The Importance of Being Slow: The Costs and Benefits of Phasing-In Regulatory Reforms

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Motivation

- In the aftermath of the 2007–2008 financial crisis, many banks were recapitalized by a combination of government interventions capital injections by shareholders, which was followed by severe credit crunches
- In 2010 the Basel Committee introduced new regulatory guidelines (Basel III) to be implemented over a (relatively long) transition phase.
- **BIS (2022) empirical finding: aggregate lending increased in response to the announcement (BIS, 2022, 8.1.3 and Annex A.18])**
- Are there benefits of being slow?

Our paper

- We study the costs and benefits of phasing-in a regulatory tightening over a transition phase
- **The benefits**: a reduction of the risk of a credit crunch
- **The costs**: capital buffer may not grow fast enough to reduce the potential costs of financial instability.
- Is there an optimal transition time?

The model

- We model the dynamics of bank capital in a stylized equilibrium model of banking.
- Banks finance risky loans to the real sector by issuing equity and liquid deposits
- The two main frictions in the model are:
  - households cannot invest directly in the real sector
  - banks incur a flotation cost γ when they issue equity.
- Thus, banks will retain earnings in order to cover future losses and save on refinancing costs.
- Banks are subject to a simple capital requirement

Optimal dividend policy

- Banks' optimal dividend policy follows a "barrier-type" strategy.
- Banks raise equity when aggregate bank equity is "low" , pay dividends when aggregate bank equity is "high", and accumulate equity (pay no dividends) in the intermediate region.
- We show the existence of a region in which bank capital requirements are slack

$$\underline{E} < E^* < \overline{E}$$

- Higher capital requirement makes the thresholds that define these regions increase (move to the right).

The announcement effect

- A capital increase is announced together with a transition period for its implementation
- **the anticipatory effect of the announcement affects bank capital accumulation and lending.**
- There exists a range of aggregate capital in which banks react to the announcement by accumulating equity via retained earnings and use such accumulated equity to increase lending.
- Without a transition period there is no anticipatory accumulation of equity, and banks decrease lending in the range of aggregate capital regions in which equity is constrained.

Welfare and the transition period

- The welfare function depends on the cost of a financial crisis, the level of depositor "return" (the convenience yield), and total output
- We compare the case in which the new capital and its transition is announced with one in which it is not announced.
- By announcing the transition period, the announcement effect is strongest for intermediate levels of aggregate capital.
- With no transition period, a credit crunch is more likely

Dynamics of Bank Capital and Loan Demand

$$(R_t + r)dt - \sigma dZ_t - \phi dN_t. \tag{1}$$

$$k_t = d_t + e_t. \tag{2}$$

$$de_t = re_t dt + k_t\big(R_t dt - \sigma dZ_t - \phi dN_t\big) + di_t - dc_t, \tag{3}$$

$$dE_t = rE_t dt + K_t\big(R_t dt - \sigma dZ_t - \phi dN_t\big) + dI_t - dC_t \tag{4}$$

$$I_t := \tfrac{k_t}{e_t} \leq \Lambda \tag{5}$$

$$L(R) = \left(\tfrac{\widehat{R}-R}{\widehat{R}}\right)^{\beta} \widehat{L}. \tag{6}$$

- (1): instantaneous return on assets, where R_t =loan rate - r.

  Asset risk: Brownian motion Z + a jump component (risk of systemic banking crisis), which destroys fraction $\phi < 1$ of bank assets
- (3) and (4): dynamics of individual and aggregate bank capital

Equity issuance and dividend policies

- A given bank's shareholder value maximization problem is given by

$$v(e_t, E_t) = \max_{k_t \in [0, \Lambda e_t],\ dc_t \geq 0,\ di_t \geq 0} \mathbb{E}\left[\int_t^\tau e^{-\rho(s-t)}\Big(dc_s - (1+\gamma)di_s\Big)\right].$$

- $u(E)$ is the market to book equity ratio, decreasing in E

- *Banks issue new equity if aggregate capital reaches a lower bound* $\underline{E}$:

$$u\left(\underline{E}\right) = 1 + \gamma. \tag{7}$$

- *Banks pay out earnings if aggregate capital reaches an upper bound* $\overline{E}$*:*

$$u\left(\overline{E}\right) = 1. \tag{8}$$

- *Between the two boundaries, banks make no payments to shareholders and do not issue new capital.*

Competitive Markov Equilibrium (Proposition 1)

- $R(E) = L^{-1}(\Lambda E)$ in the region $E \in [\underline{E}, E^*)$ (binding capital requirement),
- $R(E) = -\frac{u'(E)}{u(E)}\sigma^2 K(E)$, in the region $E \in [E^*, \overline{E}]$.
- E^* is the aggregate capitalization level beyond which a capital requirement becomes slack
- Aggregate bank capital evolves according to

$$dE_t = rE_t dt + L\big(R(E_t)\big)\big(R(E_t)dt - \sigma dZ_t - \phi dN_t\big), \qquad (9)$$

- $E_t \in \big(\underline{E}, \overline{E}\big)$, where $dI_t > 0$ at $\underline{E}$, and $dC_t > 0$ at $\overline{E}$

Equilibrium Outcomes

Corollary 1. The loan rate satisfies a first-order differential equation that implies:

$$R'(E) < 0, \tag{10}$$

for $E \in [E^*, \overline{E}]$, subject to the boundary condition $R(\overline{E}) = 0$

Corollary 2

1. the loan rate (spread), $R(E)$, is strictly decreasing in aggregate bank capital;
2. aggregate loan volume, $K(E)$, is strictly increasing in aggregate bank capital;
3. the market-to-book ratio of equity, $u(E)$, is strictly decreasing in aggregate bank capital.

The implications of Corollary 2 are supported by cross-sectional correlation of data of two large bank databases

Unannounced regulatory tightening

- Consider $\Lambda_{new} < \Lambda_{old}$.
- Since the capital requirement binds at $E = \underline{E}_{old}$, a reduction of Λ reduces the total supply of loans and increases the loan rate.
- Lending becomes more profitable, which would increase the market-to-book ratio to a value $u_{new}(\underline{E}_{old}) > 1 + \gamma$. Since $u'(E) < 0$, $\underline{E}_{new} > \underline{E}_{old}$
- The same applies to $E^*_{new} > E^*_{old}$. We would have $u_{new}(\overline{E}_{old}) > 1$, implying that $\overline{E}_{new} > \overline{E}_{old}$
- An unannounced regulatory tightening may lead to a significant reduction in aggregate lending

Regulatory tightening with a transition phase

- In $t = 0$, the regulator announces a new capital requirement Λ_{new}, to which all banks have to adhere after a transition period of T years.
- Banks' market-to-book ratio $u_{tr}(E)$ satisfies the HJB equation

$$\begin{aligned}(\zeta + \chi)u_{tr}(E) = &\Big[rE + R_{tr}(E)K_{tr}(E)\Big]u'_{tr}(E) + \frac{\sigma^2 K_{tr}(E)^2}{2}u''_{tr}(E) \\ &+ \max_{I \in [0,\Lambda_{old}]} I\Big[R_{tr}(E)u_{tr}(E) + \sigma^2 K_{tr}(E)u'_{tr}(E)\Big], \\ &+ \frac{1}{T}\Big[u_{new}(E) - u_{tr}(E)\Big]\end{aligned}$$

- The HJB contains a jump-term reflecting the anticipation of the tighter regulation implemented with Poisson intensity $1/T$.
- The market-to-book ratio jumps to $u_{new}(E)$

Aggregate lending during the transition

- For low values of aggregate capital, aggregate lending K_{tr} is determined by the binding regulatory constraint, $K_{tr} = K_{old}$.
- Under a relatively short transition phase, the anticipated regulatory change is fully priced-in for high levels of capital. Hence, K_{tr} approaches K_{new} in this region: the anticipated decrease in loan supply leads to lower levels of lending today.
- For intermediate levels of aggregate capital, however, the anticipation of the regulatory tightening has the opposite effect. A reduction in banks' implied coefficient of risk-aversion decreases the equilibrium loan rate, lending increases above K_{old} in that region.
- This is in line with recent empirical evidence of BIS (2022).

Welfare and the lenght of the transition

- The welfare relevant figures are the social costs of financial crises, $\theta\left(\phi K_{t_k} - E_{t_k}\right)$ for $k \geq 1$, the convenience yield enjoyed by depositors, χD^{+}, and the output produced by the real sector derived from aggregate loan demand.

- To assess the welfare implications of a longer transition phase, we consider the present value for each of the three welfare components

- **Simulation results**. We compute the expectation using Monte Carlo simulations with 5.000 paths over a period of 100 years. Total welfare is then computed by adding up the three present values:

$$W := PV\left(Y\right) + PV\left(\chi D^{+}\right) - PV\left(\theta(\phi K_{t_k} - E_{t_k})\right). \qquad (11)$$

- Bottom line: The anticipation effect is most important for intermediate values of E_0.