

Portfolio Effects and Efficiency of Lending under Basel II

- Esa Jokivuolle (Bank of Finland)
- Timo Vesala (Tapiola Group)

Background

■ The Basel II framework:

- Introduces 'risk-based' capital requirements (IRB; internal-ratings-based).
- Cf. Basel I with the 8% 'flat-rate' regulation

■ Pros and cons of Basel II

- Alleviates the potential allocative distortions across different loan categories
 - A positive "portfolio effect", possibly coupled with gains in efficiency
- May amplify pro-cyclicality in bank lending
 - However, the seriousness of the pro-cyclicality issue may depend on the magnitude of the portfolio effect

Our objectives

1. Build a model that
 - I. captures the effect of Basel II on the composition (i.e., 'riskiness') of banks' loan portfolio
 - II. can be used to assess gains in allocative efficiency resulting from the changeover in the regulatory framework

2. Discuss the capability of the portfolio effect to counterbalance the inherent pro-cyclicality of risk-based capital regulation

The model

- 'Entrepreneurs' choose between investments of different risk characteristics (cf. Vesala, 2007)
 - 'expansionary' or 'conservative' investment,
 - labor market participation as a fixed outside option
- Entrepreneurs differ in their success probabilities
 - Governed by the type parameter θ
 - Project success probabilities $p(\theta)$ and $q(\theta)$, respectively
 - Banks cannot observe individual success rates but they rationally expect the equilibrium average success probabilities within each investment class

The model

- Expected outputs from expansionary and conservative projects $p(\theta)v$ and $q(\theta)s$

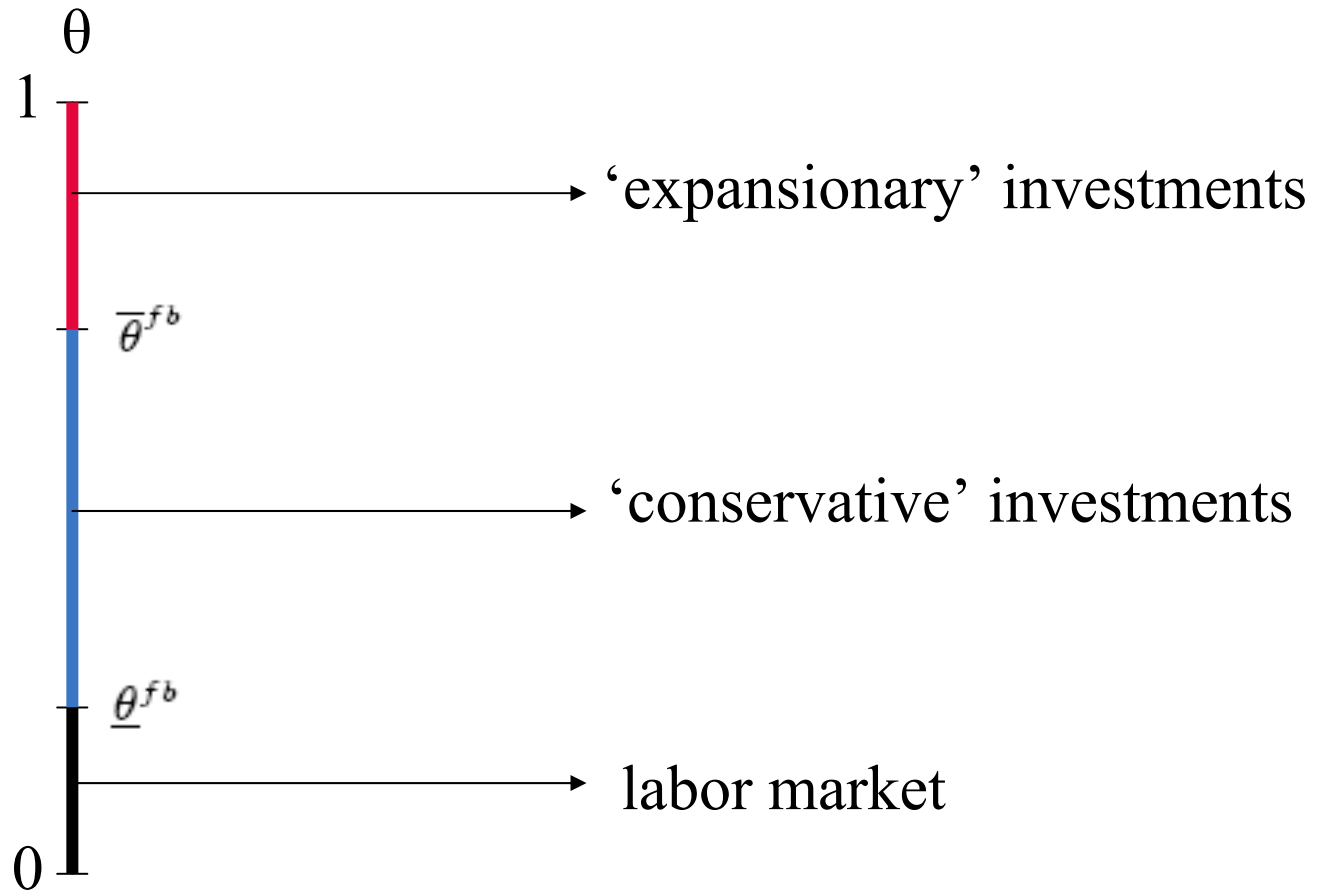
- De Meza-Webb (1987) assumption:

$$p'(\theta) > q'(\theta) > 0, \forall \theta \in \Theta.$$

- Moreover, we assume:

$$p(1)v > q(1)s > w \text{ but } p(0)v < q(0)s < w,$$

Efficient project selection



Timing of events

Stage 1: Nature draws entrepreneurs' types from the distribution $G(\theta)$ with support $\Theta=[0,1]$.

Stage 2: Entrepreneurs choose whether to invest in an uncertain project or enter the labor market.

- If they choose to invest, they need external finance in order to implement the project.
- Banks can observe the project type and they are able to monitor the implementation of the project.

Timing of events

Stage 3: Entrepreneurs obtain finance from a competitive credit market.

- Loan contracts can only be conditioned on the observable project characteristics but not on the unobservable entrepreneur type

Stage 4: Outputs are realized.

Competitive loan prices

Average success rates:

$$p(\hat{\theta}_v) = \frac{\int_{\underline{\theta}}^1 p(\theta) dG(\theta)}{1 - G(\bar{\theta})} \quad q(\hat{\theta}_s) = \frac{\int_{\underline{\theta}}^{\bar{\theta}} q(\theta) dG(\theta)}{G(\bar{\theta}) - G(\underline{\theta})}$$

Loan prices:

$$p(\hat{\theta}_v)R_v = \bar{R} + K \quad q(\hat{\theta}_s)R_s = \bar{R} + K$$

$$R_v = \frac{\bar{R} + K}{p(\hat{\theta}_v)} \quad \text{and} \quad R_s = \frac{\bar{R} + K}{q(\hat{\theta}_s)}$$

Entrepreneurial payoffs

$$\pi_v(\theta, \hat{\theta}_v) = p(\theta)(v - R_v) = p(\theta)v - \frac{p(\theta)}{p(\hat{\theta}_v)}(\bar{R} + K),$$

$$\pi_s(\theta, \hat{\theta}_s) = q(\theta)(s - R_s) = q(\theta)s - \frac{q(\theta)}{q(\hat{\theta}_s)}(\bar{R} + K).$$

Equilibrium analysis

Definition 1 *A perfect Bayesian equilibrium specifies a quadruple $(\bar{\theta}^*, \underline{\theta}^*, \hat{\theta}_v^*, \hat{\theta}_s^*)$ which is a solution to the following system of equations:*

$$(i) \pi_v(\bar{\theta}^*, \hat{\theta}_v^*) = \pi_s(\bar{\theta}^*, \hat{\theta}_s^*),$$

$$(ii) \pi_s(\underline{\theta}^*, \hat{\theta}_s^*) = w,$$

$$(iii) p(\hat{\theta}_v^*) = \int_{\bar{\theta}^*}^1 p(\theta) dG(\theta) / [1 - G(\bar{\theta}^*)],$$

$$(iv) q(\hat{\theta}_s^*) = \int_{\underline{\theta}^*}^{\bar{\theta}^*} q(\theta) dG(\theta) / [G(\bar{\theta}^*) - G(\underline{\theta}^*)].$$

'Flat-rate' regime

Proposition 1 *Given the flat-rate capital requirements, there is overinvestment in expansionary projects as entrepreneurs with inefficiently low success rates choose this investment opportunity; i.e., $\bar{\theta}^{FR} < \bar{\theta}^{fb}$ and $\hat{\theta}_v^{FR} < \hat{\theta}_v^{fb}$.*

Remark 1 *The cut-off $\underline{\theta}^{FR}$ determining the division of entrepreneurs into investment and labor is efficient if the flat-rate capital requirement satisfies*

$$\bar{k} = \left(\frac{q(\hat{\theta}_s^{fb})}{q(\underline{\theta}^{fb})} - 1 \right) \bar{R} \equiv \bar{k}^{fb}.$$

If $\bar{k} < \bar{k}^{fb}$ entrepreneurs with inefficiently low success rates choose to invest in conservative projects. On the other hand, if $\bar{k} > \bar{k}^{fb}$, too many entrepreneurs opt to enter the labor market.

'Flat-rate' regime...

- Even though the overall lending volume may be efficient, the composition of corporate loans necessarily features overinvestment in expansionary projects.
- The distortion in the expansionary investment margin is the lowest when $\bar{k} = 0$ while the upward distortion in the overall volume of corporate lending is the highest when $\bar{k} = 0$
 - There is a tradeoff between optimal composition of loans and the efficiency of the overall bank lending volume.

'Risk-based' regime

Remark 2 *The cut-offs $\bar{\theta}^{RB}$ and $\underline{\theta}^{RB}$ are efficient, if*

$$k_s = \left(\frac{q(\hat{\theta}_s^{fb})}{q(\underline{\theta}^{fb})} - 1 \right) \bar{R} \equiv k_s^{fb}$$
$$k_v = \left(\frac{p(\hat{\theta}_v^{fb})}{p(\bar{\theta}^{fb})} \frac{q(\bar{\theta}^{fb})}{q(\underline{\theta}^{fb})} - 1 \right) \bar{R} \equiv k_v^{fb}$$

Proposition 2 *Given that $k_s < \bar{k} < k_v$, it holds that*

$$\bar{\theta}^{RB} \geq \bar{\theta}^{FR} \text{ and } \underline{\theta}^{RB} < \underline{\theta}^{FR}.$$

Hence, there is less investment in expansionary projects under the risk-based capital requirements than under the flat-rate capital requirements but the overall lending volume under the risk-based regime is greater than under the flat-rate regime.

‘Risk-based’ regime...

- Risk-based capital requirements alleviate the cross-subsidization effect in expansionary investments and thereby reduce overinvestment in these projects
- Lower capital requirement against conservative loans increases entrepreneurs' participation so that the overall lending volume is higher
- The average capital holding against a risky asset is larger under the flat-rate regime than under the risk-based system because the allocation of financial resources is less efficient with the flat-rate requirements.

Procyclicality of capital regulation

- Minimum capital requirements may become a binding constraint to banks in an economic downturn when loan losses accumulate
- Banks may respond by cutting lending which in turn may fuel the downturn
- If capital requirements also increase in the downturn, as is likely under Basel II, the procyclical effect becomes even worse

Portfolio effect and pro-cyclicality

- Assume that expansionary (risky) projects fail more easily than conservative projects in economic downturns
- Under Basel II, reduced overinvestment in risky projects reduces loan losses in a downturn compared to Basel I
- Thus, the pro-cyclical impact of Basel II may be alleviated by the portfolio effect
 - Cf. Gordy and Howells (2006): “endogenous response by banks to Basel II does not necessarily lead to exacerbation of macroeconomic cycles”

Conclusions

- Under De Meza–Webb assumption, there is typically excess risk-taking in the credit market
- Flat-rate capital requirements exacerbate this problem
- The risk-based regime alleviates cross-subsidization of risky investments and reduces overinvestment in these projects
 - Increases entrepreneurs' participation in the credit market
 - First-best loan composition and lending volume achievable

Conclusions

- More efficient (and less risky) allocation may counterbalance the pro-cyclicality inherent in Basel II
- Basel II could also allow for a reduction in the overall level of regulatory capital
 - Follows from the more efficient lending allocation
 - Cf. Repullo (2004)