

Monetary policy consequences of Financial Stability interventions: assessing the LDI crisis and the central bank policy response

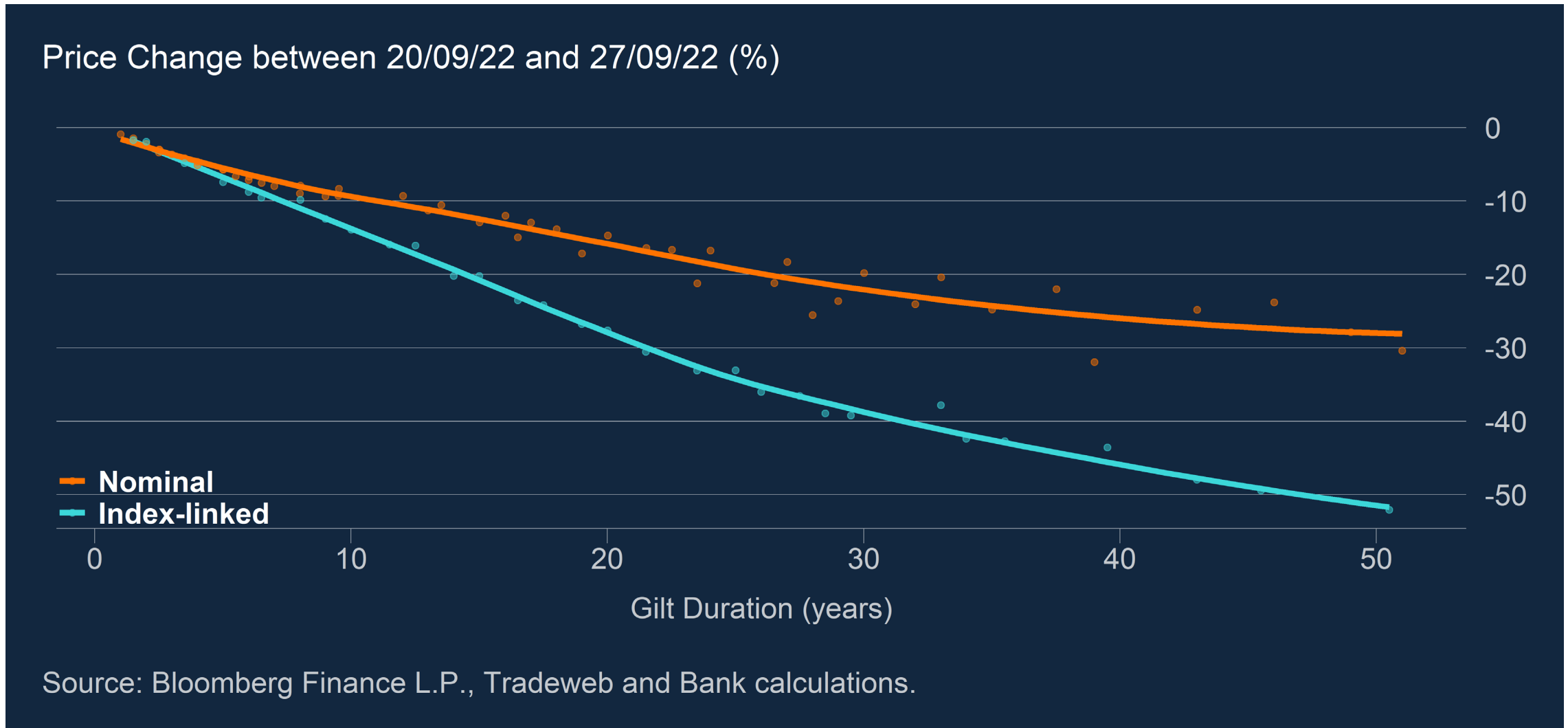
Bank of England Staff Working Paper No. 1,070

Nicolo Bandera, Bank of England
nicolo.bandera@bankofengland.co.uk

Jacob Stevens (Presenting), University of St Andrews
jrs28@st-andrews.ac.uk



Background: What happened in September 2022?



This Paper: what did the Bank of England actually do?

- The BoE responded by large-scale asset purchases (LSAPs), unwound quickly
- This was an entirely unprecedented intervention
- Previous LSAPs were designed to make monetary spillovers as large as possible
 - Quantitative Easing (QE) was a *monetary policy* instrument to increase output and inflation
- This LSAP was designed to make monetary spillovers as *small* as possible
 - The 2022 LSAP was a *financial stability* instrument designed **not** to impact inflation

Research Questions

- 1) **How can we capture Liability Driven Investment in a macroeconomic DSGE model?**
- 2) **Did the LSAP intervention affect monetary policy?**
- 3) **Did the LSAP intervention need to be temporary to avoid monetary spillovers?**
- 4) **How do other policy tools – macroprudential policy (*and repo*) – compare?**

Key Contributions

Modelling:

- First DSGE model to include Liability Driven Investment funds (LDIs)
- Key elements necessary for LDIs to impact the macroeconomy:
 - Frictions *between* households and financial sector → imperfect arbitrage
 - Frictions *within* financial sector → pension funds unable to recapitalise LDIs

Policy:

- LSAP intervention was successful in minimising spillovers to output/inflation
- Critically depends on the intervention being temporary
- Repo and macroprudential policy equally effective, with fewer spillovers

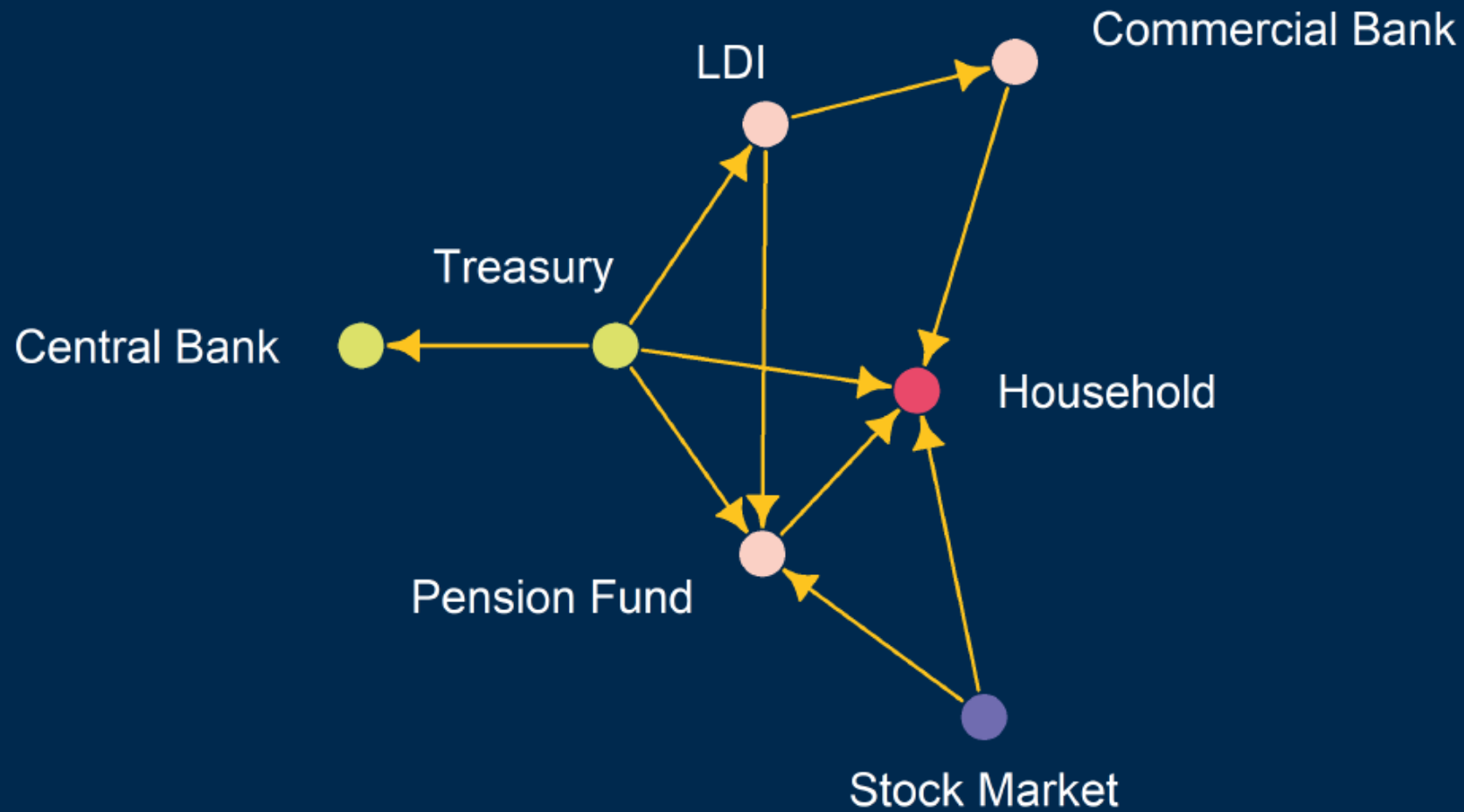
Model Setup

- Standard NK-DSGE model with price frictions and optimising households etc:
 - Habit persistence, firms/capital, labour frictions, lump-sum taxation
- Key innovation to develop the financial sector, splitting pension funds from LDIs
- Government debt: 3-month gilt, 10-year nominal gilt, 10-year linked gilt
- Pension funds sell a defined-benefit pension to households
 - Liabilities: defined-benefit pension (*fixed stream of future payments*)
 - Assets: shares in an LDI (*indirect exposure to gilts*) and equities
- Liability driven investment fund offers leveraged exposure to gilts
 - Liabilities: bank loans (*using a repo agreement*)
 - Assets: index-linked gilts
 - Highly leveraged, net worth only 25% of assets

Model Setup

- **Key feature of model:** pension fund makes plans a period in advance
 - Each period, pension fund chooses portfolio of money, firm equity and LDI shares
 - However, it also choose “*planned equity*” it intends to hold in the following period
 - It faces severe adjustment costs if it tries to deviate from this plan
 - This means that while the pension fund can inject equity into the LDI, it cannot do so quickly
- Households are a background actor, but cannot arbitrage perfectly
 - They earn “*convenience yields*” on gilts, creating a premium over stock returns
 - They also face transaction costs for changing gilt holdings quickly
 - This means that if the central bank buys assets, it increases asset prices (QE)
 - ... But also means that if LDIs sell assets, it reduces prices

Figure 1: Financial Interlinkages



Note: Arrows indicate liability holdings, e.g. Treasury → Household implies households own treasury liabilities

Simulating a crisis: exogenous “portfolio shock” increases yields

- Household portfolio preferences shift → Long-term bonds less valuable
- In baseline with no PFs/LDIs, both linkers and nominal bonds lose value equally
- In main results, LDI leverage constraint causes shock amplification:
 1. Fall in bond prices causes huge losses for leveraged LDIs, increasing leverage
 2. By contract with PF, must bring leverage back down by end of period
 3. PF cannot inject equity (adjustment costs) → only way LDI can reduce leverage is selling gilts
 4. Selling gilts pushes down prices even further
 5. Cycle repeats in a “doom loop”

Analysis: The Actual intervention and two counterfactuals

- We then analyse three potential interventions by central bank:
 1. Backstop pricing/Asset purchases → Actual intervention
 2. Repo tool (similar to NBFILending tool planned by BoE) → Aimed at pension fund, **not** LDI
 3. Active macroprudential policy (liquidity buffer) → in line with 2023 Pension Regulator changes

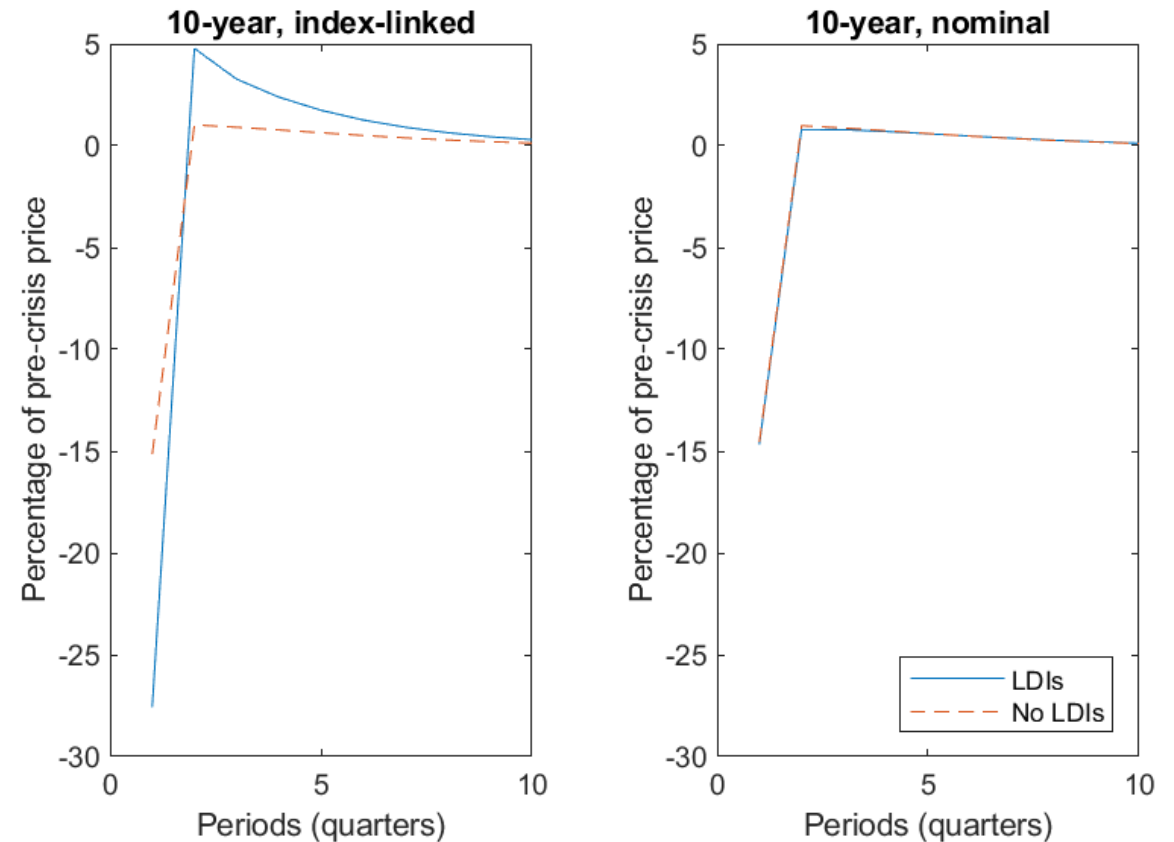
Calibration

- Most parameters are literature standard
- LDIs calibrated to capture the “most affected” LDI/pension funds
 - Pension fund risk-aversion calibrated so that they hedge 85% of liabilities
 - Size of LDI/pension sector calibrated to ~10% of GDP, based on Breeden (2022)
 - LDI leverage ratio of 4, in line with pre-crisis average
- Asset-purchase parameters calibrated to hit two targets:
 - Buying assets worth 1% of GDP and holding them should increase GDP 0.2%
 - Spread between index-linked and nominal gilts should replicate 2022

Results: Baseline Shock

- In baseline with no PFs/LDIs, both linkers and nominal bonds lose value equally (**orange line**).
- With LDIs, index-linked bonds crash in value (**blue line**).
- Markets recover relatively quickly once transient shock fades.
- Small overcorrection in index-linked prices: having been forced to sell linkers at a discount, PFs/LDIs have to buy them back at a premium.

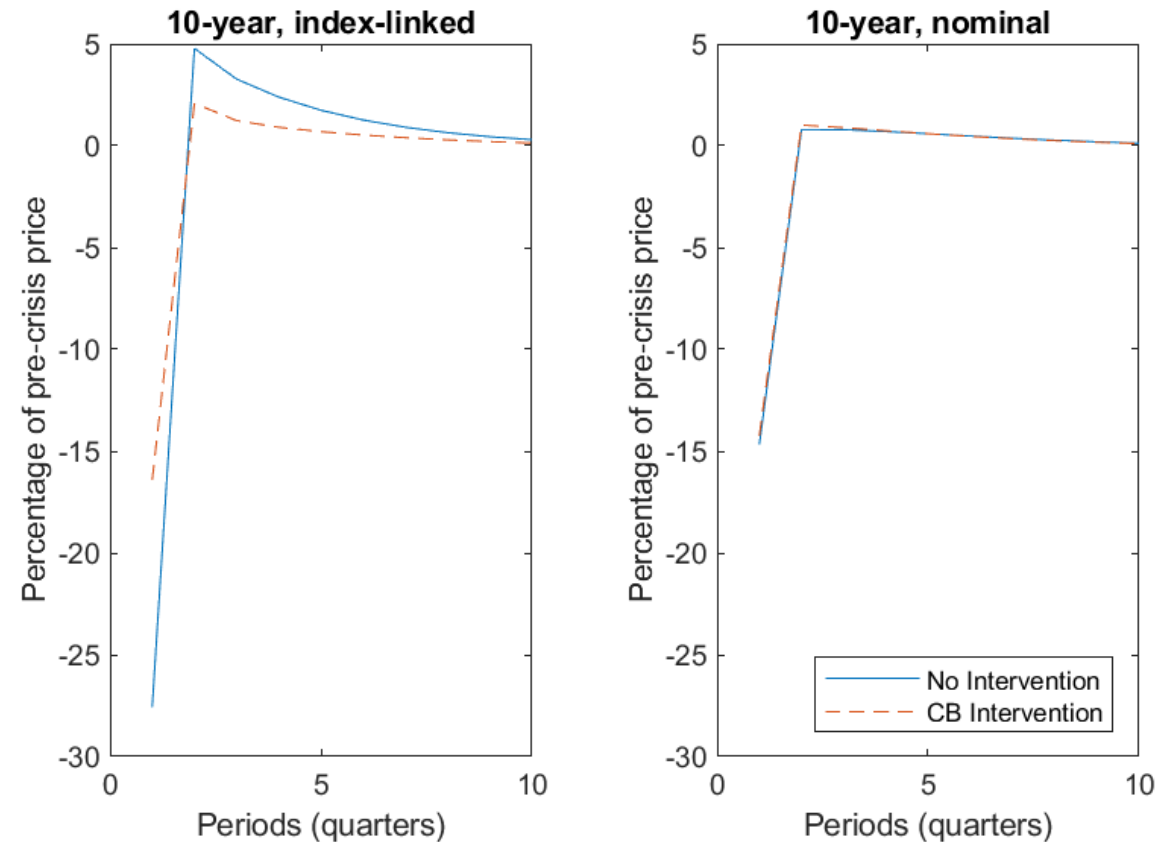
Impact of a Risk-Premium Shock on Bond Prices



Q1: How did asset purchases impact the gilt market?

- Asset purchases equal in size to actual intervention (*0.9% GDP*)
- Intervention unwound quickly (*over 3-6 months*)
- Outcome with intervention very similar to outcome with no LDIs!
- Intervention effects not calibrated → fact that the impact plausible is a good sign for model design
- Very little spillover into other bond markets, targeted intervention

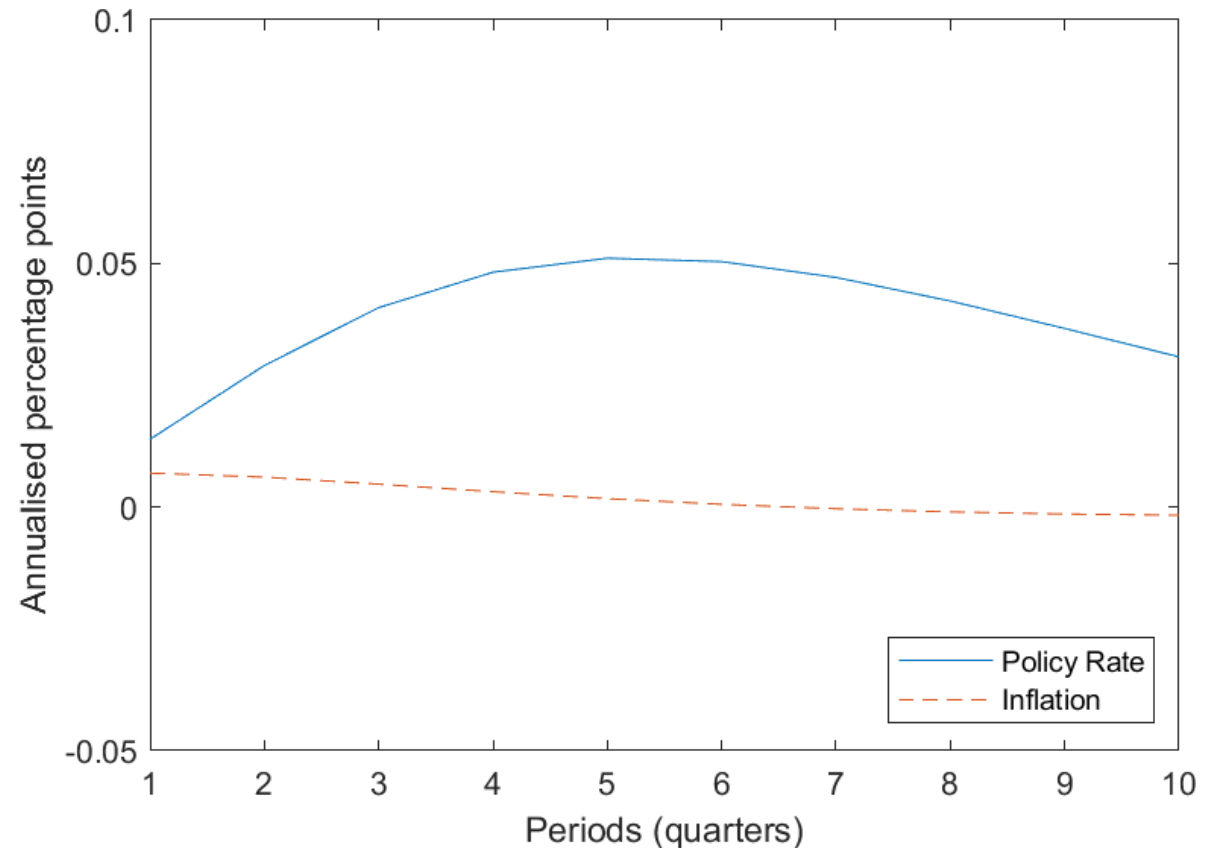
Financial Stability Intervention: Asset Purchases worth 0.9% of GDP



Q1: How did asset purchases impact monetary policy?

- **We estimate that the intervention had little consequence for monetary policy**
 - Small increase in policy rate worth 1-5 bps enough to offset any inflationary effects
 - Depends on the intervention being time limited, more persistent interventions affect monetary policy more

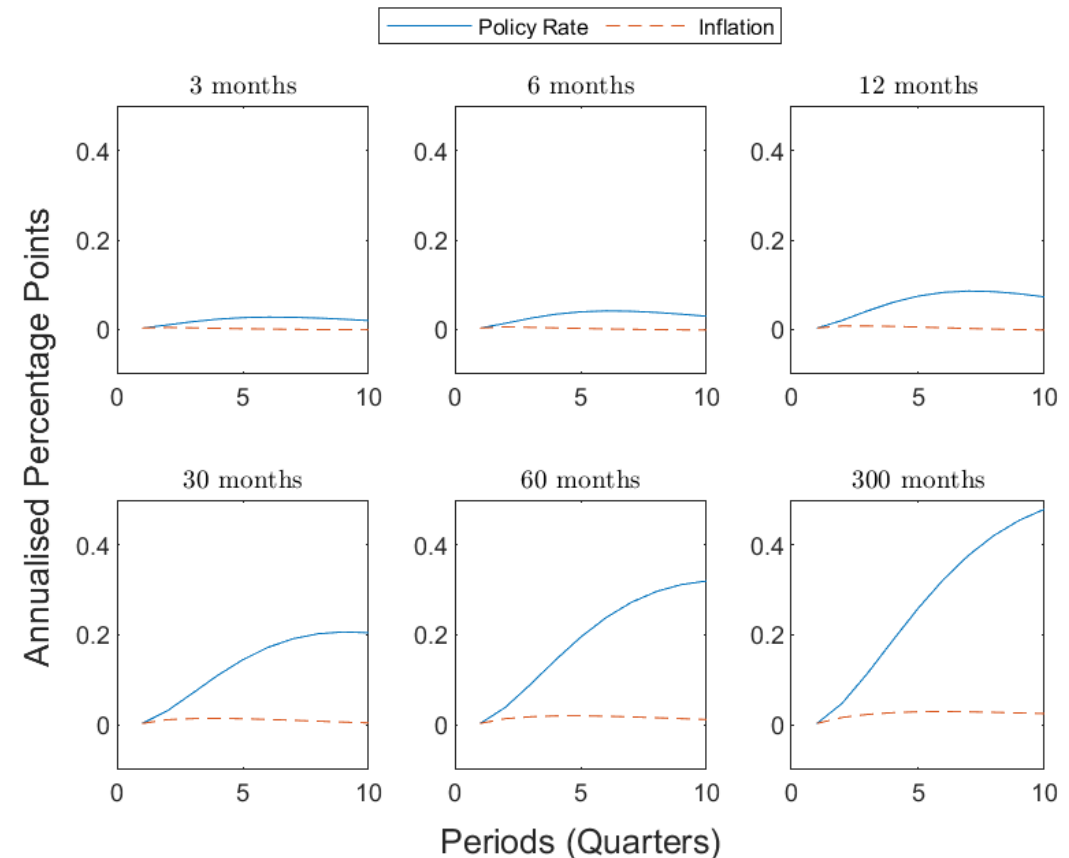
Financial Stability Intervention: Asset Purchases worth 0.9% of GDP



Q2: Do financial stability operations need to be temporary?

- We find that unwinding the intervention over 6-12 months is sufficient to control spillovers.
 - Beyond this time horizon, impacts start to escalate rapidly.
 - Time-limits only necessary for asset purchases: repo tool (next) can be unwound more slowly without consequence.
- **Intervention needs to be temporary as well as targeted to avoid monetary spillovers**

Monetary Consequences of Transparent Time-Limited Interventions



What drives this result?

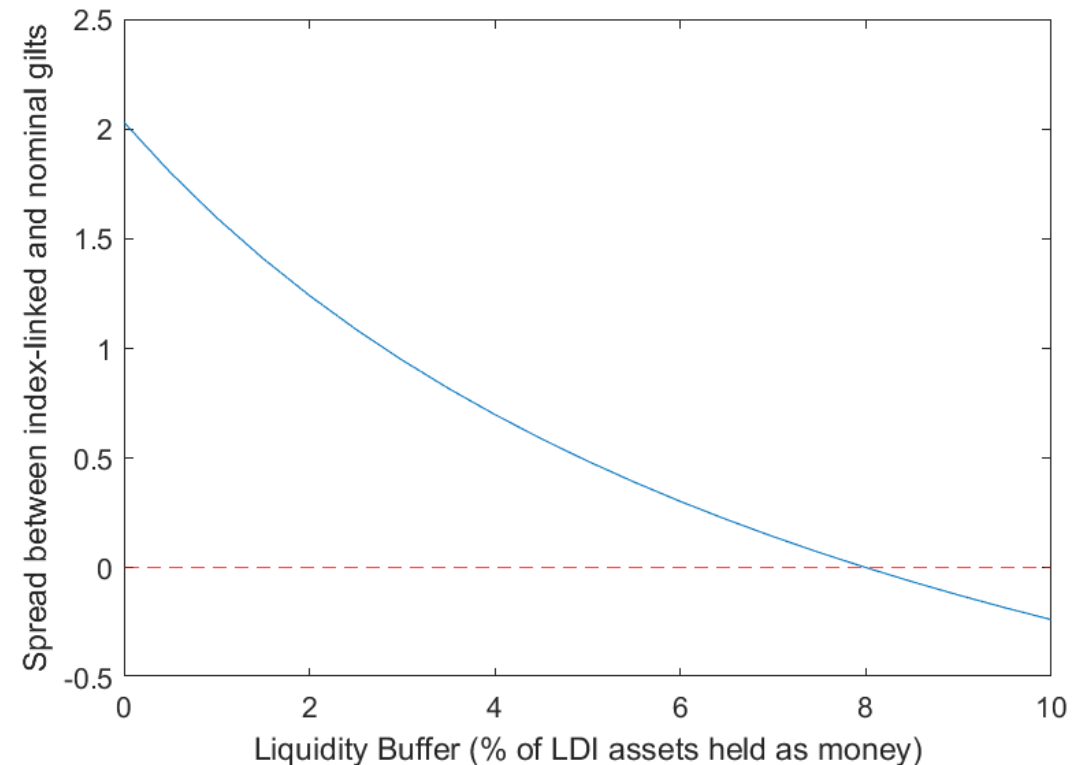
- We assume in the model significant inertia in household/firm behaviour
 - Households have consumption “habit persistence” and only gradually increase spending
 - Firms face investment adjustment costs, and only gradually increase investment
- Over time, households and firms do gradually increase spending, driving inflation
- But one quarter is not long enough for real activity to respond much

- We have only considered one type of communications (over duration)
- But could also be public confusion over which assets are being purchased
- We plan to address this question in future work

Q3: Macroprudential Tool

- Force Pension Fund/LDI to hold liquid assets (*money*) worth $X\%$ of LDI portfolio in normal times
- In crisis, relax buffer so that they can accommodate losses as less money rather than selling bonds
- Pension Regulator imposed “market stress” buffer of 250bps
- No direct analogue in our model, but we broadly support idea that more liquidity reduces dysfunction

Monetary Consequences of Transparent Time-Limited Interventions



Questions?