Quantitative Easing, Bank non-Bank Interactions and Real Estate Investments

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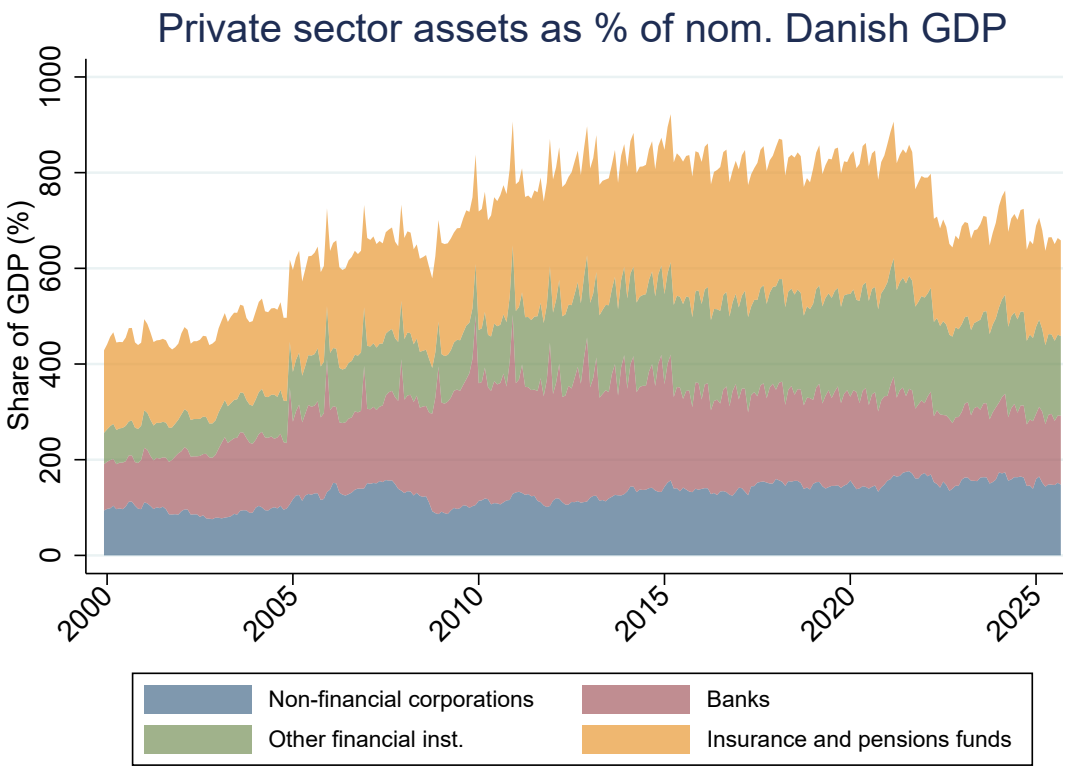
Banco de Portugal, December 2025

ChaMP 8th Workstream 1 Workshop

Motivation

Growth of non-bank financial intermediaries (NBFI's)



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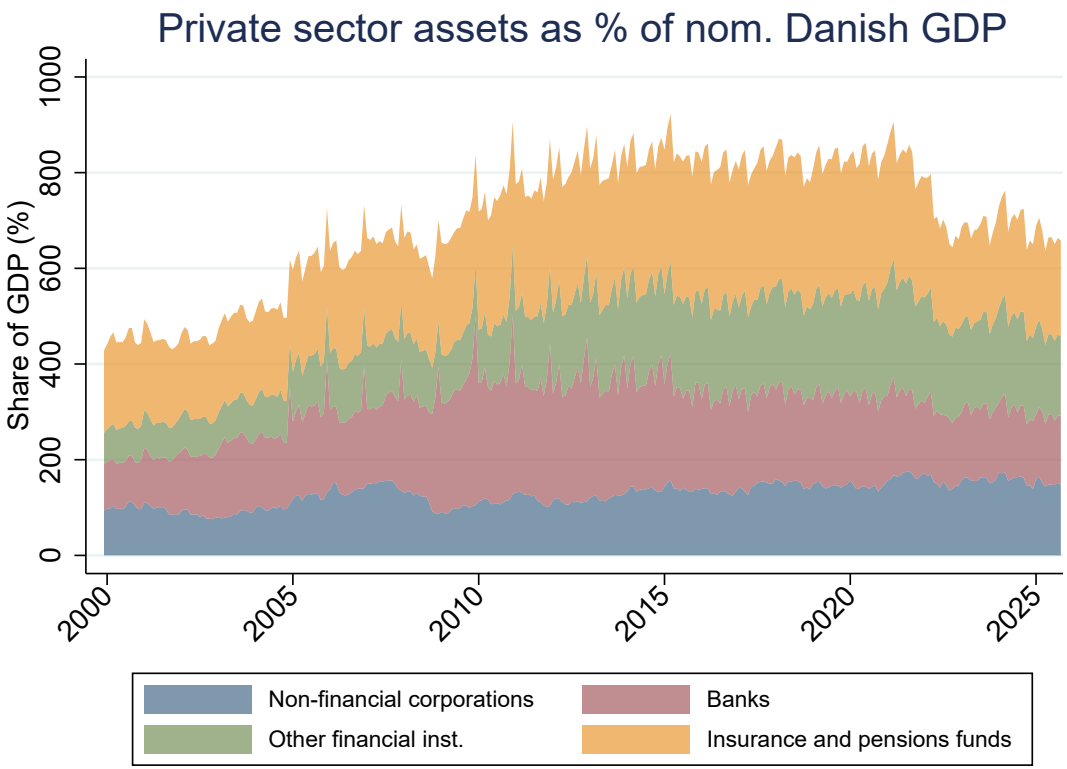

- [1] Pension funds and insurance companies (managing long-duration liabilities) **assets to GDP** have grown significantly over time:
  - **100% U.S.; 25% EA; 200% DK**
- Increasingly allocating capital to government bonds, corporate credit, and structured finance products.

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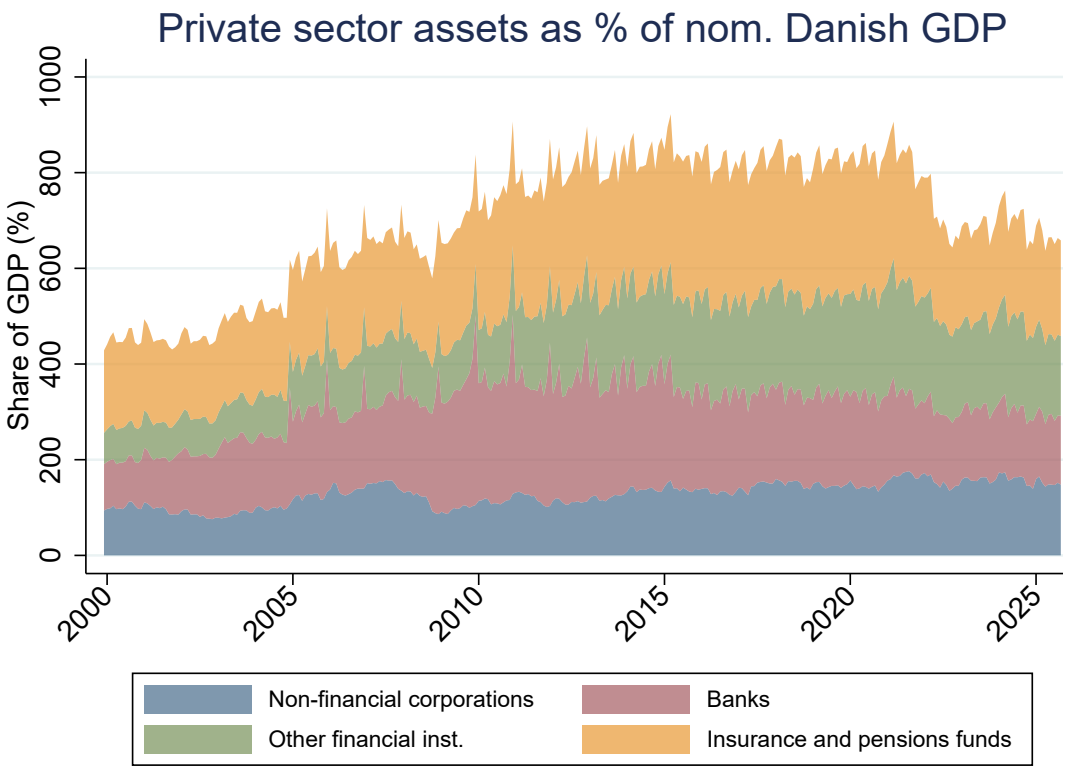

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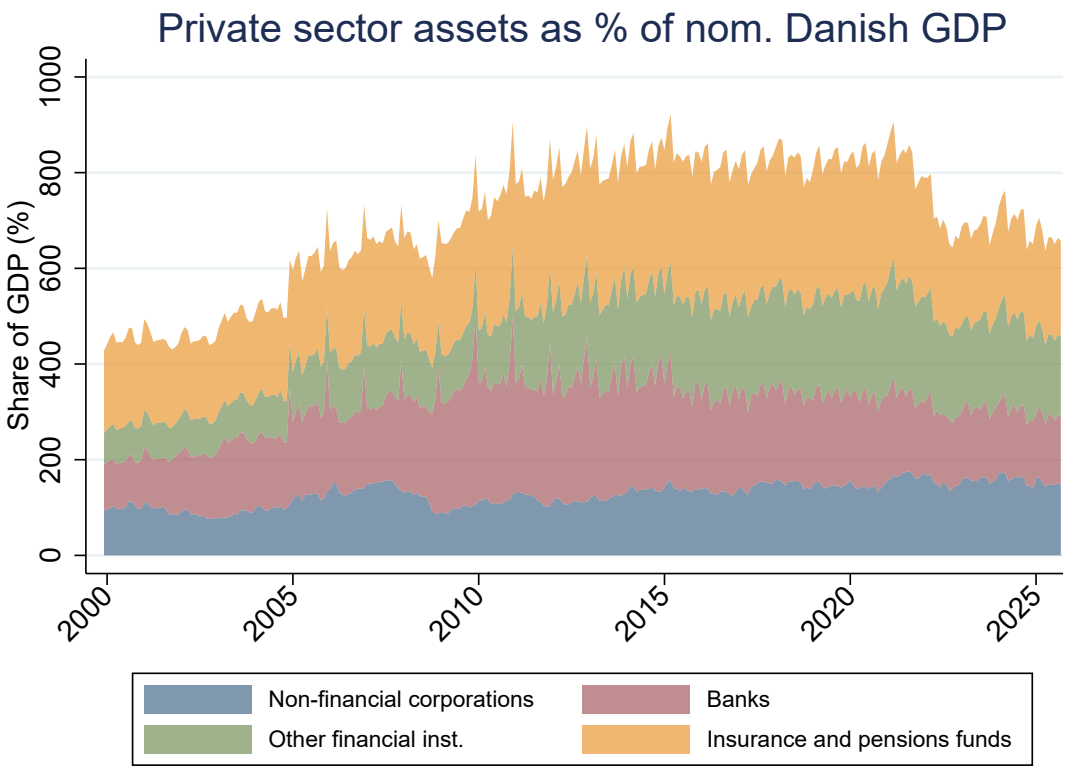

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- [2] **Great Rotation:** migration of risk from public to private markets.
- Private and real assets: trade infrequently, lumpy, unique and heterogeneous investors.

Paper in a nutshell

Question

- How do Danish NBFIs (Pension and Insurance funds) rebalance their asset portfolio in response Quantitative Easing policies and what are the implications for housing markets?

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  - $\rightarrow$ More foreign bonds and shares and longer maturity bonds, less lower-rated bonds.
  - $\rightarrow$ More non-listed real estate assets and mortgage bonds (covered bonds).

Contribution to the literature

- Monetary Policy and NBFIs

  Selgrad (*WP*, 2023); Kaufmann et al. (*WP*, 2022); Mimun et al. (*WP*, 2025), Cucic and Gorea (*RFS*, 2025)

  $\Rightarrow$ This paper focuses on housing market investments.

- Monetary Policy and Housing/Credit Markets

  Berg et al. (*WP*, 2025); Rodnyansky and Darmouni (*RFS*, 2017); Chakraborty et al. (*JFE*, 2020); Bandoni et al. (*WP*, 2025)

  $\Rightarrow$ This paper: how MP driven interaction between NBFIs and Mortgage lenders affects housing credit/prices.

- Bank-nonBank Interactions

  Buchak et al. (*JPE*, 2024); Haque et al. (*WP*, 2025)

  $\Rightarrow$ This paper: portfolio rebalancing of NBFIs improves housing credit conditions via easing banks funding conditions.

Roadmap

Hypothesis

Data and Summary Statistics

Empirical Setting

Results

Hypotheses

Transmission of Quantitative Easing

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Portfolio rebalancing

- QE lowers duration risk. Term premium declines and investors substitute to other assets (high quality corporate bonds, covered bonds or other highly rates securities).
- This lowers risk premia in other markets.
- Borrowing cost for firms and households (mortgages) decline.

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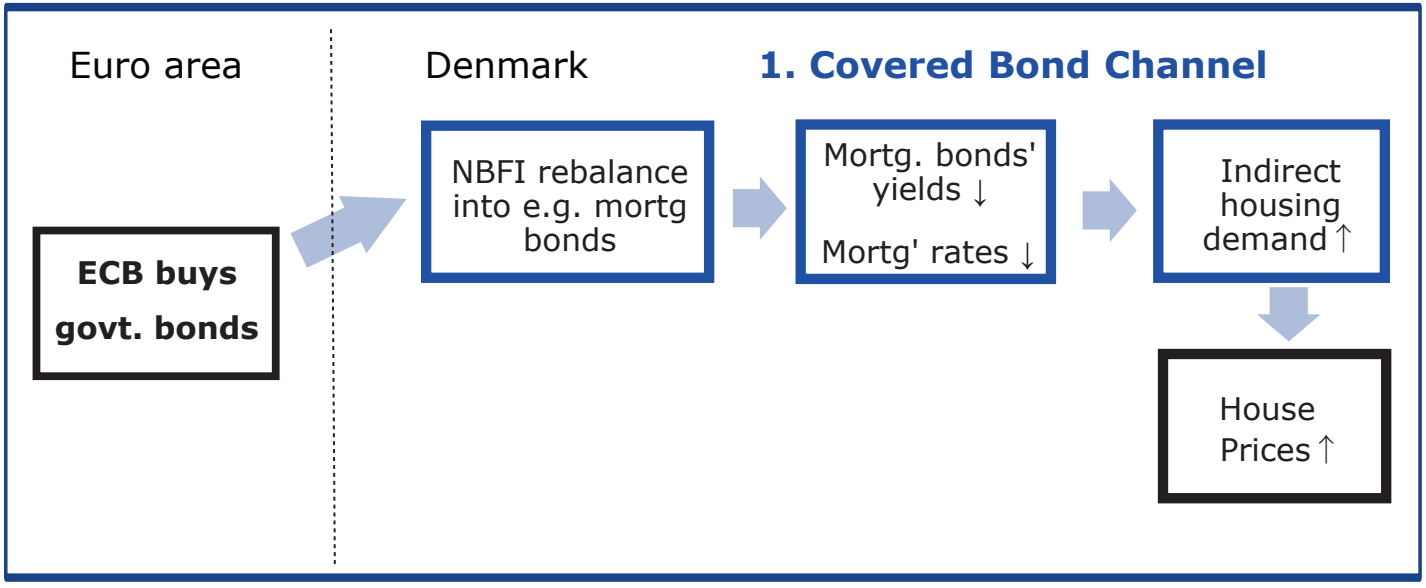

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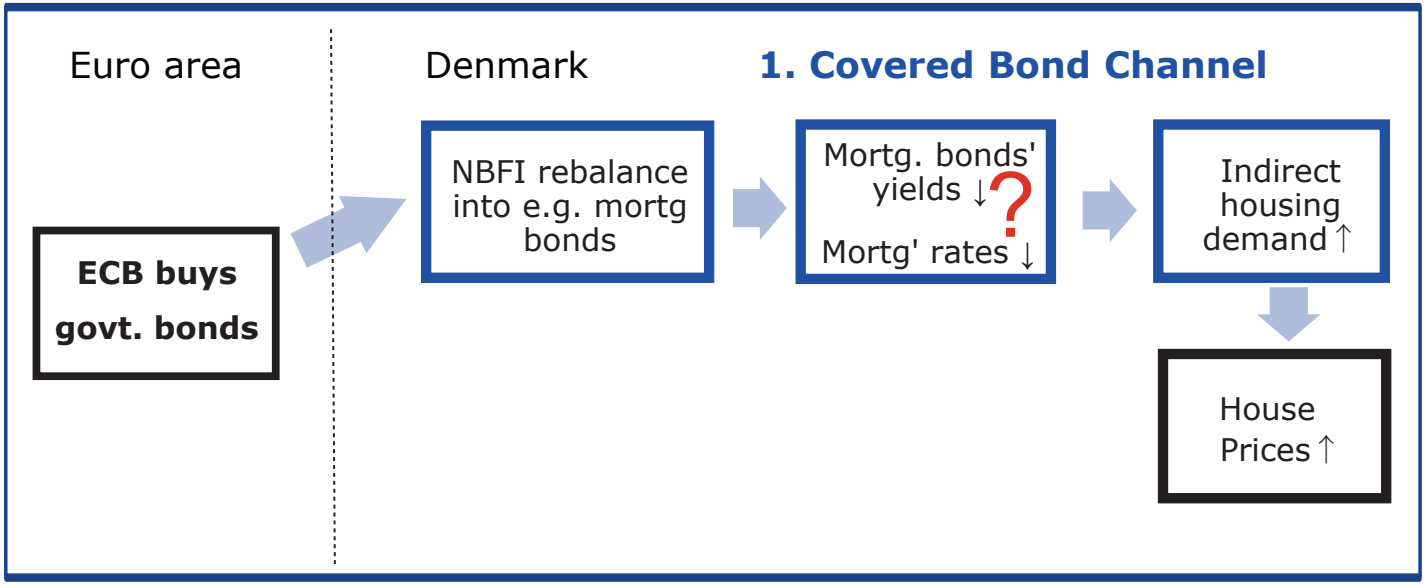

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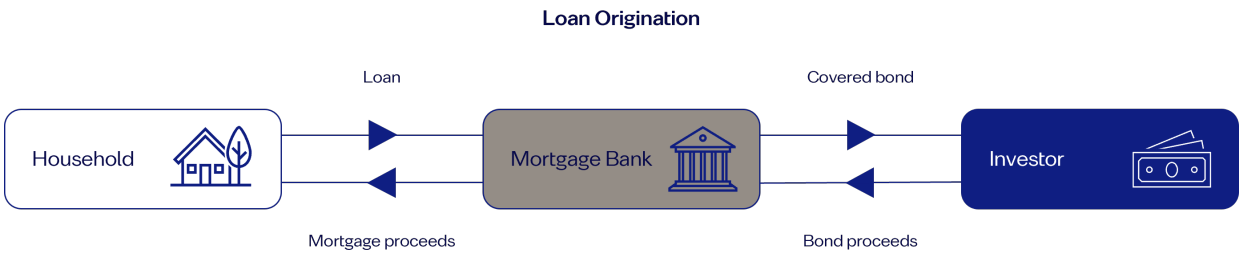
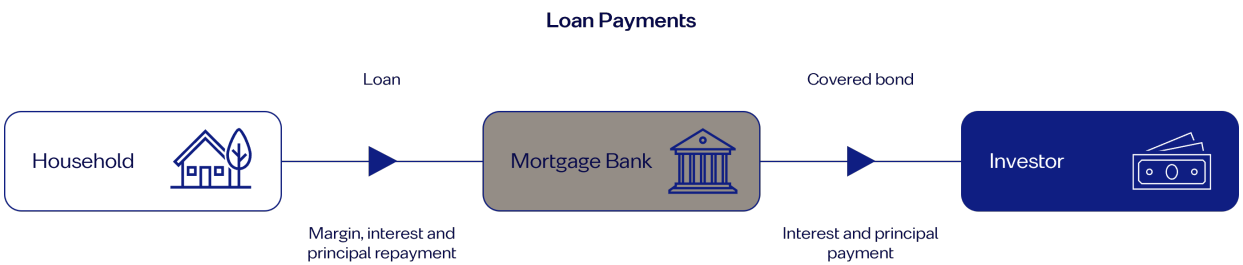
Digression: Mortgage origination in Denmark

Match funding principle

- **1:1 link** between mortgage loan terms and the bonds used to fund them.
- On a loan-by-loan basis, all **interest** and **principal** from borrowers are **passed directly to bondholders**. Bank carries credit risk, no interest rate, volatility, FX or liquidity risk.
- Borrowers has right to (i) **prepay** at par (yields fall, bonds trade above par) or (ii) **buy back** at market price (yields rise, bonds below par). $\rightarrow$ Higher liquidity in high rate periods and yields (embedded call option).





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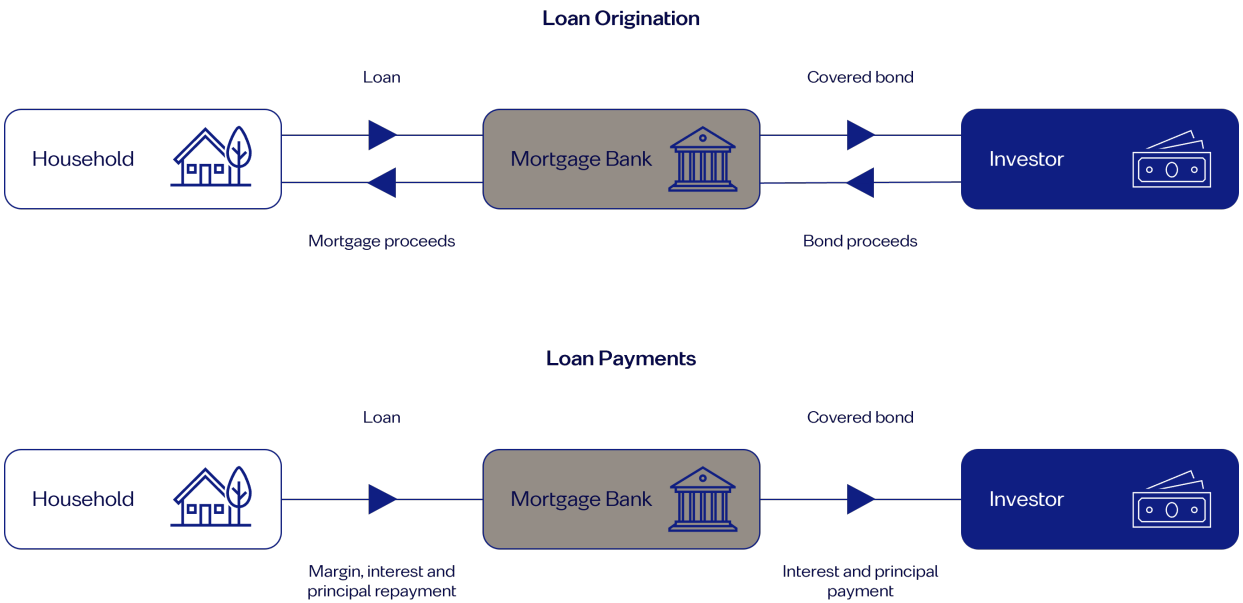

Top 10 Cov. Mortg. Bond Markets

Country	Covered Bonds (EURm)	% of GDP
Denmark	435,825	111%
France	376,098	13%
Germany	296,841	7%
Sweden	224,876	40%
The Netherlands	222,045	10%
Canada	205,903	16%
Spain	188,626	13%
Switzerland	168,800	19%
Italy	160,775	7%
Norway	145,619	33%
Austria	95,516	20%

Note: Data as of year-end 2024, except Spain (year-end 2023).
Sources: ECBC Factbook 2025; Macrobond; Nykredit Markets.

Hypotheses

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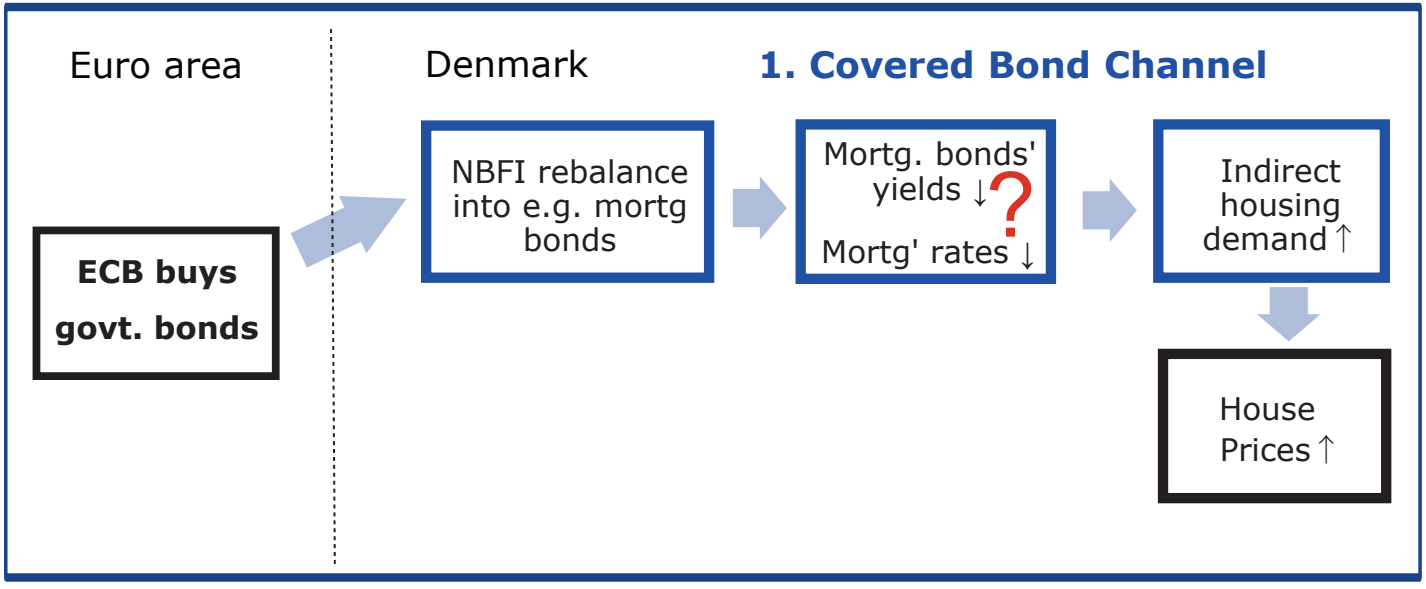

Risk shifting and reaching for yield

- Compressed yields might lead investors to other, riskier private/real assets, e.g. real estate (alpha & risk tolerance ↑).

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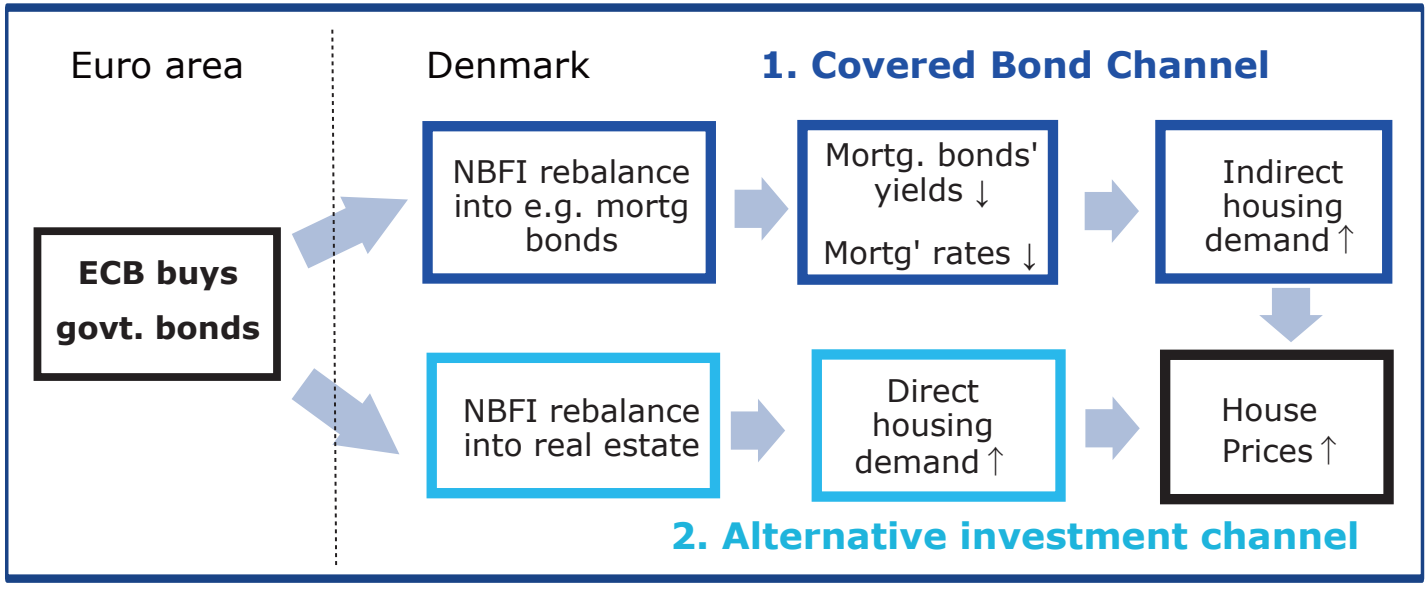

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Pension and Insurance fund data

- End-of-month security holdings of each Investor (IF, B, IC, PF) in Denmark since 2015.
- ISIN-level **security** information (type, market and nominal value, net transaction, bond rating, maturity, duration). **Listed** versus **unlisted** (alternative assets) securities.
- **Issuer** information (name, identifier, industry, sector, country).
- Domestic investment fund look-through since 2018.
- Real estate assets (lower bound due to company ownership structures):
  - $\rightarrow$ Covered mortgage bonds.
  - $\rightarrow$ Counterparty industry real estate: listed versus non-listed assets.

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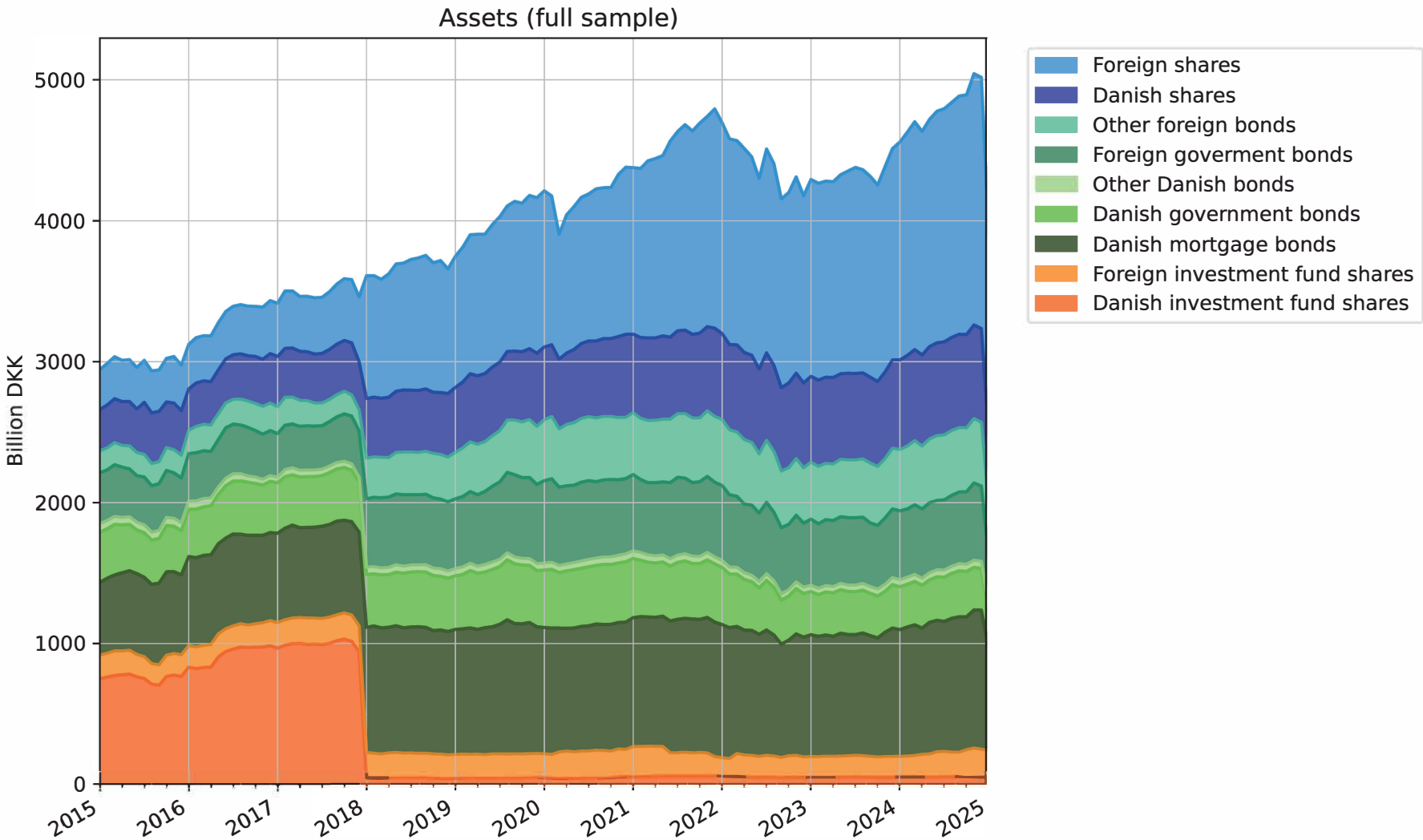
Macro data

- GDP, money market rates, inflation etc from Denmark Statistics.

Danish NBFI aggregate balance sheet - Assets

Pension funds and Insurance companies



Danish NBFI aggregate balance sheet - Liabilities

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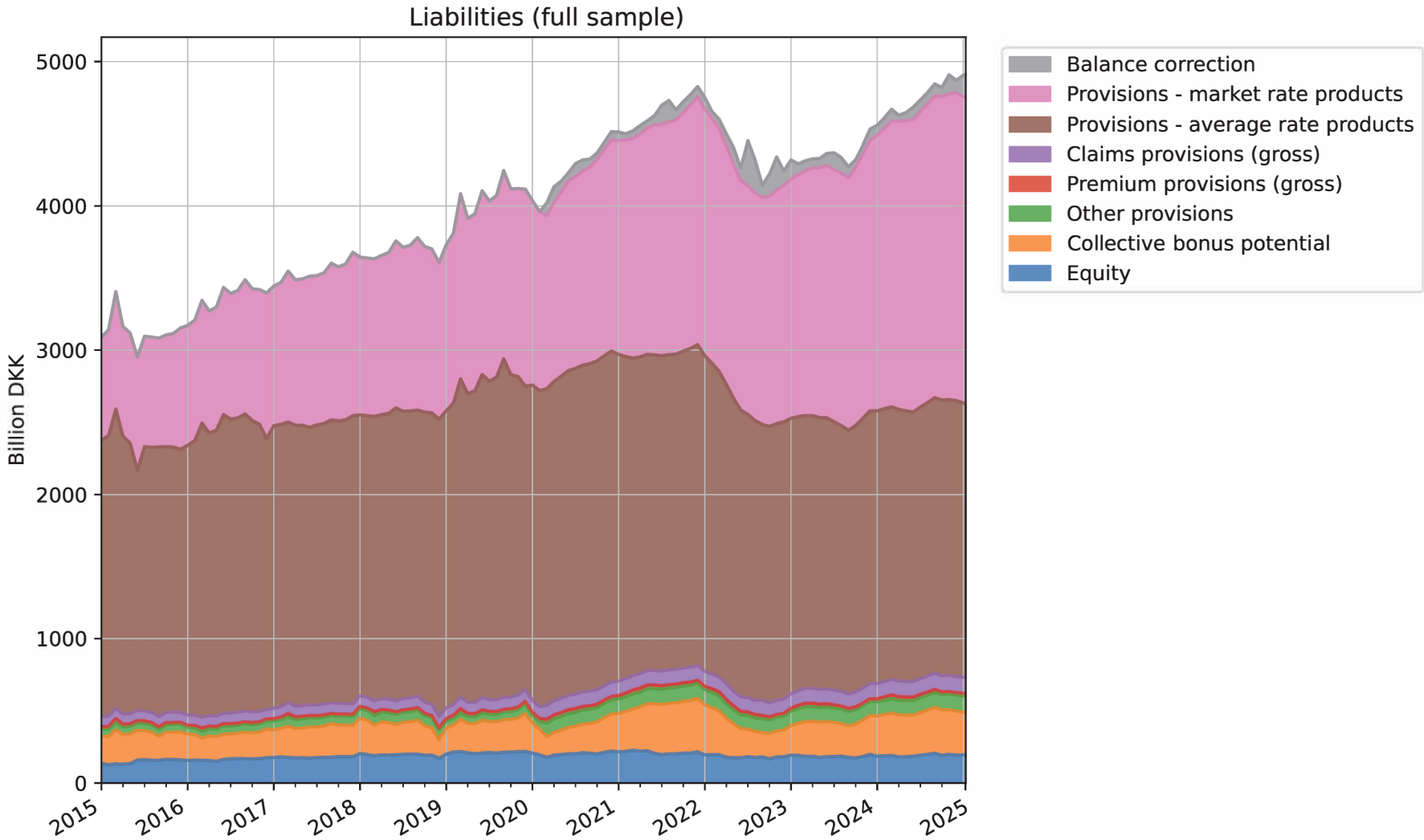
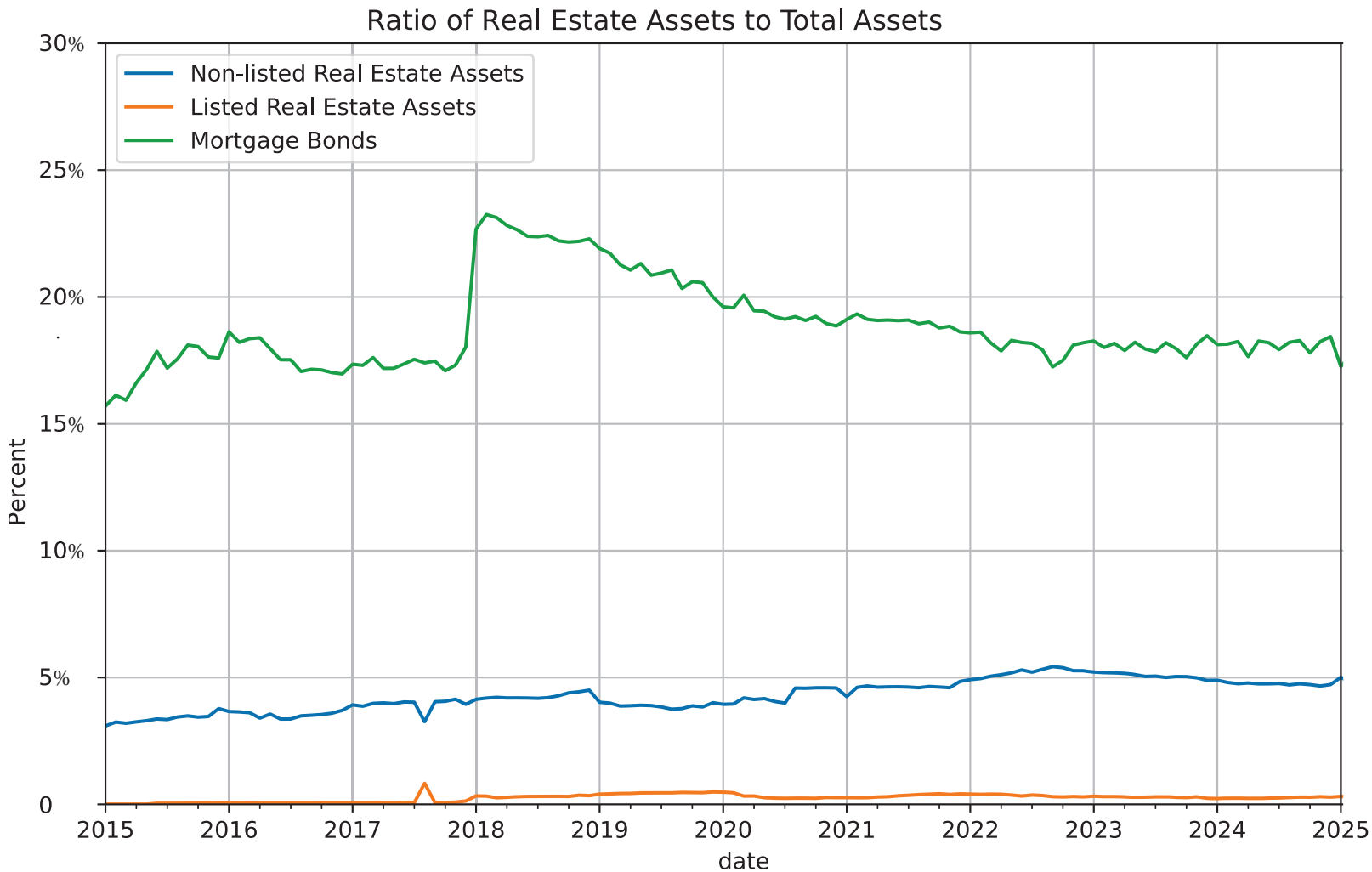


NBFI real estate securities

Share of real estate assets roughly 25% `Asset breakdown`



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Lag-augmented local panel projection model

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- Subscripts: fund i, security s, month t and horizon $h = 24$ months.

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- Standard errors clustered at firm level.

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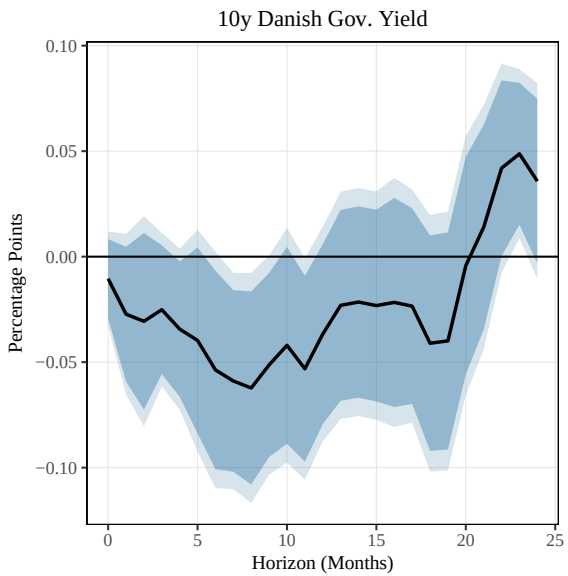
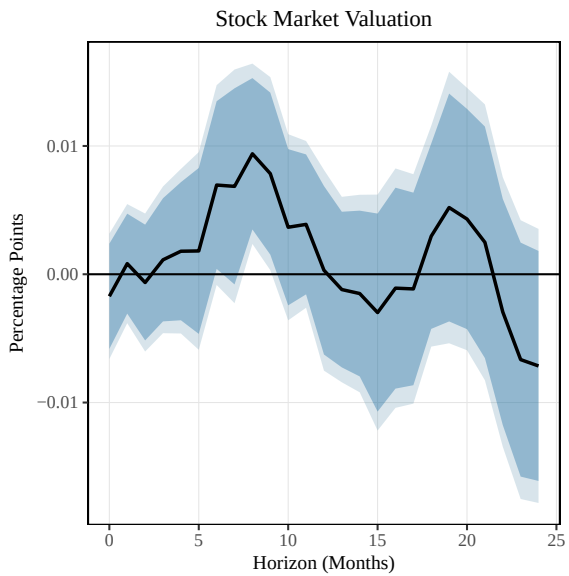
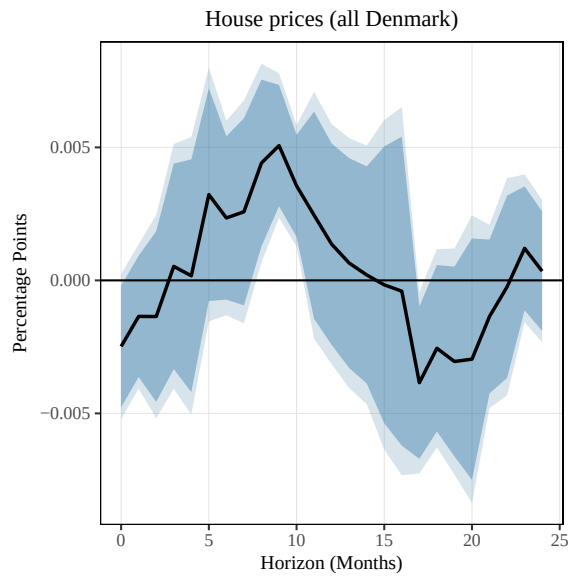
IRFs - Macro level

Expansionary QE effect spillover to Denmark







IRFs Overview - Security type

Searching-for-yield abroad, alternative and real estate assets ↑

Security type		Companies	
		Pension	**Insurance**
Equity		Up***	Up**
Fixed income		-	Down***
Long duration bonds		Up***	Down
Foreign bonds		Up***	-
Lower rated bonds		-	Down***
Non-Listed assets		Up**	Up**
Real estate	All	Up***	Up**
	Listed	Up***	-
	NonListed	Up**	Up**
DK bonds		-	Up
DK Mortg. Bonds		Down*	Up***
DK Equity		Up***	Up***
Foreign Corp. Bonds		Up***	Up
Foreign Gov. Bonds		Down**	Up**
Foreign Equity		Up***	Down

Table: *,**,*** indicates stat. sign. at 32%, 10% and 5% level.

Way forward ...

To do's

Treatment intensity

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- Firm-specific and time-varying QE exposure based on PSPP share of bonds.

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- Exploit fat-tailed properties of the covered-bond-share distribution of PF/IC asset-side.
- GIV: How is bond pricing and subsequently mortgage pricing affected.

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Housing Market Implications

- Cheaper mortgages versus less affordable house prices. Net effect on new home buyers?
- Housing wealth effect for existing home owners? Distributional effects?

Conclusion

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Findings

- Portfolio rebalancing of NBFIs towards risky assets and real estate:
  - $\rightarrow$ More foreign bonds and shares and longer maturity bonds, less lower-rated bonds.
  - $\rightarrow$ More non-listed real estate assets and mortgage bonds (covered bonds).

Implications

- Higher house prices via direct demand and indirect covered bond channel but also lower housing finance cost.

Thank you for your attention!

Appendix

Pension Funds - Liability types

Defined Benefit Plans

- Benefits an employee will receive at retirement are predetermined by a formula, rather than depending on investment returns.
- Moral hazard? Firms may have incentives to:
  1. **Underfund their DB pension plans (not put in enough money now to cover future promised benefits).**
  2. **Invest pension assets in risky investments (chasing high returns).**

  Why? Because shareholders get the upside if things go well, but don't fully bear the downside if things go badly.

  When a firm promises future pension payments, that's a liability — similar to issuing bonds.
  If the firm goes bankrupt, shareholders are not personally liable to make those pension payments (due to limited liability).
  This encourages risk-taking, because if risky pension investments succeed, the firm:
  Doesn't need to make large future contributions.
  Can preserve cash for other uses (e.g., reinvestment, dividends, executive compensation).

Defined contribution Plans

- Amount contributed to the employee's retirement account is specified, but the final benefit at retirement is not guaranteed. The retirement income depends on how much is contributed and how well the investments perform.

Appendix

The Rise of Alternatives

1. More optimistic about alpha

- ... of alternatives relative to public equities:

$$\alpha_i = E[r_i] - r_f - \beta_i \big(E[r_M] - r_f\big).$$

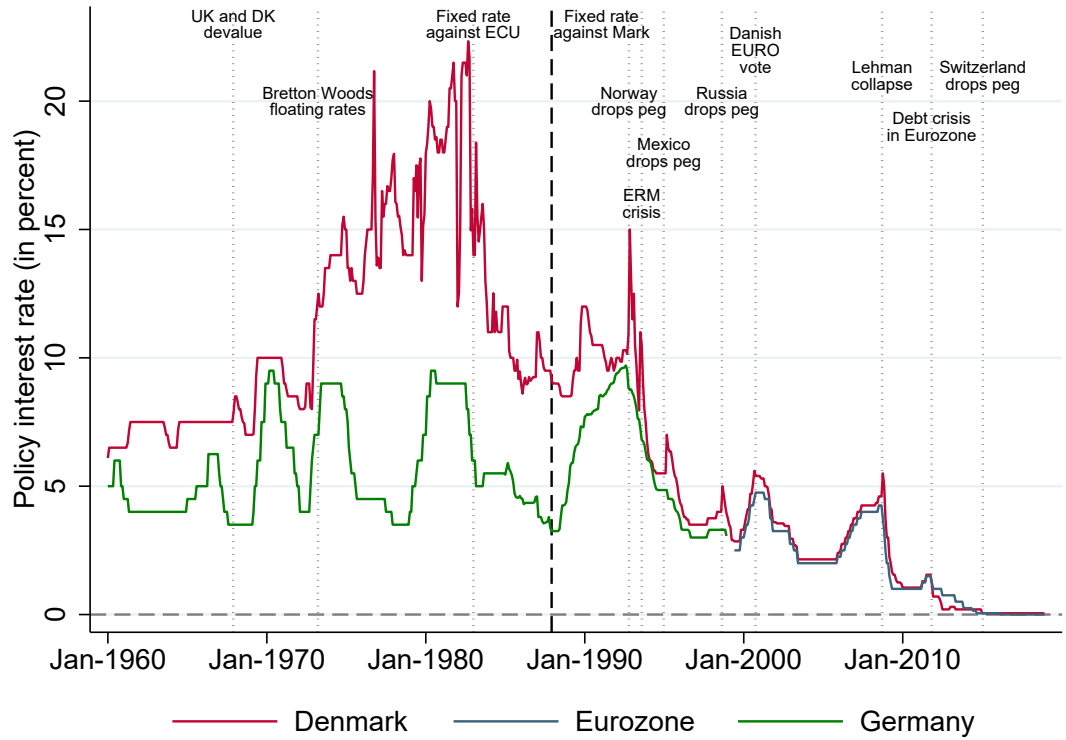
2. Risk tolerance increases

- **In the standard mean-variance model:** Investors choose between *risky portfolio* versus *risk-free assets* (e.g., cash or bonds). When risk tolerance increases, the total share invested in risky assets rises, but the composition of the risky portfolio remains unchanged, given beliefs about expected returns and covariances do not change (Tobin's (1958) two-fund separation theorem).
- **The reallocation effect (the constrained case):** If rising risk tolerance meets leverage constraints, the investor must reallocate within the risky portfolio (from public equities to alternatives).

Appendix

Monetary Policy in Denmark Back to Data

- Danish Krone pegged to Euro (previously German Mark)
- Denmark imports its MP stance from Frankfurt: When ECB changes its leading interest rate to pursue some policy objective for the Euro Area, the Danish Central Bank generally changes its rate by the same amount on the same day to restore the interest rate differential that is consistent with a fixed exchange rate.

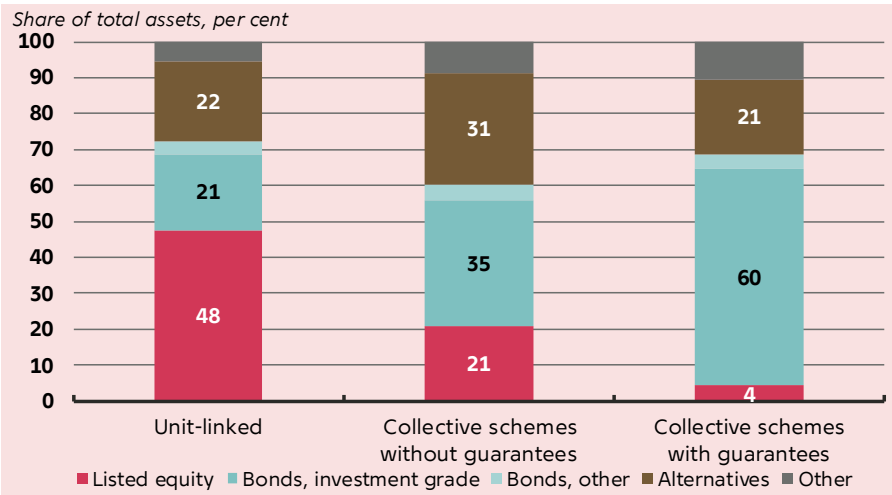


Note: **Monetary policy rates. The figure shows the leading policy interest rates for Denmark, Germany (January 1960 - December 1998) and the Euro Area (January 1999 - December 2018). The leading policy rate is: the lending rate until November 2013 and then the deposit certificate rate (Denmark); the Lombard rate until 1987 and then the repo rate (Germany); the major refinancing operations rate until November 2013 and then the deposit rate (Euro Area). The bold dashed line marks the beginning of the peg to the German Mark.**

Appendix

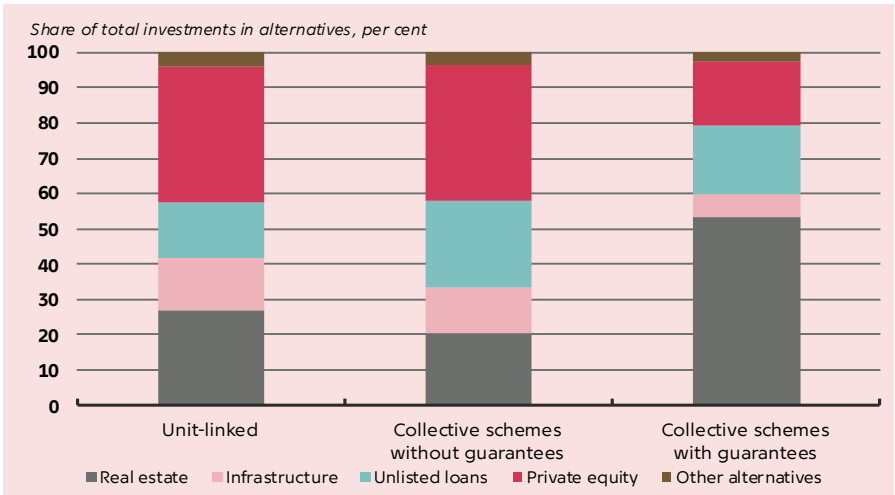
Pension fund asset breakdown Back to Data

Asset allocation by PF scheme



Note: **Other indicates various other asset classes such as loans and loans with bonds as collateral, bank deposits and unallocated holdings. Danish investment funds are screened to include pension companies' holdings of listed equities, bonds and alternatives via these funds. Data is from the end of 2024.**

Alternative investments by PF scheme



Note: **Other alternatives include hedge funds, forestry and agriculture and unallocated alternatives. Derivatives are not included. Danish investment funds are screened to include pension companies' holdings of listed equities, bonds and alternatives via these funds. Data is from the end of 2024**