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

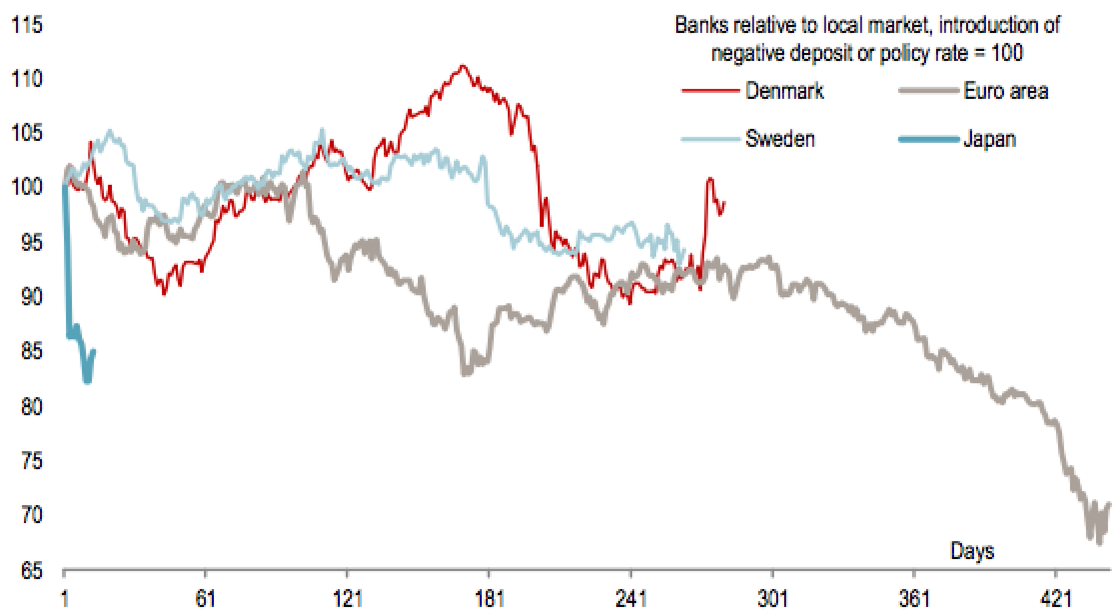
- ~~Lower bound~~ or Reversal Rate
  - Rate at which accommodative policy becomes contractionary (possibly due to financial instability)
  - Does strict financial regulation reduce effectiveness or reverse MoPo?

- 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

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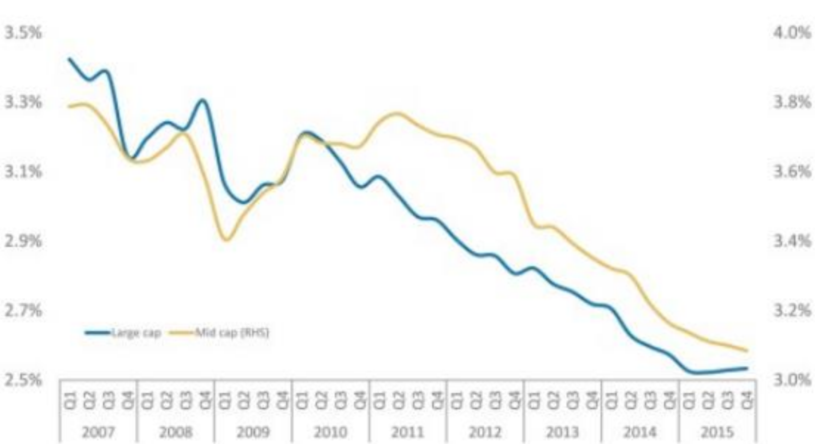
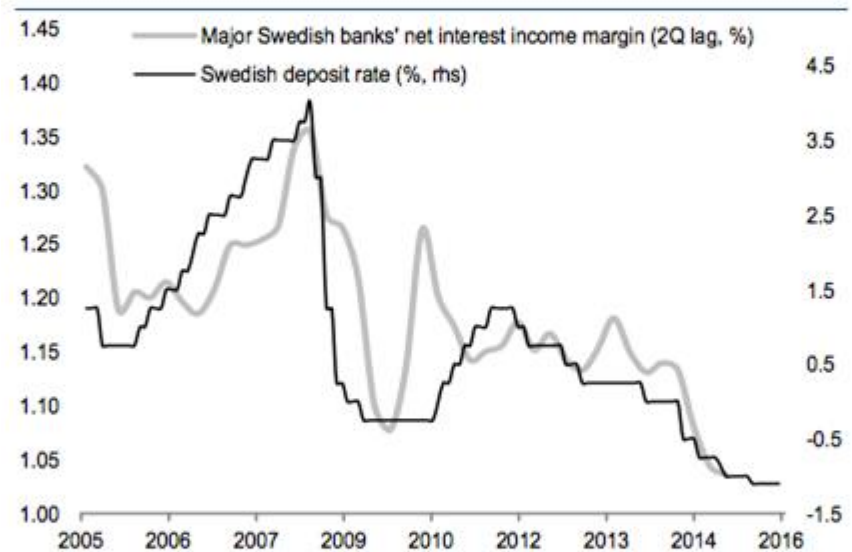
Exhibit 2: US NIMs have been eroded post QE



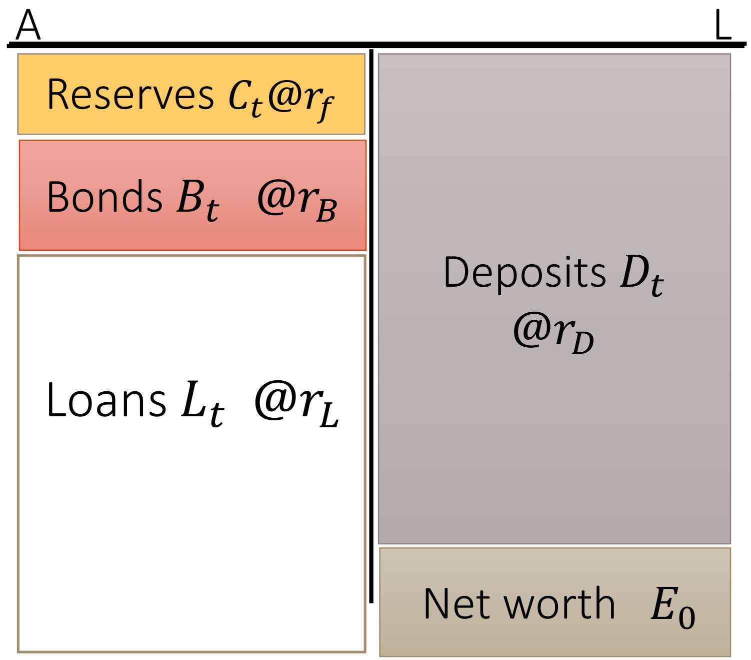
Source: Company data, Reuters, Morgan Stanley estimates

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



Source: Swedish Riksbank, Thomson Reuters, Credit Suisse research

Banks' balance sheet



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

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Model

- Loan market
  - $\boldsymbol{L}(r_L) = \int_0^1 l^i(r_L)di$ $\qquad L(r_L) = \boldsymbol{L}(r_L)/I$
- Deposit market
  - $\boldsymbol{D}\left(r_D; r_f\right) = \int_0^1 d^i\left(r_D; r_f\right)di$ $\qquad D\left(r_L; r_f\right) = \boldsymbol{D}(r_L; r_f)/I$
  - $d^i\left(r_d; r_f\right) = \mathrm{argmax}\, U(W, \mathcal{L}(c,d))$

Liquidity service

- Bank competition
  - I banks
  - Bertrand competition
  - … but house bank advantage

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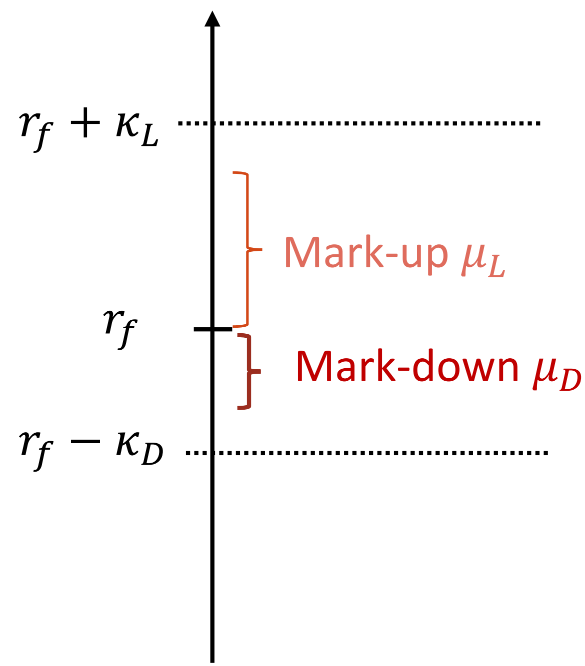


Roadmap

policy rate cut

- Impact on profit/equity

- Impact on lending/credit growth

Roadmap

policy rate cut

- Impact on profit/equity
- Impact on lending/credit growth
- Determinants of Reversal Rate
  - Interaction with financial regulation
  - Interaction with QE – optimal sequencing

Roadmap policy rate cut

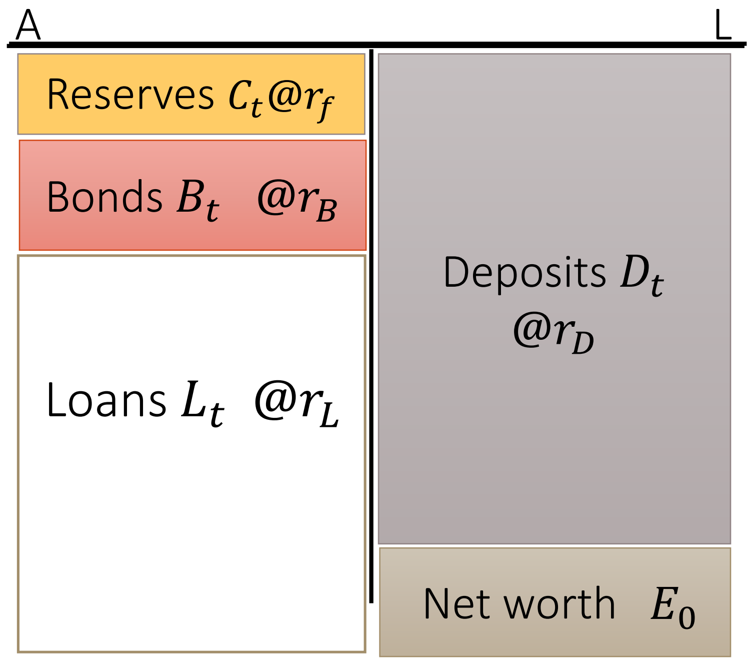
- Impact on profit/equity
  - Perfect competition ➡ perfect pass through
  - House bank driven markups ➡ perfect pass through ➡ quantity adjustment
  - Local monopolist/monopsonist ➡ mark-up depends on semi-elasticities

$$\epsilon_L(r_L) := \left|\frac{\partial \log L}{\partial r_L}\right|$$

$$\epsilon_D\left(r_D, r_f\right) := \left|\frac{\partial \log D}{\partial r_D}\right|$$

$$\epsilon^*_{D,r_f}(\cdot) := \left|\frac{\partial \log D\left(r^*_D; r_f\right)}{\partial r_f}\right|$$

Perfect competition → pass through



- $r_f = r_L = r_D$ perfect pass through

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

Interest rate cut = "stealth recapitalization"

Emphasis in
"I Theory of Money"

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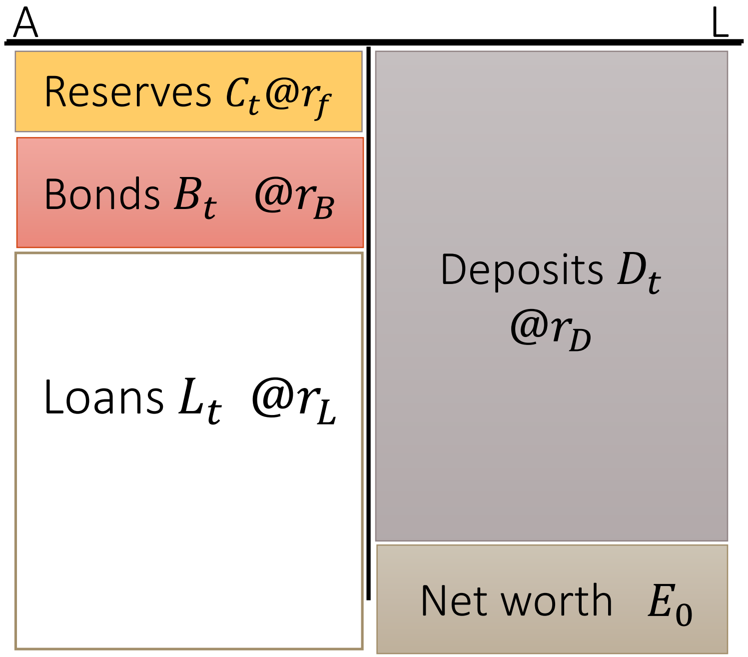
κ-mark-ups → pass through



- $r_L = r_f + \kappa_L$ $\qquad r_D = r_f - \kappa_D$

1. Profits from ongoing business change since loan quantity and deposits adjust
2. Re-evaluation gains $-Bdr_f$

Monopoly & general case

- Loan problem is separate from deposit problem
  - Why? Reserve holdings is in between
- Loan rate after mark-up μ_L

$$r_L^* = r_f + \mu_L^*(r_L^*), \qquad \mu_L^*(r_L^*) := \min\{\kappa_L, \tfrac{1}{\varepsilon_L(r_L^*)}\}$$

- Deposit rate after "mark-down" μ_D

$$r_D^* = r_f + \mu_D^*(r_D^*, r_f), \qquad \mu_D^*(r_D^*, r_f) := \min\{\kappa_D, \tfrac{1}{\varepsilon_D(r_D^*, r_f)}\}$$

  - where κ_L, κ_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):

$$\frac{d\Pi_1}{dr_f} = \underbrace{\left(\epsilon_D^* - \epsilon_{D,r_f}^*\right)\mu^* D^* - \epsilon_L^*(r_f)\mu_L^* L^*}_{\text{Net interest margin business}} - \underbrace{B}_{\text{reevaluation}}$$

- Perfect competition

$$= -B$$

- κ 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

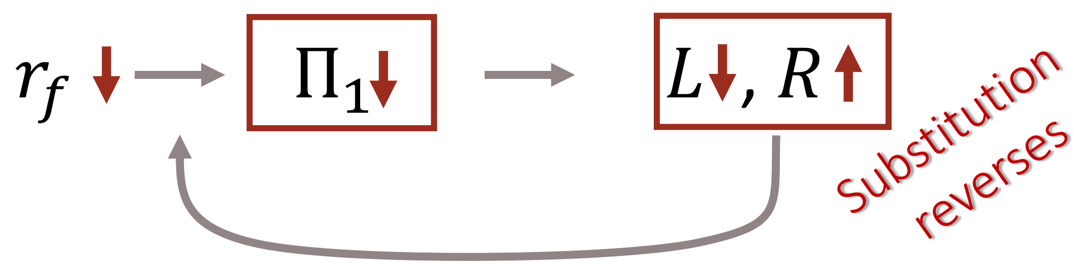
- Economic or regulatory constraint

$$\gamma(L(r_L) + \phi B) \leq \underbrace{E_0 + \Pi_1}_{=E_1}$$

- 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 $\lambda = r_L^o - r_L^* = L^{-1}\left(\frac{E_0 + \Pi_1}{\gamma} - \phi B\right) - r_L^*$

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Impact on LENDING

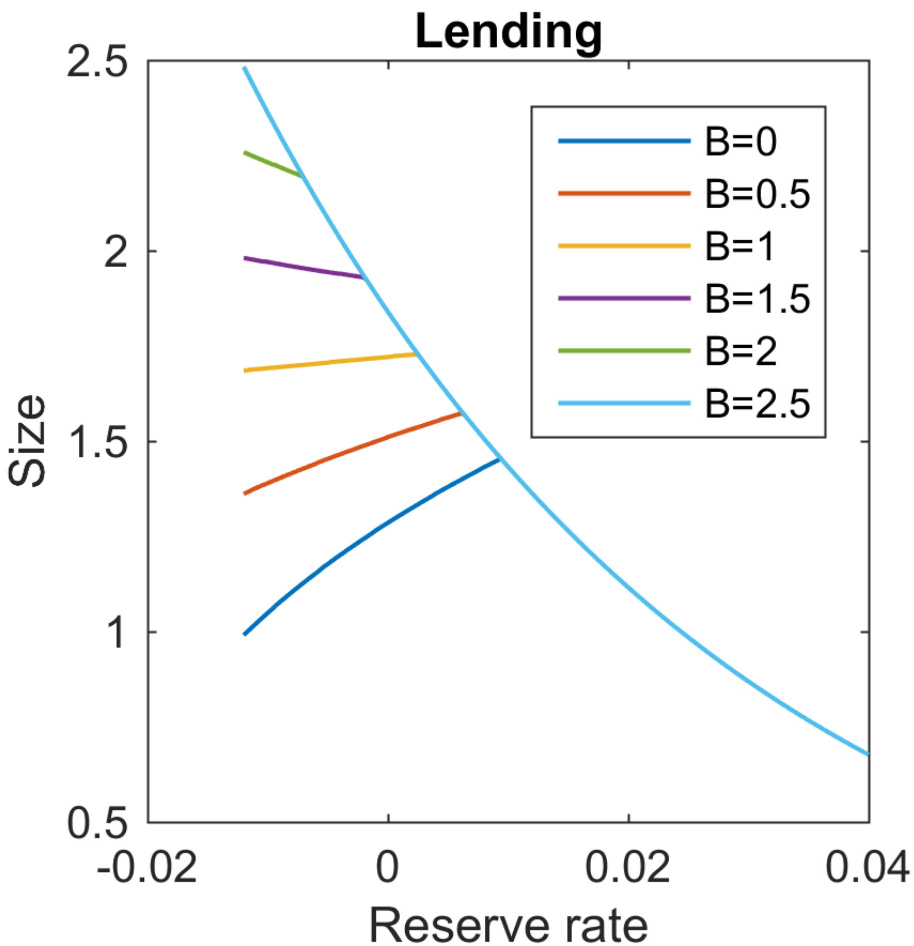
- Constraint $\gamma(L(r_L) + \phi B) \leq E + \Pi_1$

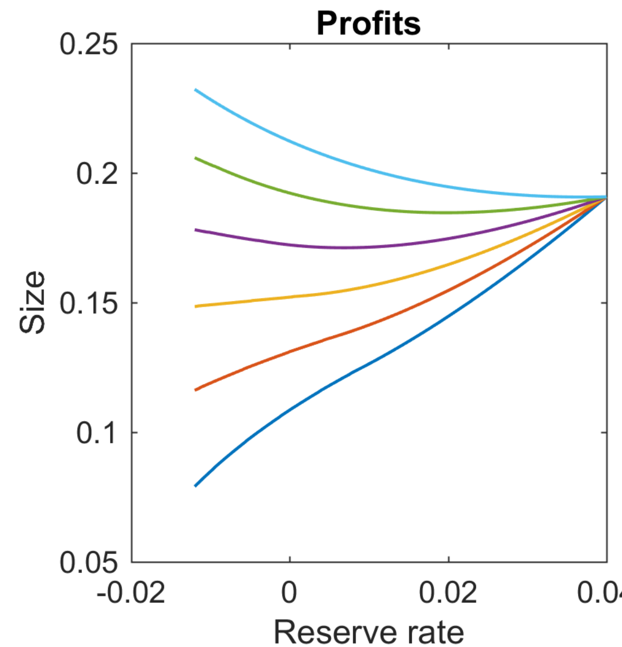
$$\frac{dL}{dr_f} = \frac{1}{\gamma}\frac{d\Pi_1}{dr_f}$$

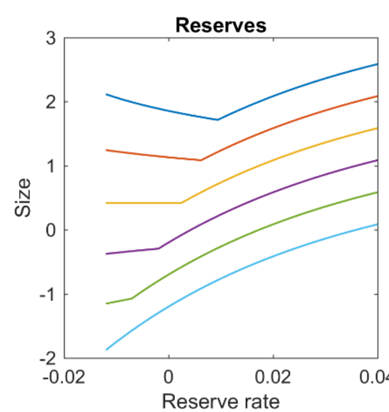
- Sum up:
  - Interest rate cut can lead to more or less lending (depending how large B is)
  - Need data on banks' interest rate sensitivity (Sraer et al. 2015, Piazzesi et al. 2015)

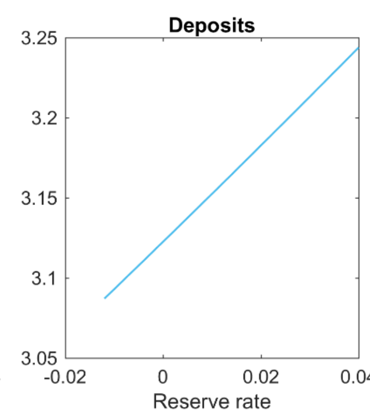
Numerical example

- Constant $\epsilon_L, \epsilon_D = \frac{1}{\alpha+\beta r^D}, \kappa_L = \kappa_D = \infty$, for different B









QE: Optimal sequencing

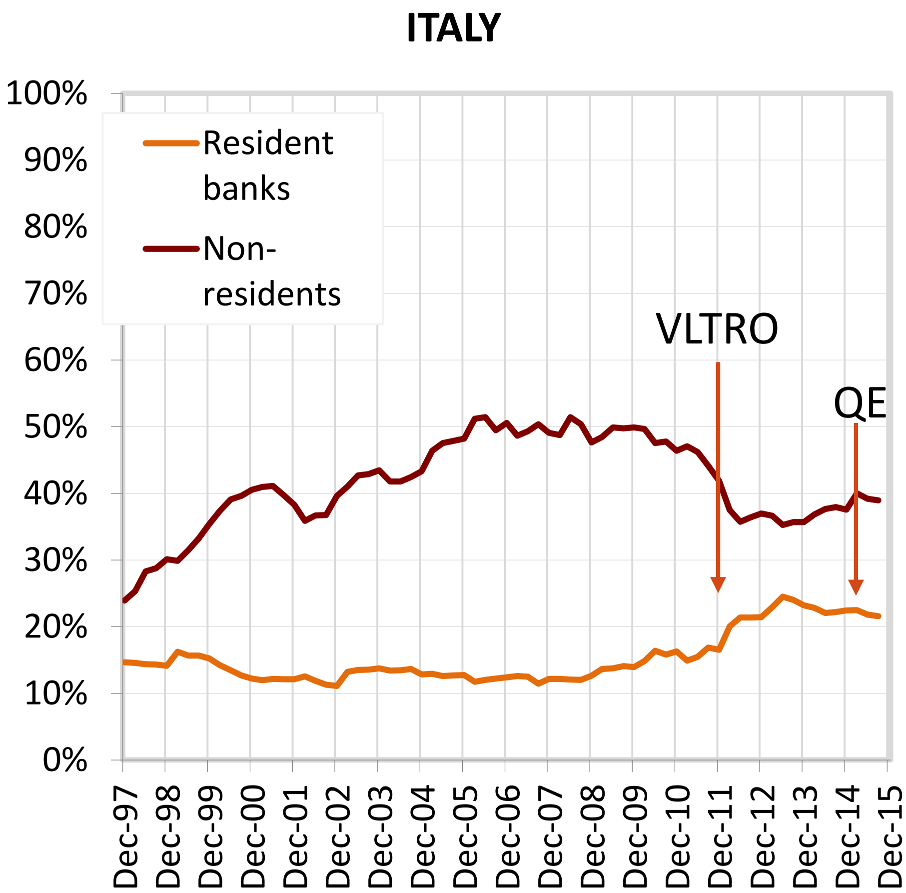
1. Induce banks to hold more long-run assets B
2. Interest rate cut   "stealth recapitalization"
3. QE: banks sell now highly priced long-run assets to CB
4. Further interest rate cut is less effective/contractionary

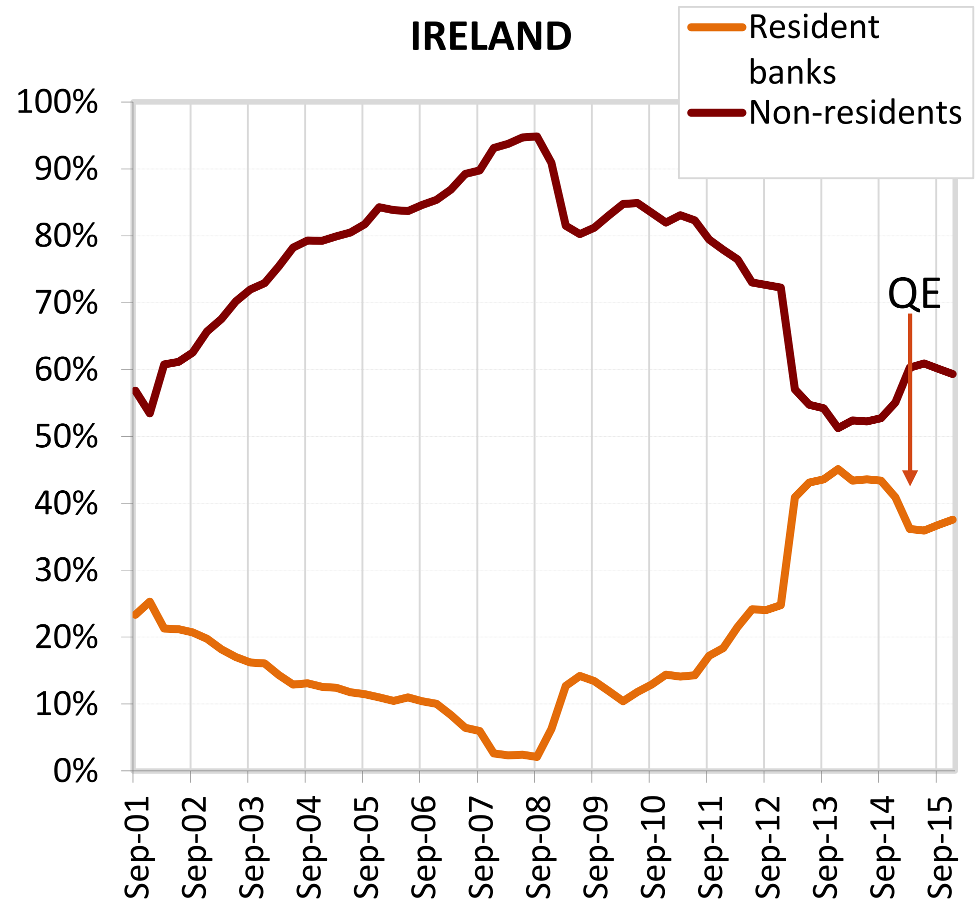
"Reloading strategy"

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 VLRTO

- 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’
  - Stock price: Flannery & James (1984), Begenau et al. (2015)
  - 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!
- Interest rate cut
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- 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)