The “Reversal Rate”
Effective Lower Bound on Monetary Policy

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Motivating Questions

- New Keynesian models: ZLB = Liquidity trap

- Is zero special? Are negative rates special? **No**
  - Ignoring headline risk

- Lower bound or **Reversal Rate**
  - Rate at which accommodative policy becomes contractionary (possibly due to financial instability)
  - Does strict financial regulation reduce effectiveness or reverse MoPo?

- What factors determines the Reversal Rate?
  - Market structure
  - Banks’ equity
  - Interaction with prudential regulation
  - Interaction with QE
Motivation

- Interest rate cut
  - Substitution effect: safe asset → risky loans
  - Wealth effect: negative rate = tax
    - Not in representative agent analysis

![Figure 38: The introduction of negative rates has tended to lead to underperformance by banks relative to their domestic markets](source: Thomson Reuters, Credit Suisse research)
Motivation

- **Interest rate cut**
  - Substitution effect: safe asset → risky loans
  - Wealth effect: negative rate = tax

Exhibit 2: US NIMs have been eroded post QE

Figure 41: ...but Swedish net interest margins have proved relatively resilient despite a policy rate at -0.5%

Source: Company data, Reuters, Morgan Stanley estimates

Source: Swedish Riksbank, Thomson Reuters, Credit Suisse research
Banks’ balance sheet

- **Two-sided market**
  - Output: loans, reserves
  - Input: deposits
Model

- **Loan market**
  - \( L(r_L) = \int_0^1 l^i(r_L)di \) \( L(r_L) = L(r_L)/l \)

- **Deposit market**
  - \( D(r_D; r_f) = \int_0^1 d^i(r_D; r_f)di \) \( D(r_L; r_f) = D(r_L; r_f)/l \)
  - \( d^i(r_d; r_f) = \arg\max U(W, L(c, d)) \)

- **Bank competition**
  - \( I \) banks
  - Bertrand competition
  - ... but house bank advantage
Model

- Loan market
  - $L(r_L) = \int_0^1 l^i(r_L) di$
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  - $D(r_L; r_f) = D(r_L; r_f)/I$
  - $d^i(r_d; r_f) = \text{argmax } U(W, \mathcal{L}(c, d))$

- Bank competition
  - $I$ banks
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  - ... but house bank advantage

\[ r_f + \kappa_L \]

\[ r_f - \kappa_D \]

\[ r_f + \mu_L \]

\[ r_f - \mu_D \]
Roadmap

- Impact on profit/equity

- Impact on lending/credit growth
Roadmap

- Impact on profit/equity

- Impact on lending/credit growth

- **Determinants of Reversal Rate**
  - Interaction with financial regulation
  - Interaction with QE – optimal sequencing
Roadmap

• Impact on profit/equity
  • Perfect competition: perfect pass through
  • House bank driven markups: perfect pass through
  • Local monopolist/monopsonist: mark-up depends on semi-elasticities

\[
\begin{align*}
\epsilon_L(r_L) & := \left| \frac{\partial \log L}{\partial r_L} \right| \\
\epsilon_D(r_D, r_f) & := \left| \frac{\partial \log D}{\partial r_D} \right| \\
\epsilon_D^*(r_f) & := \left| \frac{\partial \log D(r_D^*; r_f)}{\partial r_f} \right|
\end{align*}
\]
Perfect competition \[ \rightarrow \] pass through

- \( r_f = r_L = r_D \) \quad \text{perfect pass through}

1. Profits from ongoing business/interest rate margins = 0
2. Re-evaluation gains \(-Bdr_f\)
   - Funding of bonds \( B \) that yield \( r_B \) is now lower by \( dr_D \)

Interest rate cut = “stealth recapitalization”
\( \kappa \)-mark-ups \( \rightarrow \) pass through

\[
\begin{align*}
\text{Reserves } C_t @ r_f \\
\text{Bonds } B_t @ r_B \\
\text{Loans } L_t @ r_L \\
\text{Deposits } D_t @ r_D \\
\text{Net worth } E_0
\end{align*}
\]

- \( r_L = r_f + \kappa_L \) \quad \text{and} \quad \kappa_D \quad \text{and} \quad r_D = r_f - \kappa_D 

1. Profits from ongoing business change since loan quantity and deposits adjust

2. Re-evaluation gains \(-Bd r_f\)
Monopoly & general case

- Loan problem is separate from deposit problem
  - Why? Reserve holdings is in between
- Loan rate after mark-up $\mu_L$
  \[ r_L^* = r_f + \mu_L^*(r_L^*), \quad \mu_L^*(r_L^*) := \min\{\kappa_L, \frac{1}{\varepsilon_L(r_L^*)}\} \]
- Deposit rate after “mark-down” $\mu_D$
  \[ r_D^* = r_f + \mu_D^*(r_D^*, r_f), \quad \mu_D^*(r_D^*, r_f) := \min\{\kappa_D, \frac{1}{\varepsilon_D(r_D^*, r_f)}\} \]

  - where $\kappa_L, \kappa_D$ are new relationship costs outside of “house bank”
    - $\kappa_L, \kappa_D = 0$  perfect competition
    - $\kappa_L, \kappa_D = \infty$  segmented markets & monopolies

- Profit has four parts:
  \[ \Pi_1(r_f) = \mu_L^*(r_L^*)L^* + \mu_D^*(r_D^*, r_f)D^* + (r^B - r_f)B - \pi_E E_0 \]
  Implicit assumption: Price stickiness
Impact on PROFIT – unconstrained case

- Proposition (general case):

\[
\frac{d\Pi_1}{dr_f} = \left(\epsilon_D^* - \epsilon_{D,r_f}^*\right)\mu^*D^* - \epsilon_L^*(r_f)\mu^*_L L^* - \frac{B}{\text{Net interest margin business}}
\]

- Perfect competition

\[
= -B
\]

- \(\kappa\) mark-ups (set \(\epsilon_{D,r_f}^* = 0\))

\[
= \kappa_D \frac{D^*}{1/\epsilon_D^*} - \kappa_L \frac{L^*}{1/\epsilon_L^*} - B
\]

- “Local” monopoly (set \(\epsilon_{D,r_f}^* = 0\))

\[
= D^* - L^* - B = C^* - E_0
\]

Measurable!
Impact on PROFIT – constrained case

- Economic or regulatory constraint

\[ \gamma (L(r_L) + \phi B) \leq E_0 + \Pi_1 = E_1 \]

- If constraint binds:
  interest rate cut can’t lead to a substitution from \( C \) to \( L \)

- Loan mark-up even larger than in monopoly case
  - Ongoing business vs. re-evaluation effect

- Deposit margin is not affected
  - Since constraint only binds \( L \) & loan and deposit decisions separable
Impact on PROFIT – constrained case

- Amplification/spiral

\[
\frac{d\Pi_1}{dr_f} = \frac{\gamma}{\gamma - \lambda} \left( C^* - E_0 - \frac{\epsilon_D^*, r_f}{\epsilon_D^*} D^* \right)
\]

where \( \lambda = r_L^0 - r_L^* = L^{-1} \left( \frac{E_0 + \Pi_1}{\gamma} - \phi B \right) - r_L^* \)
Impact on LENDING

- Constraint \( \gamma (L(r_L) + \phi B) \leq E + \Pi_1 \)

\[
\frac{dL}{dr_f} = \frac{1}{\gamma} \frac{d\Pi_1}{dr_f}
\]

- Sum up:
  - Interest rate cut can lead to more or less lending (depending how large \( B \) is)
  - Need data on banks’ interest rate sensitivity (Sraer et al. 2015, Piazzesi et al. 2015)
Numerical example

- Constant $\epsilon_L, \epsilon_D = \frac{1}{\alpha + \beta r_D}, \kappa_L = \kappa_D = \infty$, for different $B$
QE: Optimal sequencing

1. Induce banks to hold more long-run assets $B$
2. Interest rate cut “stealth recapitalization”
3. QE: banks sell now highly priced long-run assets to CB
4. Further interest rate cut is less effective/contractionary

“Reloading strategy”

1. if banks suffer losses (e.g. delinquencies) & RR rises $> r_f$
2. Raise policy rate (to increase banks’ interest margin)
3. “Reverse QE” or another LTRO
Interaction with QE and VLRTRO

- Re-evaluation effect depends on $B$
- QE lowers (aggregate) $B$ and increases $R$

- One bullet – reload with interest rate rise + 2nd QE + cut
Literature

- **Theory**
  - Oligopoly: Business margin: Monti-Klein model \((B = 0)\)
  - Competitive: Re-evaluation: BruSan “I theory of money”

- **Interest rate sensitivity of banks’**
  - Lending: Landier et al. (2015)
  - Deposits: Drechsler et al. (2015),

- **Deposit rate pass through**
  - Competition: Maudos & de Guevarra (2005)
  - Delay: DeBondt (2005)
Conclusion

- Zero/negative interest rates are not special!

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  - Reverses substitution effect + amplification
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  - Substitution effect: safe asset ⇄ risky loans
  - Wealth effect: “tax”
    + prudential regulation
  - Reverses substitution effect + amplification

- What determines the “Reversal Rate”?
  - Market structure and pass through of rates
  - Interaction with prudential regulation
  - Banks’ equity capitalization – countercyclical regulation
  - Duration risk of banks (long-dated assets)
  - Interaction with QE ... (correct sequencing)