

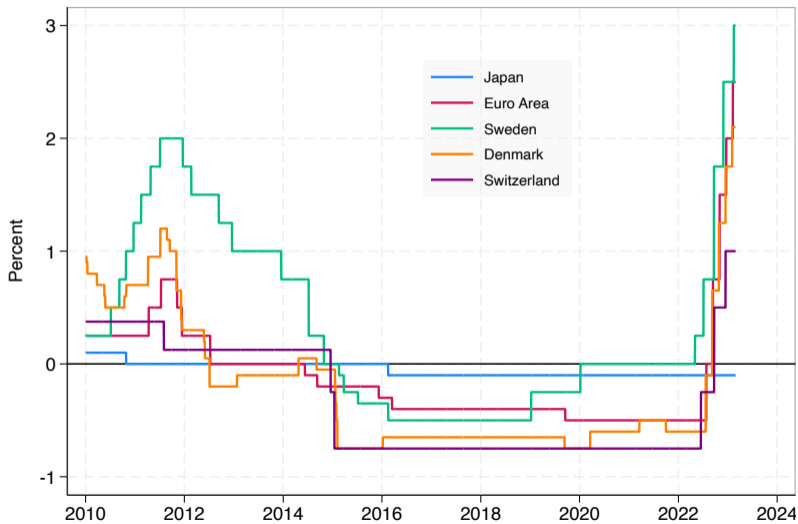
Negative Interest Rate Policies: The Role of Pass-Through to Deposit Rates

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Negative Interest Rate Policies



Negative Interest Rate Policies

- Are negative interest rates an effective policy tool for stimulating the economy?

- Current literature: Less efficient than in normal times

[Ulate 2021, Abadi-Brunnermeier-Koby 2023, Eggertsson et al 2023, ...]

- Key assumption: Banks that set a negative deposit rate attract zero deposits

- ▶ ZLB on banks' deposit rates

- But negative deposit rates were widespread

- Banks only pass through negative rates to depositors if they are perceived as persistent

- ▶ Negative interest rate policies are potentially quite effective

What We Do

- Study pass-through from policy rates to bank's deposit rates
- Expectations about future interest rates play a key role
- Estimate the effect of introducing a negative deposit rate on bank deposits
 - ▶ Current models: 100% deposit outflow
 - ▶ Our estimates: About 10% deposit outflow
- Build a model that can explain these facts
 - ▶ Allow for negative deposit rates
 - ▶ Forward-looking deposit rate setting

Roadmap

- Descriptive time series evidence
- Estimate the elasticity of deposits to negative deposit rates
- Model (work in progress)

Deposit Rates

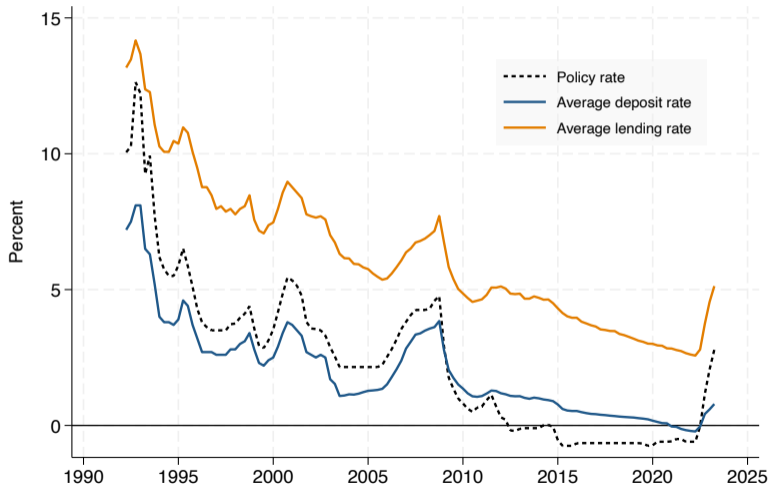
- Banks have market power in deposit markets
- In normal times, they set the deposit rate below the policy rate

- For example:

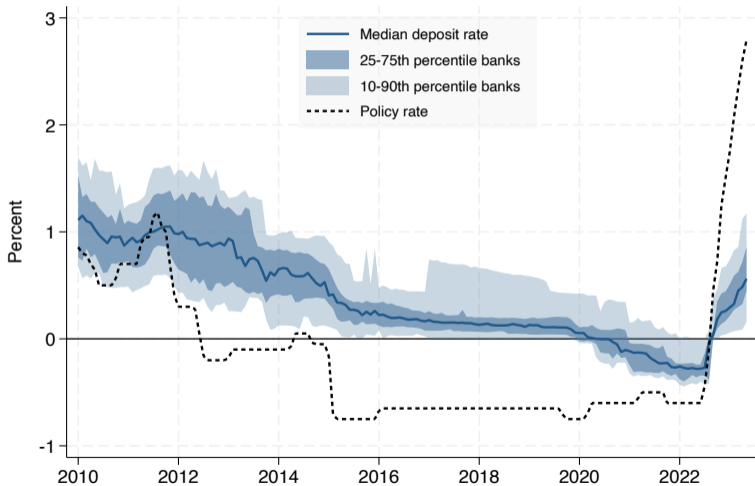
$$1 + i_t^d = \text{markdown} \times (1 + i_t^p)$$

- Deposit rate only changes if contemporaneous policy rate changes

Average Deposit and Lending Rates in Denmark



Deposit Rates at Danish Banks



► Firms

► All deposits

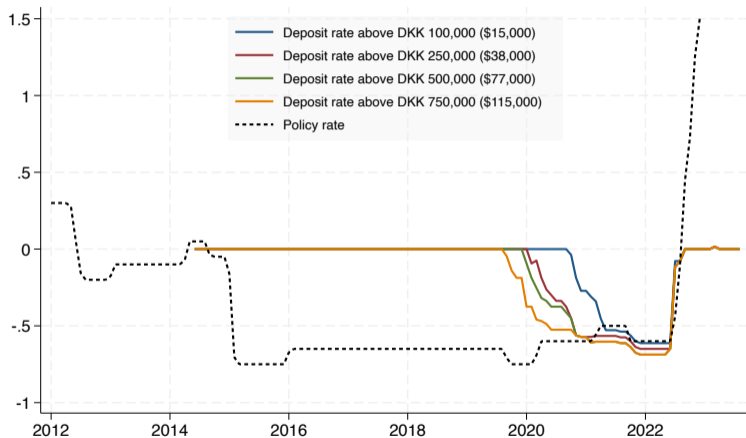
Measuring Deposit Rates

- Effective deposit rates are the relevant measure for bank profits:

$$\frac{\text{Interest Paid on Deposits}}{\text{Total Deposits}}$$

- But they aggregate a lot of heterogeneity
- Deposit rates can vary depending on
 - ▶ Product type (checking, savings, time deposits)
 - ▶ Deposited amount
 - ▶ Characteristics of customer
- Look at **posted deposit rates** for household checking and savings deposits
 - ▶ 2/3 of total deposit market

Average Posted Deposit Rates in Denmark



Taking Stock

- Banks kept deposit rates at zero for \approx 5 years
- Suddenly, they rapidly introduce negative deposit rates
- Happened with no change in policy
- Why?

Expected Future Interest Rates

- **Possible explanation:** Shift in expectations about future interest rates
- Banks are losing money on their deposit business
- Interest margins are being squeezed
- May be sustainable in the short run, but not permanently

⇒ Estimate expected future short-term interest rate (Svensson 1994)

Expected Future Short-Term Interest Rates

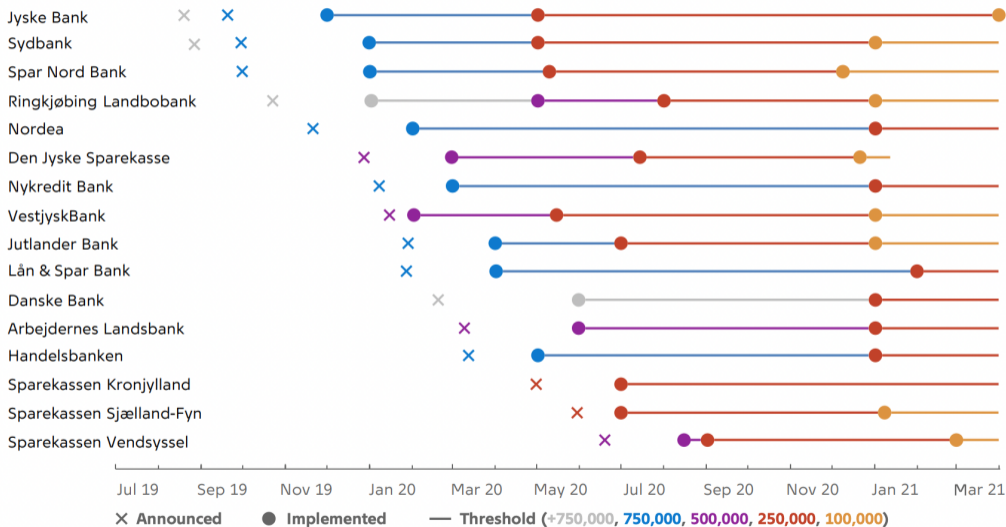
- What does the market expect the short-term interest rate to be X years from now?



Deposit Outflows

- Want to build a model with negative deposit rates
- Does introducing a negative deposit rate lead to a large deposit outflow?
 - ▶ Increased substitution towards cash
 - ▶ Loss aversion
 - ▶ Saliency
 - ▶ Reach for yield (Lian et al 2019)
- Exploit staggered timing of when banks introduced negative deposit rates

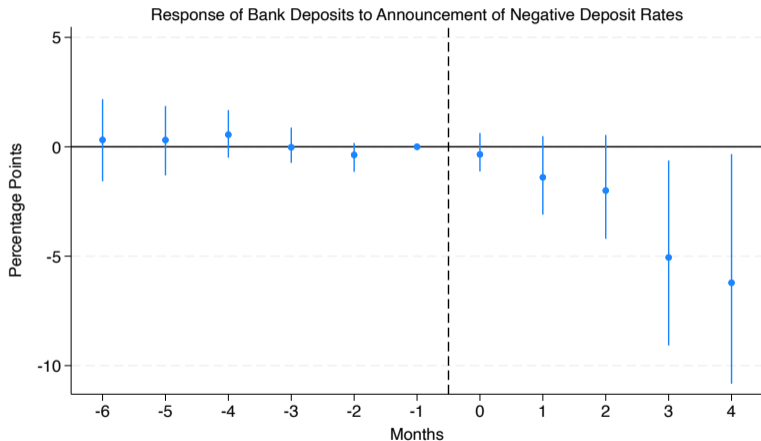
Staggered Timing of Negative Deposit Rates



Event Study

- Compare change in deposits between
 - ▶ Banks that introduced a negative deposit rate above DKK 750,000 (\$115k)
 - ▶ Banks that did not yet introduce a negative deposit rate
- “Clean control” approach of Cengiz et al (2019)
- Concerns:
 1. Spillover effects: May switch to control bank
 2. Selection: Is treatment as good as randomly assigned?

Deposit Outflows above DKK 750,000 Threshold

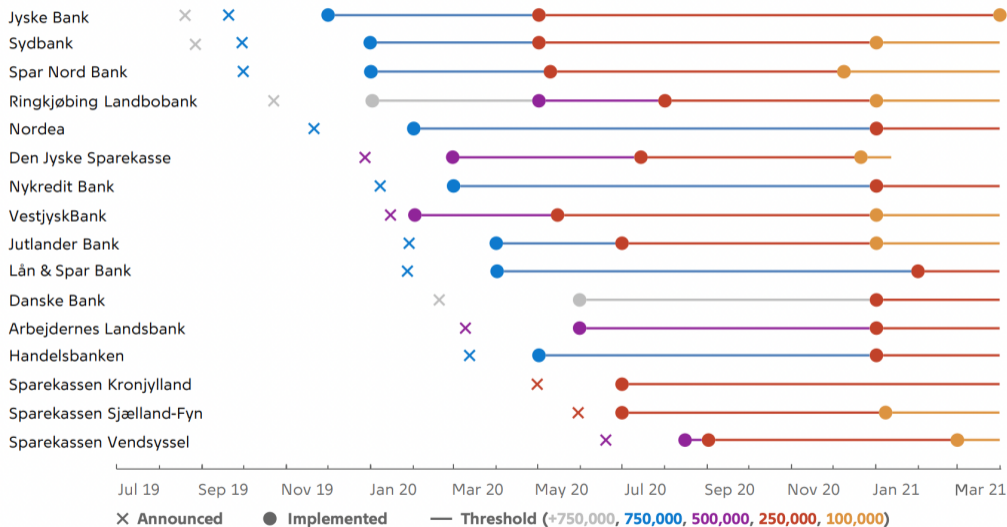


- 35% of deposits are above threshold, so this corresponds to a $\approx 17\%$ outflow

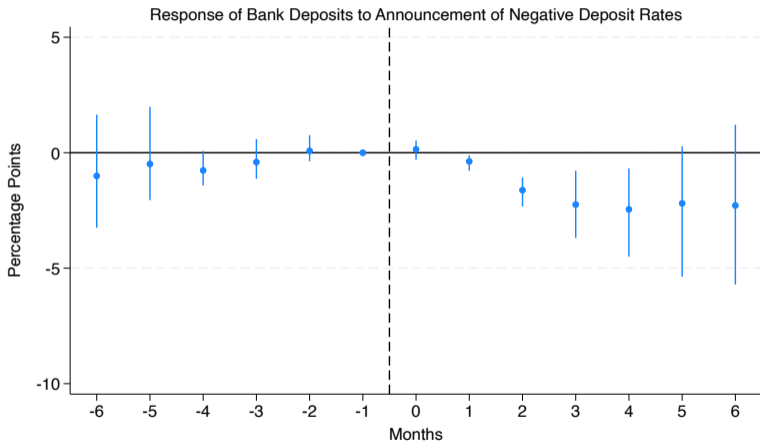
Event Study at DKK 100,000 Threshold

- Can do similar exercise at lower thresholds
- Compare change in deposits between
 - ▶ Banks that introduce negative deposit rate above DKK 100,000 (\$15k)
 - ▶ Banks with negative interest rate above DKK 250,000 (\$40k)
- Concern: This is during COVID

Staggered Timing of Negative Deposit Rates



Deposit Outflows at DKK 100,000 Threshold



- 30% of deposits in 100-250K range, so this corresponds to a $\approx 6\%$ outflow

Model

- How effective are negative interest rate policies in stimulating the economy?
- New Keynesian model with monopolistic banks
- Allow for negative deposit rates
 - ▶ Finite elasticity of deposits to deposit rate
 - ▶ But can still be larger than in normal times
- “Sticky” depositors
 - ▶ Depositors face a cost of switching banks
 - ▶ Banks’ deposit rate setting becomes forward-looking

Deep Habits in Deposits

- Today: Focus on deposits and banks
- Households save in deposits and earn interest i_t^d
- Model switching costs with **deep habits** framework (Ravn et al, 2006)
- Depositor j cares about their stock of deposits after taking habits into account:

$$x_t^j = \left(\int_0^1 \left(D_{b,t}^j - \theta s_{b,t-1} \right)^{\frac{\eta}{\eta-1}} db \right)^{\frac{\eta-1}{\eta}}$$

- ▶ θ measures external habit formation in deposits of each variety
- ▶ $s_{b,t}$ is the external habit stock in deposits from bank b

Deep Habits in Deposits

- Implied demand for deposits faced by bank b

$$D_{b,t} = \left(\frac{1 + i_{b,t}^d}{1 + i_t^d} \right)^{-\eta} x_t + \theta s_{b,t-1}$$

- Demand for deposits is sticky
- Nests standard model used in the literature ($\theta = 0$)

Banks

- Banks take deposits from households, pay a deposit rate i_t^d and earn the policy rate i_t^p
- Bank's problem is to maximize

$$\mathbb{E}_t \sum_{s=t}^{\infty} \Lambda_{t,t+s} (i_s^p - i_{b,s}^d) D_{b,s}$$

subject to demand and a law of motion for the habit stock:

$$D_{b,t} = \left(\frac{1 + i_{b,t}^d}{1 + i_t^d} \right)^{-\eta} x_t + \theta s_{b,t-1}$$

$$s_{b,t} = \rho s_{b,t-1} + (1 - \rho) D_{b,t}$$

Forward-Looking Deposit Rate Setting

- Consider special case: $\rho = 0$ (no persistence of habits)
- Habit stock today is yesterday's stock of deposits: $s_{b,t-1} = D_{b,t-1}$
- Optimal deposit rate:

$$1 + i_t^d = \frac{\eta \left(1 - \theta \frac{D_{t-1}}{D_t}\right)}{\eta \left(1 - \theta \frac{D_{t-1}}{D_t}\right) - 1} \left((1 + i_t^p) + \mathbb{E}_t \sum_{s=1}^{\infty} \theta^s \Lambda_{t,t+s} (i_{t+s}^p - i_{t+s}^d) \right)$$

- Deposit rate is a markdown below policy rate and future deposit spreads
- No habits case: $1 + i_t^d = \frac{\eta}{\eta-1} (1 + i_t^p)$

$$1 + i_t^d = \frac{\eta \left(1 - \theta \frac{D_{t-1}}{D_t}\right)}{\eta \left(1 - \theta \frac{D_{t-1}}{D_t}\right) - 1} \left((1 + i_t^p) + \mathbb{E}_t \sum_{s=1}^{\infty} \theta^s \Lambda_{t,t+s} (i_{t+s}^p - i_{t+s}^d) \right)$$

- Deposit rate can change without change in current policy rate
- If future deposit spread are high:
 - ▶ Deposits are valuable
 - ▶ Bank may want to set deposit rate $i_t^d > i_t^p$
- If negative deposit spread last for a long time \Rightarrow Decrease deposit rate

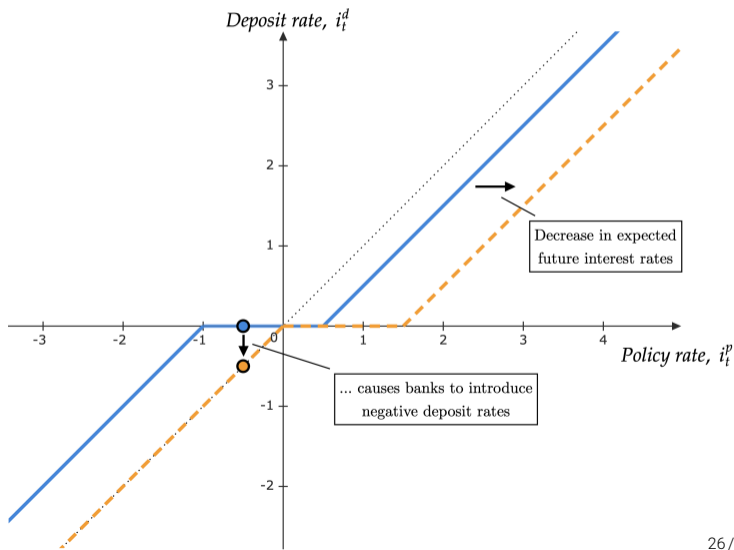
Adding a Kink at Zero

- High future deposit rates:

- ▶ Depositors are valuable
- ▶ Shield depositors from negative rates

- Low future deposit rates:

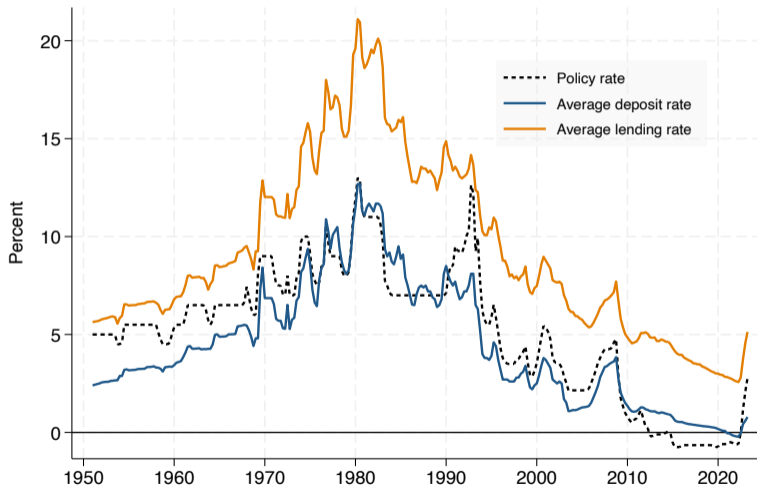
- ▶ Depositors less valuable
- ▶ Pass-through negative rates



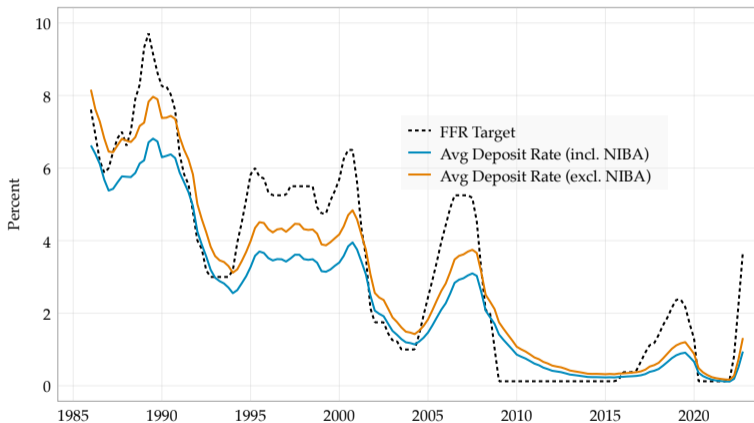
Conclusion

- How useful are negative interest rate policies?
- Depends crucially on pass-through to deposit rates
- Banks' deposit rate setting is forward-looking
- If central banks can convince banks that rates will be “negative for long”:
 - ▶ Banks will pass-through negative rates to depositors
 - ▶ Negative interest rates are potentially quite effective (in the 0 to -1% range)

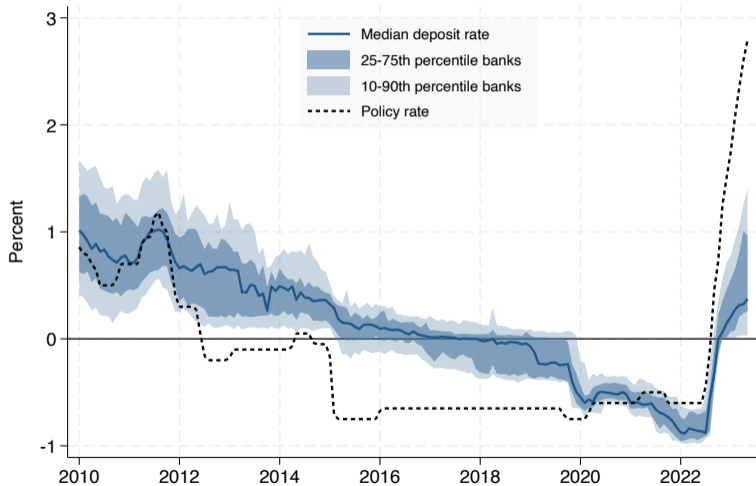
Longer Time Series



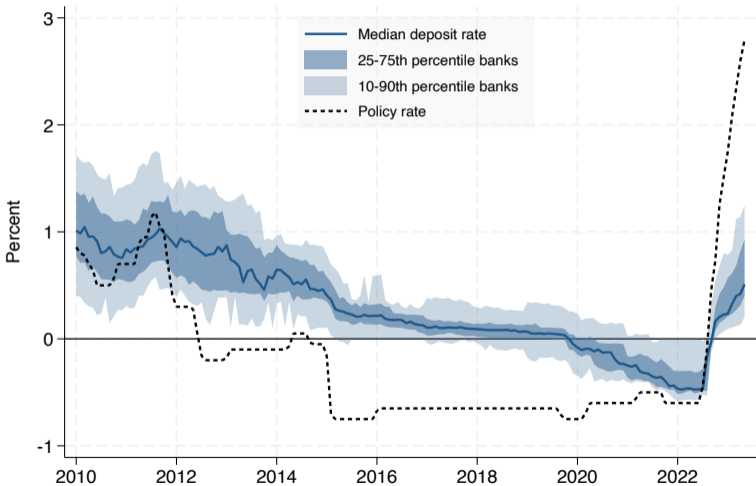
Average Deposit Rate in the US



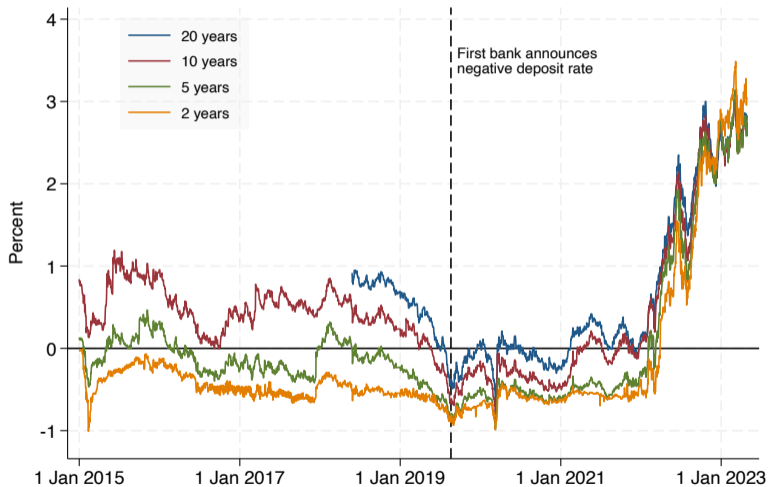
Non-Financial Firms



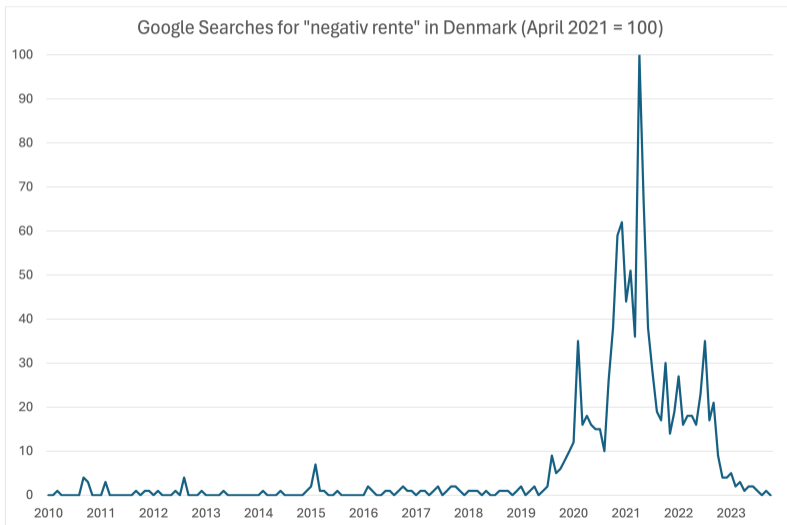
All



Danish Government Bond Yields



Salience



Monetary Policy Implementation in Denmark

- Reserves are held as either
 - ▶ Demand deposits (overnight)
 - ▶ Certificates of deposits (7-day)
- Demand deposits are exempt from negative interest rates
- But there is a cap on banks' demand deposit holdings, and the cap binds
- Implies the relevant **policy rate** is the **interest rate on certificates of deposits**
 - ▶ Captures opportunity cost of marginal loan
 - ▶ Captures benefit of marginal deposit
- Results are robust to using the short-term money market rates (e.g. 1-month unsecured inter-bank loans)

Policy Rates

