.22	-2.43	0.79	2.59	0.85	0.11	0.65	1.89	0.30	-0.68
	Percent cost (-) premium (+)	-0.12%	-0.15%	-0.07%	-0.01%	-0.08%	0.03%	0.10%	0.03%	0.004%	0.02%	0.06%	0.01%	-0.023%
	Number of Auctions	161	47	40	59	38	105	17	95	178	2	27	10	779

Determinants of Auction Concession

The sample is trimmed to include only those auctions with costs (or premiums) below £25 million.***, **, * indicate statistical significance at the 1%, 5% and 10% levels, using Clustered standard errors.

	May 1987 to September 2007	October 2007 to January 2014	February 2014 to December 2022
	Concess3	Concess2	Concess
Constant	57.03 (1.06)	-10.86 (-0.54)	15.84*** (-5.45)
VOL	-36.11** (-2.45)	26.02** (2.63)	-1.456 (1.57)
ACT	-1.519 (-0.68)	-1.5 (-0.64)	0.0767 (0.32)
DEM	4.302* (1.77)	0.907 (0.32)	0.804*** (3.63)
SIZE	-18.03 (-1.14)	0.809 (0.17)	-3.711*** (-6.20)
LIQ	-2.328 (-1.38)	3.608 (1.63)	-0.105 (-0.32)
BENCH	6.050*** (-3.23)	1.818 (1.04)	-0.392** (-2.16)
Tue	5.129 (-1.69)	0.704 (0.41)	0.124 (0.5)
Wed	3.765* (-2)	0.28 (0.17)	-0.264 (-1.14)
Crisis		-8.855*** (-3.02)	
QE1		-4.246* (-1.73)	
QE1a		-0.876 (-0.40)	
QE2&QE3		-4.144* (-1.91)	
QE3a			-2.323 (-1.11)
QE4			-2.942 (-1.37)
QE4a			-2.537 (-1.19)
QE5			-2.807 (-1.31)
QE5a			-3.638 (-1.63)
QTP			-2.745 (-1.30)
BoEShare			-0.972* (-1.80)
APF			-0.311 (-1.02)
No. Observations	70	199	261
Adj. R-squared	0.26	0.088	0.222

Future Work

- Direct analysis of the outlier Concession data
- Index-linked bonds