Quantitative easing and preferred habitat investors in the euro area bond market

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The paper in one slide

This paper estimates bond demand regressions and distinguishes between eight investor sectors from the euro area (Banks, Governments, Households, Insurance companies, Investment funds, Non-financial corporations, OMFI's, Pension funds) **and a single Rest of the World investors sector**

The sample covers the full asset purchase program (2013Q4-2022Q2) and distinguishes between QE purchases and new issuances.

The main results show that **insurance companies and pension funds are strong preferred habitat investors, while non-euro area investors and banks appear to be most elastic**. The results show quite some heterogeneity between maturity segments, but are relatively robust when considering sub-periods.

While QT is not simply the mirror image of QE, the results could provide clues on investor behaviour when the Eurosystem shrinks its balance sheet.

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A long-term project on bond ownership

In Boermans and Vermeulen (2018, DNB WP) we investigate whether the PSPP affected euro area investors' demand for bonds using granular securities holdings data. The results show:

- **strong evidence that euro area investors acted as preferred habitat investors**. These findings hold across all major euro area investors (banks, insurance companies, pension funds and investment funds).
- **sellers of bonds in response to QE in the euro area are different from those that sold to the Fed, BoE and BoJ**, policymakers need to pay particular attention to demand by non-euro area investors, especially if the ECB plans to reduce its balance sheet.

We expand this work with an improved empirical methodology, **including bond-level data on ECB purchases**, covering the 2013-2022 time period, conducting sub-sample analysis across time periods and different bond maturities.

Agenda

1. Why does it matter who owns bonds?
2. Euro area government bond ownership during 2015-2022
3. Findings on the buyers of central bank purchases
4. Data
5. Econometric approach
6. Results
7. Conclusions

1. Why does it matter who owns bonds?

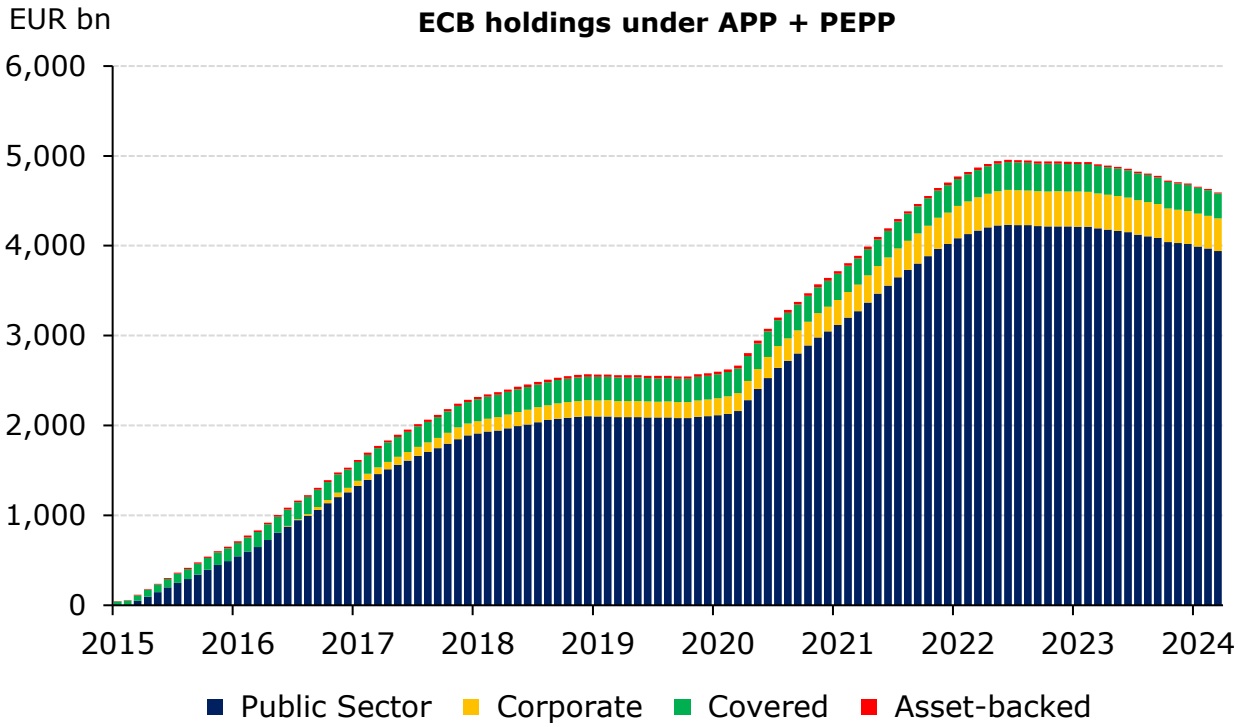
First, **for unconventional monetary policy the ownership structure determines the effectiveness:**

- **In frictionless markets quantitative easing has no price effect** due to arbitrage, but with **imperfect substitutability** there are price effects (Tobin, 1965)
- **In particular, some investors have a preference for bonds with long maturities** (Andres et al. 2004; Vayanos & Vila, 2021)
- Evidence **for the euro area shows significant price effects** (Altavilla et al, 2015)
- Ray et al. (2023) show the effects of preferred habitat with QE in a New Keynesian model

Second, **bond ownership structure determines shock amplification in fire sale situations and financial stability risks:**

- **Investors with mandates/regulation based on ratings sell at the same time** (e.g. Ellul et al., 2011)
- Investor redemptions can have power **spillover effects when funds hold the same assets** (Falato et al., 2021)

2. During 2015-2022 the ECB balance sheet expands…



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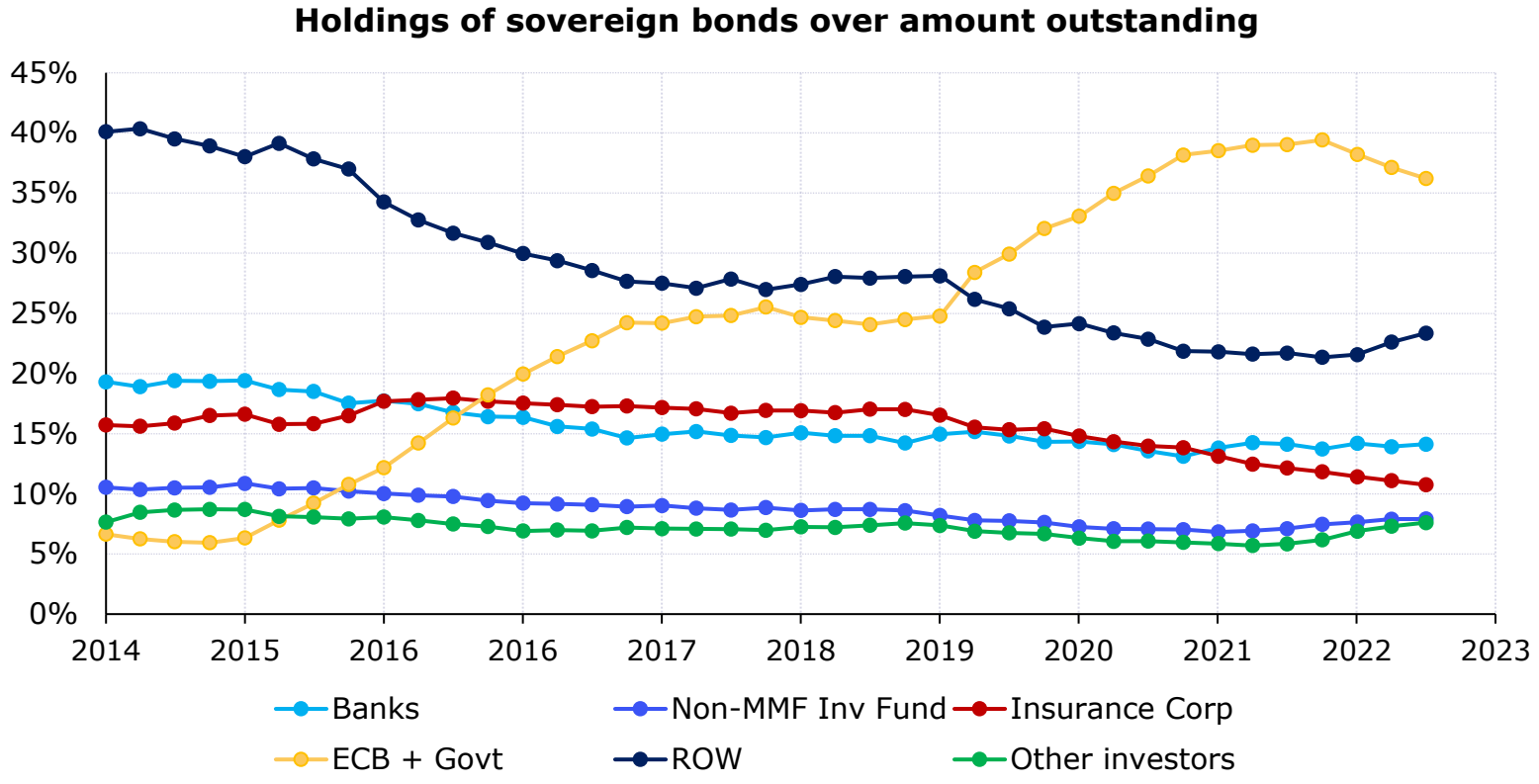
…shifting the composition of euro area sovereign debt holders



3. Findings on the buyers of central bank purchases

There are several studies analyzing from whom central banks brought bonds during recent episodes of QE

For the *euro area*, evidence suggests that euro area banks and non-euro area investors mostly sold to the ECB in response to QE (see Koijen et al., 2021)

- Stronger responses from vulnerable countries (Albertazzi et al., 2021)
- Portfolio rebalancing by investment funds and households to similar foreign sovereign bonds (Bergant et al., 2020) and risky emerging market debt (Hudepohl, 2022)
- Elsayed et al. (2023) connect investors' rebalancing patterns to preferred habitat. For example, selling by banks spurs bank lending, while investment funds may increase their demand for riskier securities.

3. Findings on the buyers of central bank purchases

For *non-euro area*, studies highlight different roles in different countries by various investors:

- For the US, domestic mutual funds and households rebalancing (Carpenter et al. 2015; Goldstein et al., 2018)
- For the UK, domestic insurers and pension funds rebalancing (Joyce et al., 2017)
- For Japan, rebalancing by the domestic Government Pension Investment Fund towards equities (Saito & Hogen, 2014)

These studies conduct no analyses specifically on the presence of preferred habitat investors and if so, whether QE changed the demand for bonds by these investors

4. Data

Securities Holdings Statistics Sectoral (SHS-S) combined with Eurosystem bond purchase information

For the euro area, we observe at the country-sector level bond portfolio positions over the period 2013Q4-2023Q4

- E.g. NL1234567890 held by German banks in 2022Q1
- We have nine different investor groups: ECB; euro area banks; investment funds; insurance corporations; pension funds, OMFIs; households; government; NFCs; and as a residual holder non-euro area investors ("RoW")
- ECB purchases are program specific (e.g. PSPP, PEPP)

By analyzing investor holdings in individual bonds, we can control for many (unobserved) factors and observe at a very granular level changes in investor composition

5. Econometric approach to estimate bond demand functions

The literature applies several alternative methodologies to estimate the response of investors to central bank purchases. Alternatives include:

- Koijen et al. (2021) have a demand system perspective

$$-\frac{\partial \log(Q_{i,t}(n))}{\partial \log(P_{i,t}(n))} = 1 + 100\frac{\beta_{0,i}}{m_t(n)}(1 - w_{i,t}(n)).$$

- Albertazzi et al. (2021) consider log holdings and a pre- and post-announcement period

$$h_{i,h,t} = \left(\beta_0 m_h + \beta'_0 r_{it} + \beta_0'' m_h r_{i,t}\right) + \left(\beta_1 m_h T_t + \beta_1' T_t r_{i,t} + \beta_1'' m_h T_t r_{i,t}\right) + \\ + \gamma T_t + a_{i,t} + b_{h,t} + \varepsilon_{i,h,t}$$

- Elsayed et al. (2023) make a more direct connection to central bank purchases

$$\frac{\Delta Q_{ijt}}{Q_{ijt} + Q_{ijt-1}} = \beta_i \frac{\Delta Q_{jt}^{QE}}{FV_{jt} + FV_{jt-1}} + \gamma^1 \frac{\Delta FV_{jt}}{FV_{jt} + FV_{jt-1}} + \gamma^2 \Delta Rating_{jt} + FE_{it} + FE_j + \epsilon_{ijt},$$

5. Econometric approach to estimate bond demand functions

To test if there are preferred habitat investors, we **estimate at the bond level the demand for a bond** and **analyse the responsiveness to the purchases by the ECB and shifts in supply (amount outstanding)**

- Outcome variable: (Nominal) holdings by different investor sectors of a bond *i* at quarter *t*
  - Main variables of interest
    - ECB holdings*Holder Sector dummies *(External demand shock)*
    - Amount Outstanding*Holder Sector dummies *(Supply shock)*

As extensions from the baseline specification, we investigate whether the effect varies for

- Different maturity segments,
- Different QE periods (state-dependency)
- Domestic vs Cross-border holdings (home-bias), and
- Credit ratings

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5. Econometric approach to estimate bond demand functions

More formally:

$$H_{b,i,t} = \beta_i^{ECB} * ECB_{b,t} * HolderSector_i + \beta_i^{AO} * Outstanding_{b,t} * HolderSector_i + \gamma_{b,i} + \mu_{i,t} + \varepsilon_{b,i,t}$$

Estimate regression using least squares:

- β_i^{ECB} and β_i^{AO} are the main coefficients of interest
  - β_i^{ECB} measures investor *i* holdings' response to ECB purchase shock; $\sum_i \beta_i^{ECB} = -1$
  - β_i^{AO} measures investor *i* holdings' response to bond supply shock; $\sum_i \beta_i^{AO} = 1$
- $\gamma_{b,i}$ captures time-invariant bond preferences by holder sector i
- $\mu_{i,t}$ captures time-specific common shocks for holder sector i

Main advantages:

- Directly observe the elasticity to central bank purchases
- Easier interpretation of the coefficients
- Large observations are weighted more heavily compared to using % change approaches

6. Regression results (baseline only) - mechanics

All investor sectors sell in response to ECB purchases

- *When the ECB buys EUR 1 bln of bonds, e.g. euro area banks sold EUR 207 mln to the ECB*

When governments issue new debt, all investors step in to purchase

- *When euro area government finance EUR 1 bln in debt, "ROW" investors buy EUR 457 mln*

Sector	β^{ECB}	β^{AO}	$\beta^{ECB} + \beta^{AO}$
Banks	-0.207 ***	0.170 ***	-0.037 ***
	(0.016)	(0.012)	(0.011)
Govt	0.016	0.019 **	0.035 ***
	(0.014)	(0.008)	(0.013)
Households	-0.028 ***	0.016 ***	-0.012 **
	(0.008)	(0.004)	(0.005)
Insurers	-0.045 **	0.145 ***	0.100 ***
	(0.022)	(0.021)	(0.024)
Inv. Funds	-0.160 ***	0.111 ***	-0.049 ***
	(0.009)	(0.006)	(0.007)
NFCs	-0.017 ***	0.010 ***	-0.007 *
	(0.005)	(0.002)	(0.003)
OMFIs	-0.015 ***	0.011 ***	-0.003
	(0.004)	(0.002)	(0.003)
Pension Funds	-0.030 ***	0.061 ***	0.031 **
	(0.009)	(0.011)	(0.013)
Rest of World	-0.513 ***	0.457 ***	-0.056 **
	(0.030)	(0.024)	(0.024)

The baseline regression is specified as follows:

$$H_{b,i,t} = \beta_i^{ECB} * ECB_{b,t} * HolderSector_i + \beta_i^{AO} * Outstanding_{b,t} * HolderSector_i + \gamma_{b,i} + \mu_{i,t} + \varepsilon_{b,i,t} \quad \textbf{(1)}$$

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6. Regression results (baseline only) - preferred habitat

Foreign investors sold most in response to ECB purchases, followed by euro area banks and investment funds

Taking into account the absorption of these investors of sovereign bonds outstanding, we find that euro area **insurers and pension funds** acted as preferred habitat investors

Sector	β^{ECB}	β^{AO}	$\beta^{ECB} + \beta^{AO}$
Banks	-0.207 ***	0.170 ***	-0.037 ***
	(0.016)	(0.012)	(0.011)
Govt	0.016	0.019 **	0.035 ***
	(0.014)	(0.008)	(0.013)
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The baseline regression is specified as follows:

$$H_{b,i,t} = \beta_i^{ECB} * ECB_{b,t} * HolderSector_i + \beta_i^{AO} * Outstanding_{b,t} * HolderSector_i + \gamma_{b,i} + \mu_{i,t} + \varepsilon_{b,i,t} \quad \textbf{(1)}$$

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6. On the role of euro area insurers and pension funds

The preferred habitat of insurers and pension funds from the euro area is further supported by robustness exercises:

- *Lower willingness to sell sovereign bonds with longer maturities*
- *Relative time-invariance along the different episodes of QE*
- *Demand persistence beyond domestic bonds*
- *Demand indifference across issuer credit ratings*

Our study highlights the fickle flows from foreign investors in contrast to the strong investor base from euro area insurers and pension funds, which arguably induced QE to raise interest rates while operating at the zero-lower bound

7. Conclusion and further steps

The main results show that **insurance companies and pension funds are strong preferred habitat investors, while non-euro area investors and banks appear to be most elastic**. The results show quite some heterogeneity between maturity segments, but are relatively robust when considering sub-periods.

Work in progress: Analyze if investors' demand behaves symmetrically during tightening period (post 2022:Q2) than during QE.

Ferrara et al. (2024) already provide some evidence on investors stepping in to absorb the additional supply of government bonds. Our results highlight the importance of preferred habitat and more elastic investors the Eurosystem needs to take into account when shrinking its balances sheet.

7. Conclusion and further steps

Several next steps can be envisaged going forward:

- Conduct the analyses for the QT period and assess if results are symmetric or not
- Future work and possibilities through ChAMPS of cooperation with other NCBs/countries with large pension funds and insurance company holdings to test implications at the investor level similar to IBRN. Answer more detailed questions:
    - Which types of insurers and pension funds are reluctant to sell to the Eurosystem?
    - What may be the origin of the preferred habitat?