QE(March2009 - June2013) and the bank lending channel in the United Kingdom

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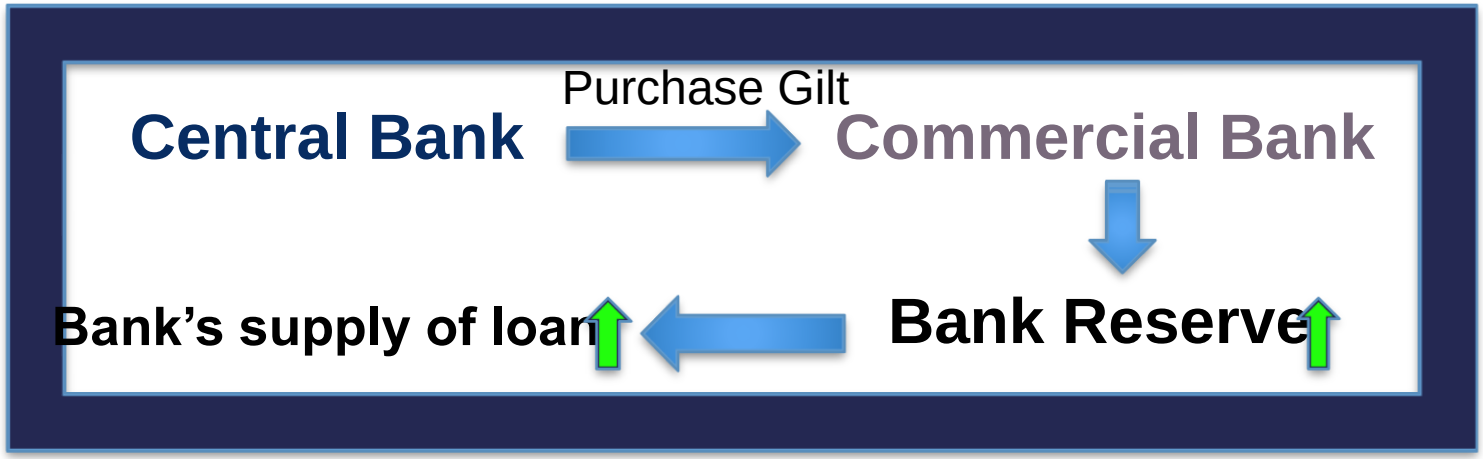
Introduction

- Bank of England vote to **QE** (March2009 – June2013) to boost GDP and Inflation.

  Asset price channel was expected to be the main channel
- How **QE** can operate **through bank lending channel?**



Key Finding

No evidence of QE boosting Bank Lending in UK!

The researchers construct a framework and suggest that **QE gave rise to "Flighty Deposit", then Bank Lending Channel is diminished.**

Researchers also explain how **QE operate via Portfolio Rebalancing Channel that give rise to Flighty Deposit.**

Bank Lending Channel

- *When will bank lend out their reserve?*

Bank will lend out money if they believe that they will have enough reserve to repay the depositor in the next period.

Bank Lending Channel: Framework Model

Assets	Liabilities
R **Reserve (liquid Asset)** **L** **Loan (illiquid asset)**	**D** **Deposit** **B** **Wholesale Borrowing**

As L is illiquid, if D ↓, bank have to ↓R to manage the balance sheet.

But if D ↓ too much and bank don't have enough R to pay to depositor, bank will go for B. (More costly)

So if bank expect *D to decrease a lot next period*, bank will *lend out less L and hold more R.*

Lending this period depends on Deposit next perioc

Bank Lending Channel: Deposit

The researchers believe that Deposit is the factor on the bank's balance sheet to be affected by QE.

$$D_0 = \check{D} + \eta_0$$

$$D_1 = \rho D_0 + (1-\rho)\check{D} + \varepsilon_1$$

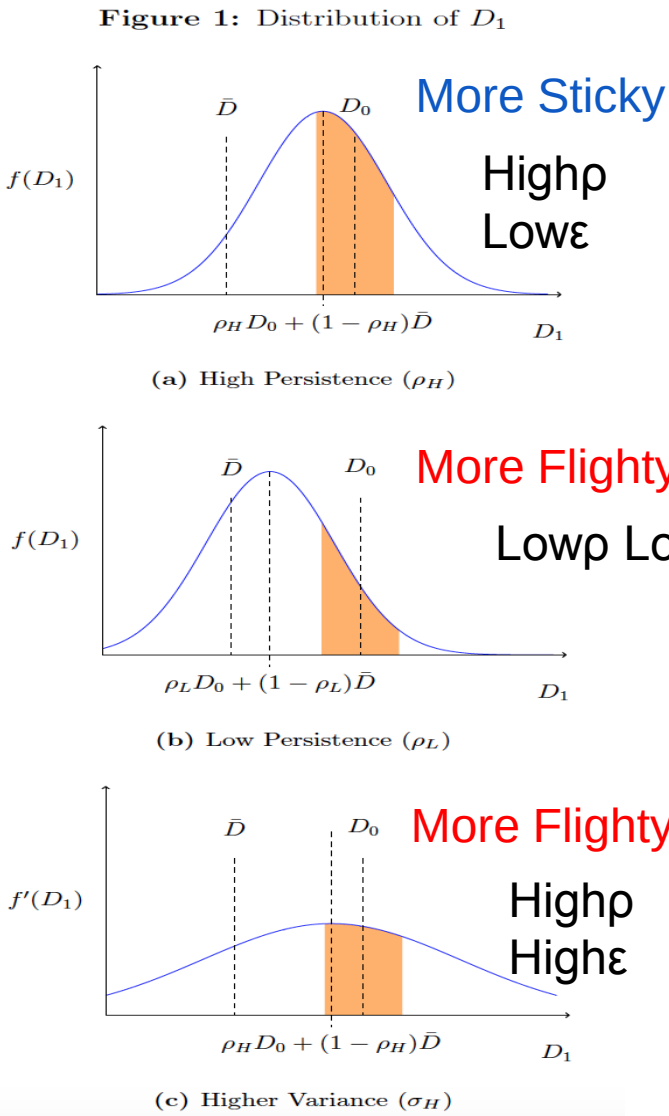
$\check{D}$ = Deposit at normal period (without QE)

D_t = Deposit at period t

η_0 = effect of QE

ρ = persistence of deposit

ε= payment shock (+/-)



Bank Lending Channel: Funding Need (FN)

- Bank has to concern the possibility that R will be not enough to pay the decline in D in the next period.
- If D decline so much and exceeds bank's holding R, the external funding is needed (FN);

$$FN_1 = \underbrace{(D_0 + B_0) - (D_1 + B_0)}_{\text{Fall in liabilities}} - \underbrace{R_0}_{\text{Liquid assets}}$$
$$= L_0 - D_1 - B_0$$

FN_1<0; excess funding **FN_1>0; funding needed**

Bank Lending Channel: Funding Need (FN)

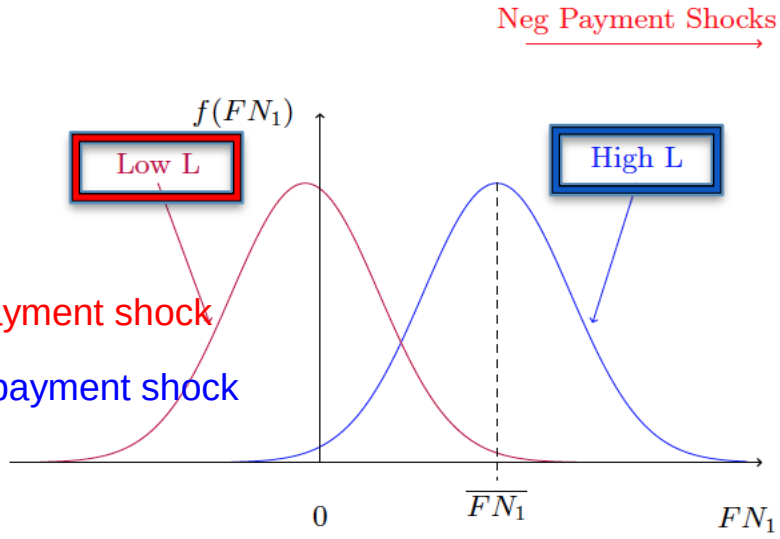
Figure 2: Funding Shortfalls in Period 1

$$FN_1 = L_0 - D_1 - B_0$$

Keep D_1 constant,

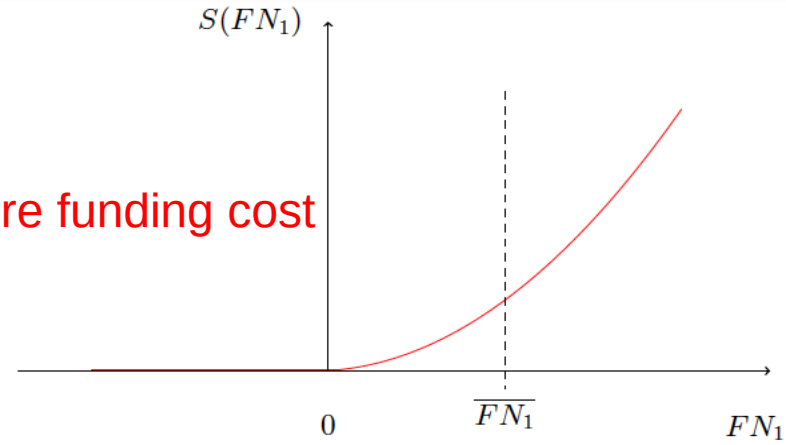
Low L_0 has less possibility to face negative payment shock

High L_0 has more possibility to face negative payment shock



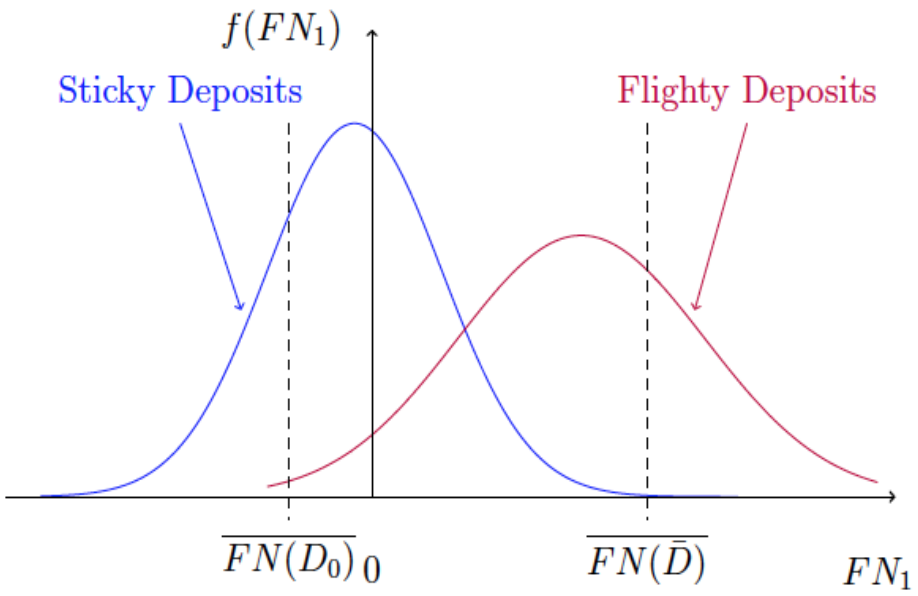
(a) Distribution of Funding Needs (FN_1)

More funding needed leads to more funding cost



(b) Shortfall funding costs ($S_1(FN_1)$)

Bank Lending Channel: Funding Need (FN)



Given the same R_0 , L_0 ,D_0 ,B_0 for both case but
Highρ Lowεfor the 1st case,
Lowρ Highεfor the 2nd case,

The 1st case (sticky deposit) will have a less possibility to face a shortfall than The 2nd case (flighty deposit)

The level of Flightiness is really important to bank's decision to Lend Out!

The Effect of QE on Banks' Balance Sheets

- Key Finding in this section
  - **QE increase reserve** in the system
  - **QE increase variance** in **reserve** and **OFC deposit**

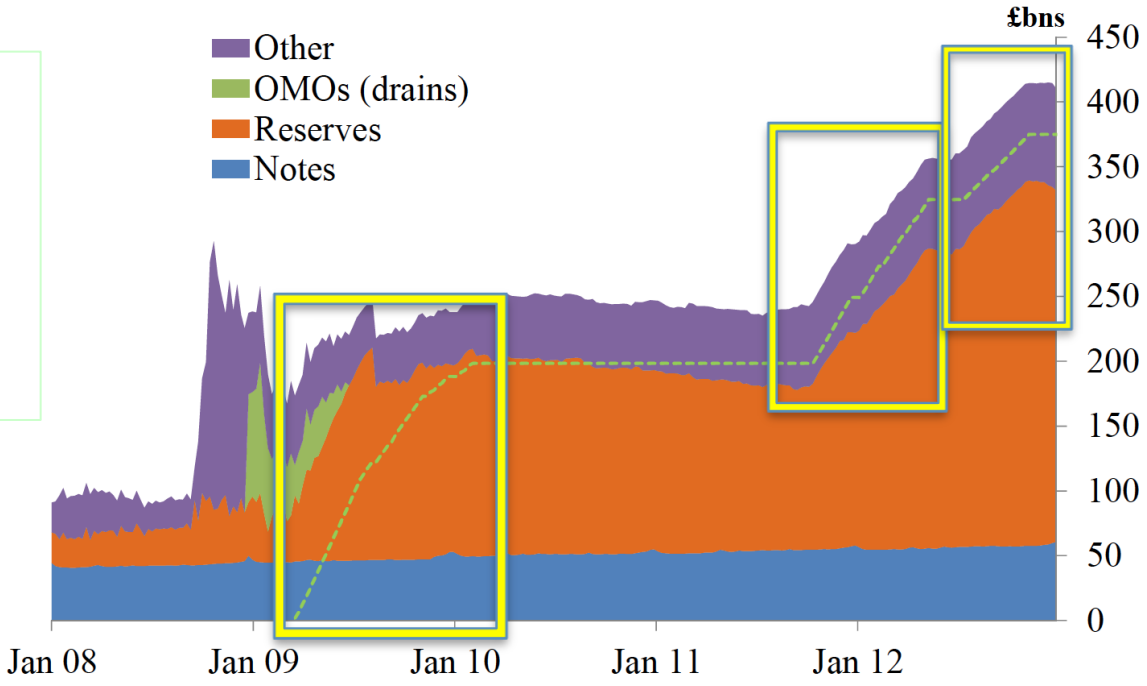
Other Financial Corporations

- The financial (non-bank) institution who also participate the gilt transaction
- Ex. Pension funds, insurance companies, and asset managers

The Effect of QE on Banks' Balance Sheets

Even QE increase a reserve, the ratio is not 1to1.

There is a clue that bank shuffle their portfolio.



	Gilt purchase	ΔReserve
Mar2009-Jan2010	**£200bn**	**£130bn**
Oct2011-May2012	**£125bn**	**£104bn**
July2012-Oct2012	**£50bn**	**almost £50bn**

The Effect of QE on Banks' Balance Sheets

$$\Delta R_{i,t} = \beta_1 GS_{i,t} + \beta_2 APF_t + \beta_3 OMO_{i,t} + u_i + \epsilon_{i,t}$$

$\Delta r_{i,t}$ = change in reserve of bank i at time t

$GS_{i,t}$ = APF Gilt sales conducted through
bank i at time t on behalf of their customers

APF_t = Aggregate APF transaction at time t

$OMO_{i,t}$ = Open Market Operation conducted by the Bank to
supply
or drain reserves

QE increase RESERVE

	Monthly
APF gilt sales$_{i,t}$	0.304**
	(0.129)
OMO$_{i,t}$	0.568***
	(0.185)
Agg APF gilt sales$_t$	0.0291
	(0.0194)
Constant	-171.2
	(172.6)
Bank fixed effects	Yes
Observations	454
Banks	16
F	4.257

Note: APF is Asset Purchase Facility

The Effect of QE on Banks' Balance Sheets

Regression of OFC deposits on APF gilt sales

Table 2: OFC deposits regressed on APF gilt sales

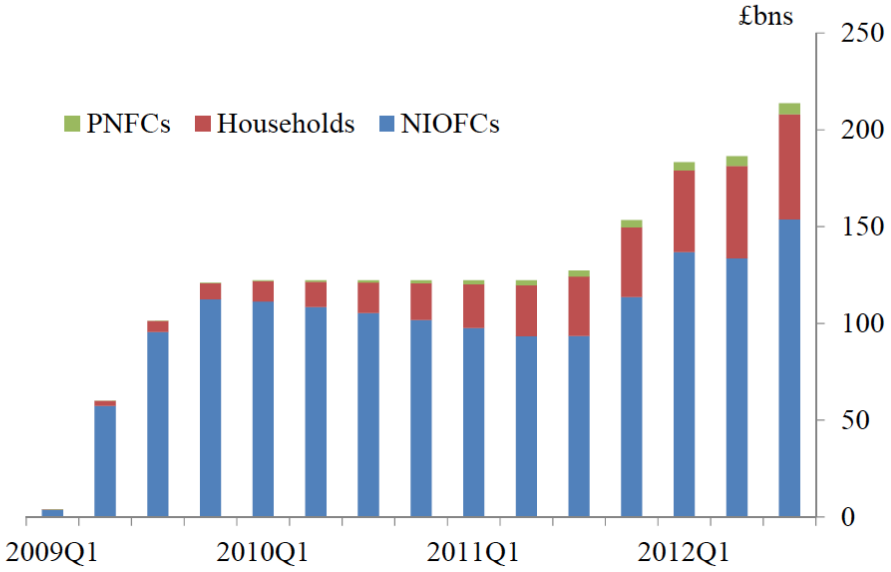
	(1)	(2)
APF gilt sales$_{i,t}$	0.236***	0.235**
	(0.060)	(0.078)
Constant	-567.775***	
	(52.704)	
Bank fixed effects	Yes	Yes
Time fixed effects	No	Yes
Observations	426	426
Banks	13	13
F	15.296	9.038

QE increase OFC deposit

The Effect of QE on Banks' Balance Sheets

Impact of QE on money

Figure 6: Monetary impact of QE



Concentrated in OFC

The Effect of QE on Banks' Balance Sheets

Variability of variable of interest

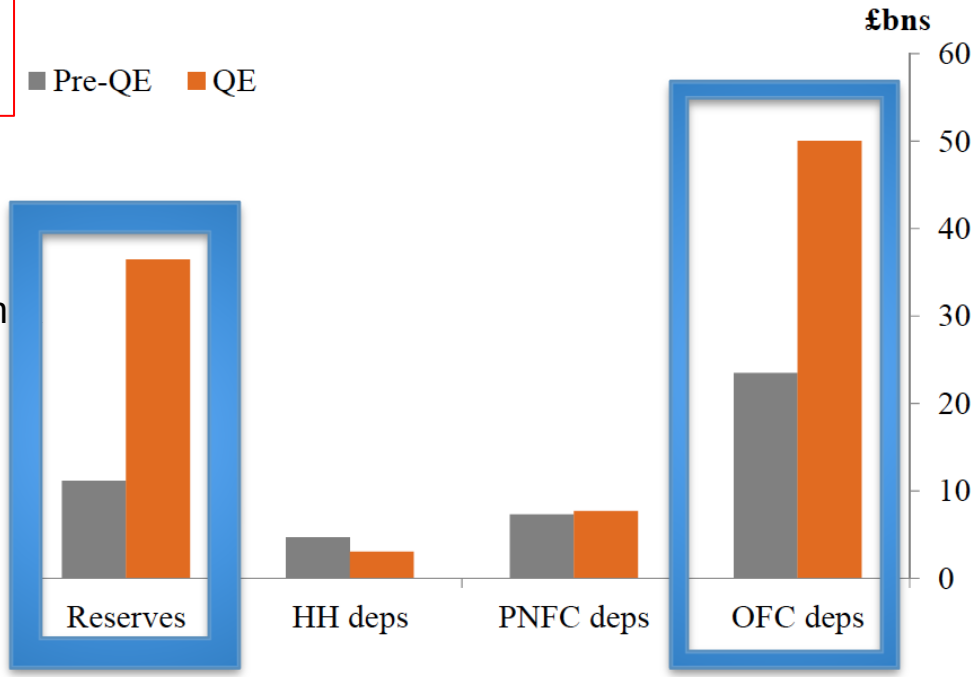
$$GNF_t^X = \sum_i |\Delta X_{it}| - \sum_i \Delta X_{it}$$

GNF_t^X Gross versus net flows gap

$\sum_i |\Delta X_{it}|$ Sum of absolute change in

$\sum_i \Delta X_{it}$ Sum of change in X

Figure 8: Gross/net flow gaps



Increase in variability of OFC deposit can be interpreted as the reduction in persistence parameter (ρ) in the BLC framework.

Analysis & Result

Specification

Baseline model:

$$\Delta L_{i,t} = \gamma_1 \Delta L_{i,t-1} + \beta_1 \Delta D_{i,t-1} + \phi_1 X_{i,t} + \alpha_i + \tau_t + \epsilon_{i,t}$$

ΔL = change in lending to household and PNFCs (public non financial coperations)

ΔD = change in OFC deposit

X = Institution specific time-varying control

α = individual effect

τ = time effect

Analysis & Result:

Difference-in-Difference model: taking advantage of structural funding differences

- The researchers used this approach with the reason that bank which is bigger or have better technology would attract more OFC deposit.

Banks with peak with peak share of OFC funding more than 12.5% in the period leading up to March 2009 are classified as OFC funder.

Dummy variable for QE

Dummy variable for OFC funder

$$\Delta L_{i,t} = \alpha_i + \tau_t + \delta D(QE)_t + \gamma_1 \Delta L_{i,t-1} + \phi_1 X_{i,t} + \beta_0 D(Funder)_i \times D(QE)_t \\ \ldots + \lambda_0 \Delta D_{i,t-1} + \epsilon_{i,t}$$

$$\Delta L_{i,t} = \alpha_i + \tau_t + \delta D(QE)_t + \gamma_1 \Delta L_{i,t-1} + \phi_1 X_{i,t} + \beta_0 D(Funder)_i \times D(QE)_t + \lambda_0 \Delta D_{i,t} \\ \ldots + \lambda_1 D(QE)_t \times \Delta D_{i,t} + \lambda_2 D(Funder)_i \times D(QE)_t \times \Delta D_{i,t} + \epsilon_{i,t}$$

Add on change in OFC deposit

Increase in OFC deposit during QE period give a negative effect to BLC. OFC may increase but may not be a stable source of fund for bank to lend

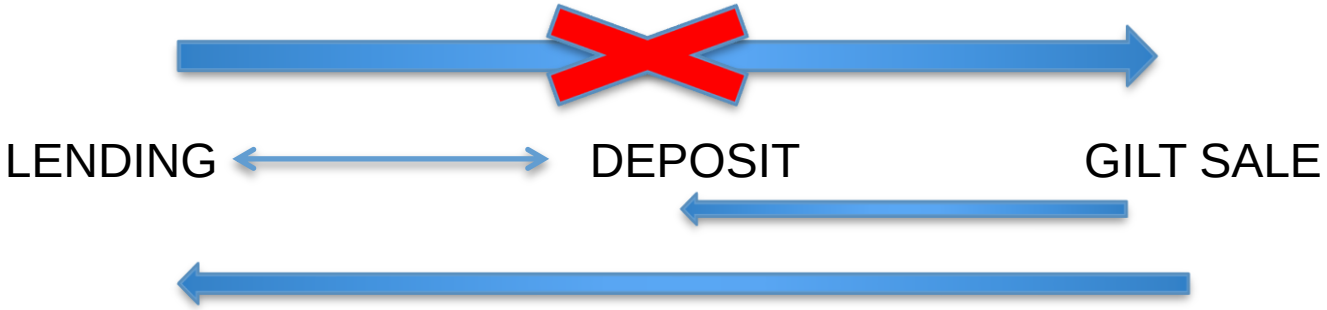
Only some change in OFC deposit have a significance effect to BLC., though the magnitude is quite small.

	(1)	(2)	(3)	(4)	(5)
$D(Funder)_i \times D(QE)_t$	-167.608**	-155.171*	-104.825*	-103.211	-66.026
	(80.853)	(78.840)	(61.032)	(62.239)	(46.998)
$D(QE)_t$	-	-	-	-	-0.860
					(14.485)
$\Delta L_{i,t-1}$	0.378***	0.378***	0.287***	0.282***	0.265***
	(0.072)	(0.073)	(0.057)	(0.056)	(0.058)
$\Delta L_{i,t-2}$			0.165***	0.173***	0.171***
			(0.033)	(0.029)	(0.028)
$\Delta L_{i,t-3}$			0.108***	0.112***	0.108***
			(0.034)	(0.035)	(0.035)
Sector $demand_{i,t}$	-0.013	-0.013	-0.026	-0.027	0.057***
	(0.027)	(0.027)	(0.024)	(0.024)	(0.015)
Credit $stock_{i,t-1}$	0.002	0.002	0.001	0.001	0.000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Customer funding $gap_{i,t}$	0.041	0.043	0.029	0.030	0.001
	(0.041)	(0.041)	(0.041)	(0.041)	(0.011)
Liquid $assets_{i,t}$	0.000	0.000	0.000	-0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$\Delta OFC\ deposits_{i,t}$	0.010	0.032*	0.008	0.031*	0.031
	(0.007)	(0.016)	(0.008)	(0.019)	(0.018)
$\Delta OFC\ deposits_{i,t-1}$			0.009***	0.008	0.007
			(0.002)	(0.008)	(0.009)
$\Delta OFC\ deposits_{i,t-2}$			-0.005	-0.017	-0.018
			(0.005)	(0.013)	(0.013)
$\Delta OFC\ deposits_{i,t-3}$			-0.007	-0.023**	-0.023**
			(0.005)	(0.011)	(0.011)
$D(QE)_t \times \Delta OFC\ deposits_{i,t}$		-0.023		-0.035	-0.037**
		(0.020)		(0.022)	(0.018)
$D(QE)_t \times \Delta OFC\ deposits_{i,t-1}$				-0.043***	-0.036***
				(0.007)	(0.010)
$D(QE)_t \times \Delta OFC\ deposits_{i,t-2}$				-0.014	-0.009
				(0.016)	(0.017)
$D(QE)_t \times \Delta OFC\ deposits_{i,t-3}$				0.003	0.008
				(0.020)	(0.020)
$D(Funder)_i \times D(QE)_t \times \Delta OFC\ deposits_{i,t}$		-0.011		-0.002	0.001
		(0.010)		(0.012)	(0.007)
$D(Funder)_i \times D(QE)_t \times \Delta OFC\ deposits_{i,t-1}$				0.044***	0.041***
				(0.010)	(0.008)
$D(Funder)_i \times D(QE)_t \times \Delta OFC\ deposits_{i,t-2}$				0.033***	0.029***
				(0.010)	(0.010)
$D(Funder)_i \times D(QE)_t \times \Delta OFC\ deposits_{i,t-3}$				0.021	0.015
				(0.017)	(0.018)
Bank fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	No
Observations	6191	6191	5948	5948	6086
Banks	55	55	55	55	55
F	3	4	39	43	129

Analysis & Result:

Instrumental Variable (IV) model: using APF Gilt sales as an instrumental

- The may be a cycle between deposit and lending.
- So IV was introduced to clear the identification



Analysis & Result:

Instrumental Variable (IV) model: using APF Gilt sales as an instrumental

First stage: Test the relation of Gilt sale and OFC deposit

Table 7: First stage regressions, OFC deposit flows regressed on exogenous variables

	(1)	(2)	(3)	(4)
APF gilt sales$_{i,t}$	0.363***	0.237***	0.352***	0.317***
	(0.070)	(0.068)	(0.074)	(0.099)
$\Delta L_{i,t-1}$			-0.480	-0.198
			(1.057)	(1.074)
$\Delta L_{i,t-2}$			1.483	1.764
			(1.092)	(0.977)
Sector demand$_{i,t}$	2.340**	-0.377	2.415*	0.852
	(1.046)	(1.458)	(1.266)	(1.307)
Credit stock$_{i,t-1}$	0.054	-0.004	0.032	-0.004
	(0.073)	(0.021)	(0.067)	(0.020)
Bank fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	No	Yes
Observations	379	372	378	366
Banks	12	11	12	11
F	28.292	4.812	22.526	9.536

Gilt sale and OFC are statistically significance correlated

Analysis & Result:

Instrumental Variable (IV) model: using APF Gilt sales as an instrumental

Second stage: Test the effect of OFC on Lending

Table 8: Lending IV regressions

	(1)	(2)	(3)	(4)
ΔOFC Deposit$_{i,t}$	-0.171	-0.330	-0.175	-0.230
	(0.157)	(0.423)	(0.160)	(0.237)
$\Delta L_{i,t-1}$			-0.070	0.019
			(0.157)	(0.162)
$\Delta L_{i,t-2}$			0.341	0.461
			(0.261)	(0.448)
Sector demand$_{i,t}$	0.376	-1.256*	0.418	-0.872*
	(0.428)	(0.652)	(0.453)	(0.513)
Credit stock$_{i,t-1}$	0.036*	-0.002	0.030	-0.001
	(0.019)	(0.006)	(0.021)	(0.004)
Bank fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	No	Yes
Observations	498	485	377	366
Banks	11	11	11	11
F	0.924	0.150	0.935	1.375

No significance evidence of
increase in deposit on lendir

Analysis & Result:

Instrumental Variable (IV) model: using APF Gilt sales as an instrumental

Impulse response function

Table 9: Second stage estimation, with leads of the dependent variable

	$\Delta L_{i,t}$	$\Delta L_{i,t+1}$	$\Delta L_{i,t+2}$	$\Delta L_{i,t+3}$	$\Delta L_{i,t+4}$	$\Delta L_{i,t+5}$	$\Delta L_{i,t+6}$
ΔOFC Deposit$_{i,t}$	-0.175	-0.149	-0.091	-0.128	-0.040	0.005	-0.055
	(0.160)	(0.145)	(0.074)	(0.109)	(0.071)	(0.055)	(0.107)
$\Delta L_{i,t-1}$	-0.070	0.031	0.154	0.058	0.026	-0.006	-0.059
	(0.157)	(0.219)	(0.143)	(0.110)	(0.073)	(0.072)	(0.121)
$\Delta L_{i,t-2}$	0.341	0.005	0.091	0.310*	0.105	0.100	0.112
	(0.261)	(0.162)	(0.150)	(0.179)	(0.087)	(0.086)	(0.110)
Sector demand$_{i,t}$	0.418	0.011	-0.109	0.285	-0.222	-0.188	0.183
	(0.453)	(0.347)	(0.257)	(0.343)	(0.202)	(0.181)	(0.244)
Credit stock$_{i,t-1}$	0.030	0.029	0.019	0.013	0.012	0.008	0.016
	(0.021)	(0.022)	(0.016)	(0.020)	(0.013)	(0.012)	(0.017)
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	377	377	376	375	375	375	364
Banks	11	11	11	11	11	11	11
F	0.935	1.532	1.645	0.877	2.555	1.865	0.530

Conclusion

- No evidence that QE give rise to bank lending in UK during the QE period

- The researcher suggest the reason that QE give rise to OFC deposit, flighty deposit, which lead BLC to diminished.

Q&A