PETERSON INSTITUTE FOR INTERNATIONAL ECONOMICS

Estimating Optimal Capital Requirements for Banks

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Modigliani-Miller Equity Cost as Function of Debt/Equity Leverage

$$i_j = \rho + (\rho - r)\frac{D_j}{S_j}$$

i_j = unit cost of equity

ρ = sectoral capitalization rate

r = interest rate

D_j = debt

S_j = shareholder equity

M&M Test for 51 Large US Banks
2001-13

Earnings yield: Adj. $R^2 = 0.088$

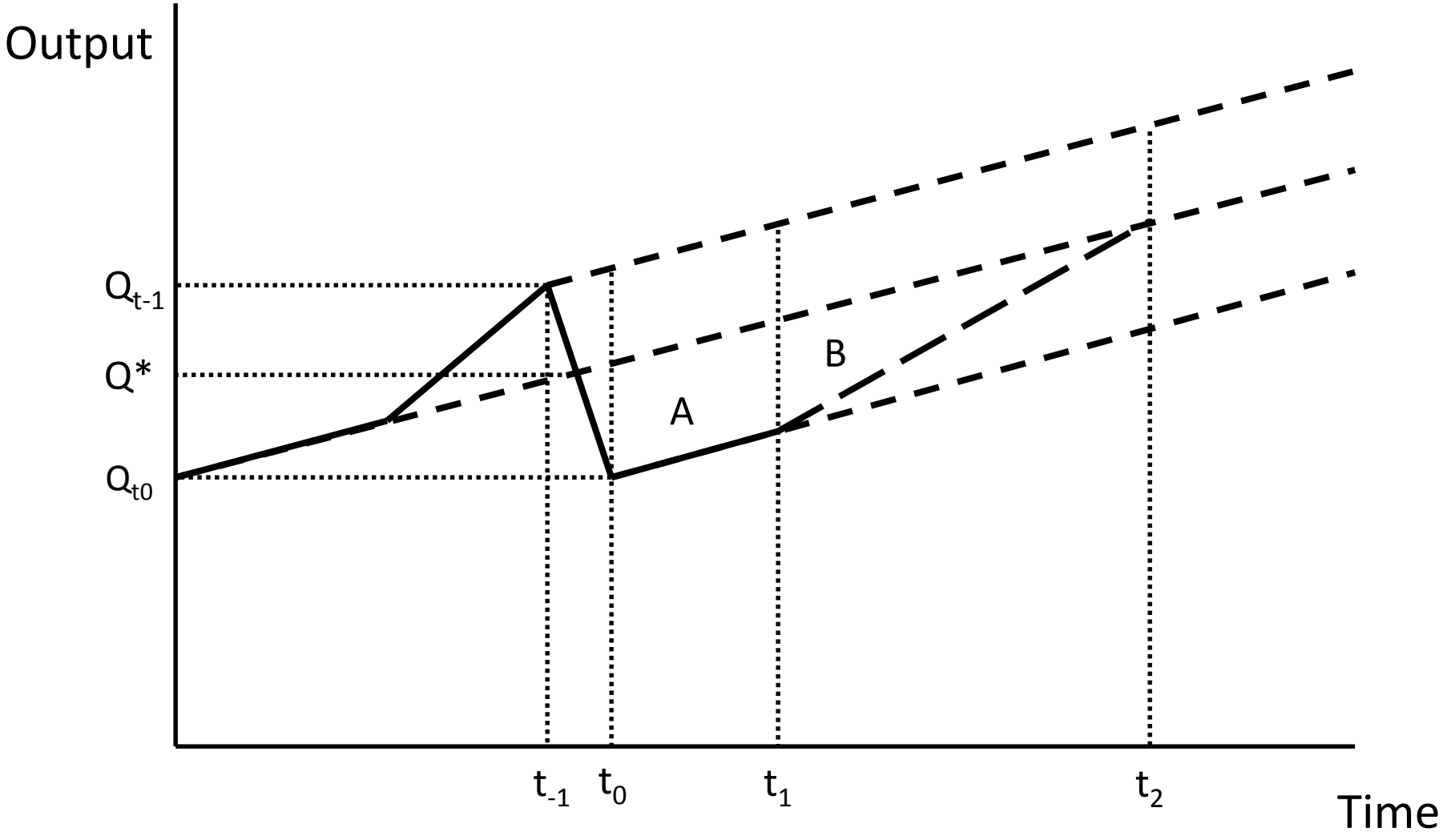
$ey_t = 6.63 + 0.0513\ R_{t-1} - 1.89\ D_{0810}$;
(19.5) (1.62) (–7.2)

R: debt/equity D: dummy

Net income/ Book equity Adj. $R^2 = 0.268$

$NI_t/E_{t-1} = 7.206 + 0.636\ R_{t-1} - 5.823\ D_{0810}$;
(10.0) (9.4) (–10.5)

Losses from a Banking Crisis



Deriving the benefits curve

Baseline damage: $D_0 = P_{cr0}\lambda_0$

Crisis probability: $P_{crk} = Ak^{\gamma}, \qquad \gamma < 0$

Benefit: $B = -(P_{crk} - P_{cr0})\lambda_0$

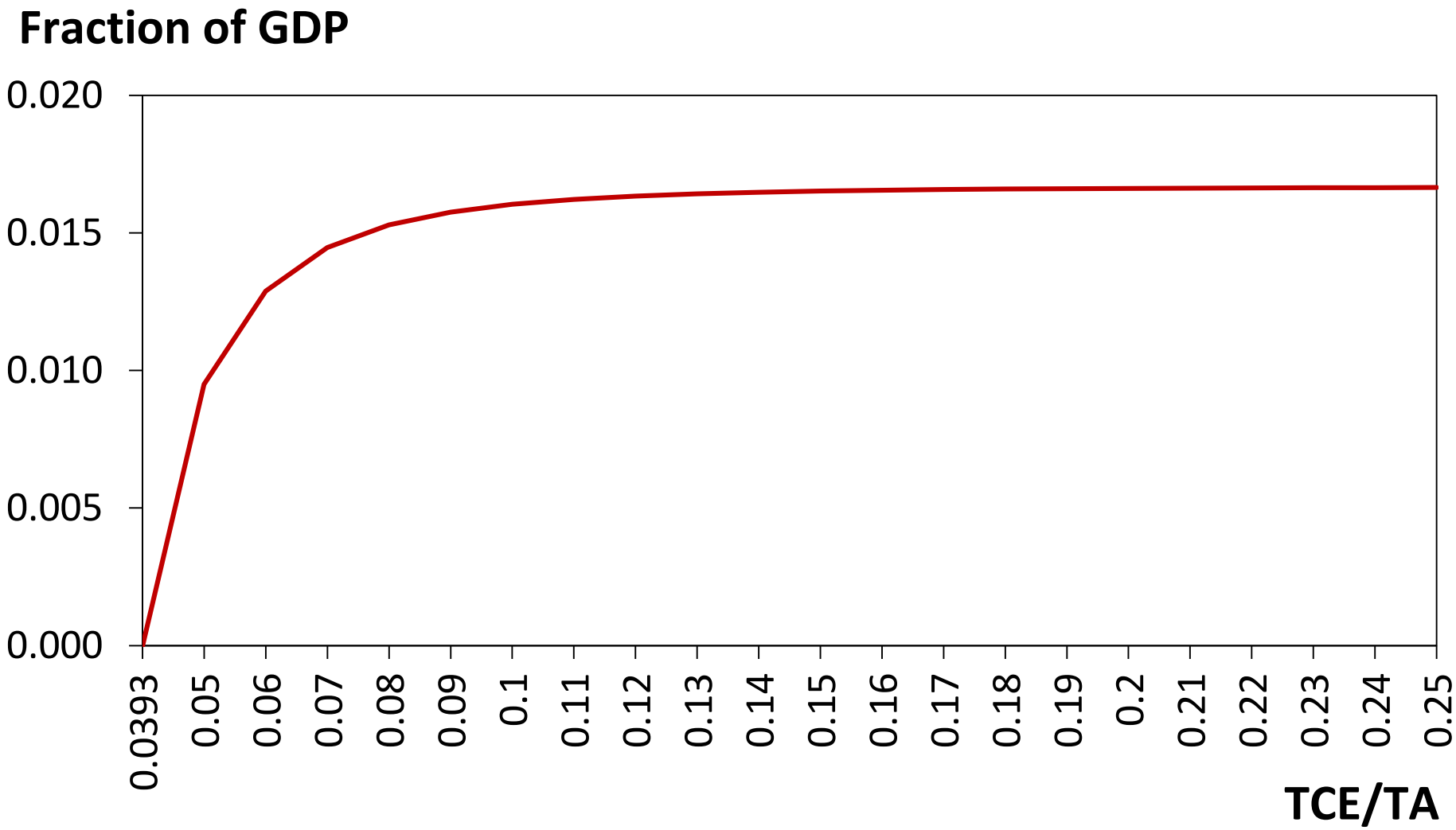
$$= -A\lambda_0\left(k^{\gamma} - k_0^{\gamma}\right)$$

Marginal benefit: $\frac{dB}{dk} = -A\lambda_0\gamma k^{\gamma-1}$

BCBS Schedule of Crisis Probability For Alternative Capital Ratios

	TCE/RWA	TCE/TA	P_{cr}
	6	3.4	7.2
	7	3.9	4.6
	8	4.5	3
	9	5.1	1.9
	10	5.6	1.4
	11	6.2	1
	12	6.7	0.7
	13	7.3	0.5
	14	7.9	0.4
	15	8.4	0.3

Benefits of higher capital ratios



Impact on cost of capital to the economy

Banks: $z = z_0 + (k - k_0)(\rho_B - r_d)(1 - \mu)$

Non-banks: $r_{NB,0} + \theta \times (z - z_0)$

Economy:

$$w = \phi_B(z + S_f) + \phi_{NB} r_{NB} + \phi_f \rho_f$$

Proportional change $v = \left(\frac{w_k}{w_0} - 1\right)$

Cost of higher capital cost to economy

$$C = \frac{v \times \alpha \times \sigma}{(1 - \alpha)}$$

α = output elasticity with respect to capital

σ = elasticity of substitution, capital & labor

If α =0.33, σ = 0.5, w_0= 0.1, Δw = 0.01, and v =0.1, then:

$$C = 0.025$$

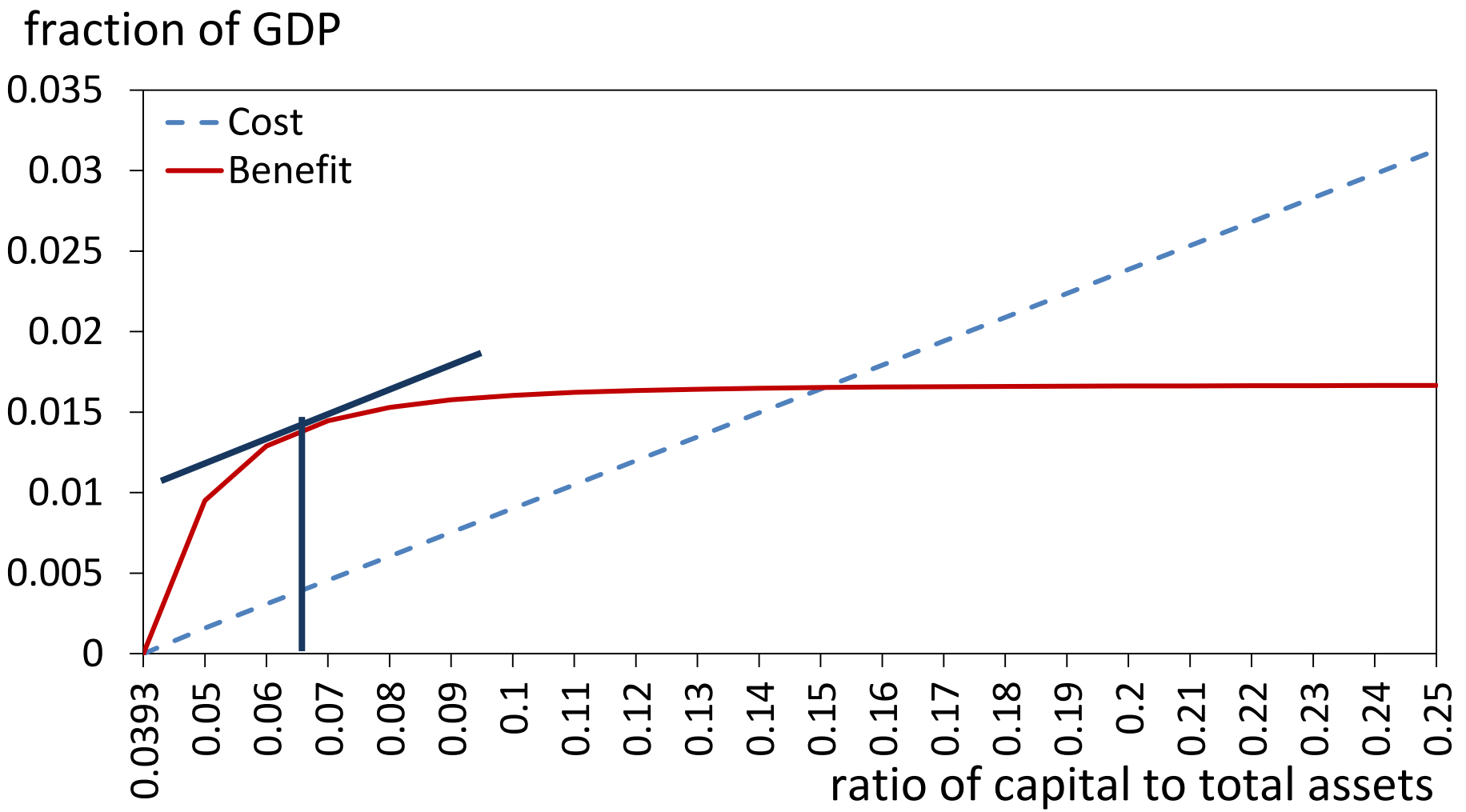
Marginal cost to economy from higher *k* is constant

$$\frac{dC}{dk} = \frac{dC}{dv} \times \frac{dv}{dw} \times \frac{d_w}{d_z} \times \frac{d_z}{d_k}$$

$$= \frac{\alpha\sigma}{1-\alpha} \frac{1}{w_0} (\phi_B + \theta\phi_{NB})\{(\rho_B - r_d)(1-\mu)\}$$

$$\equiv \psi$$

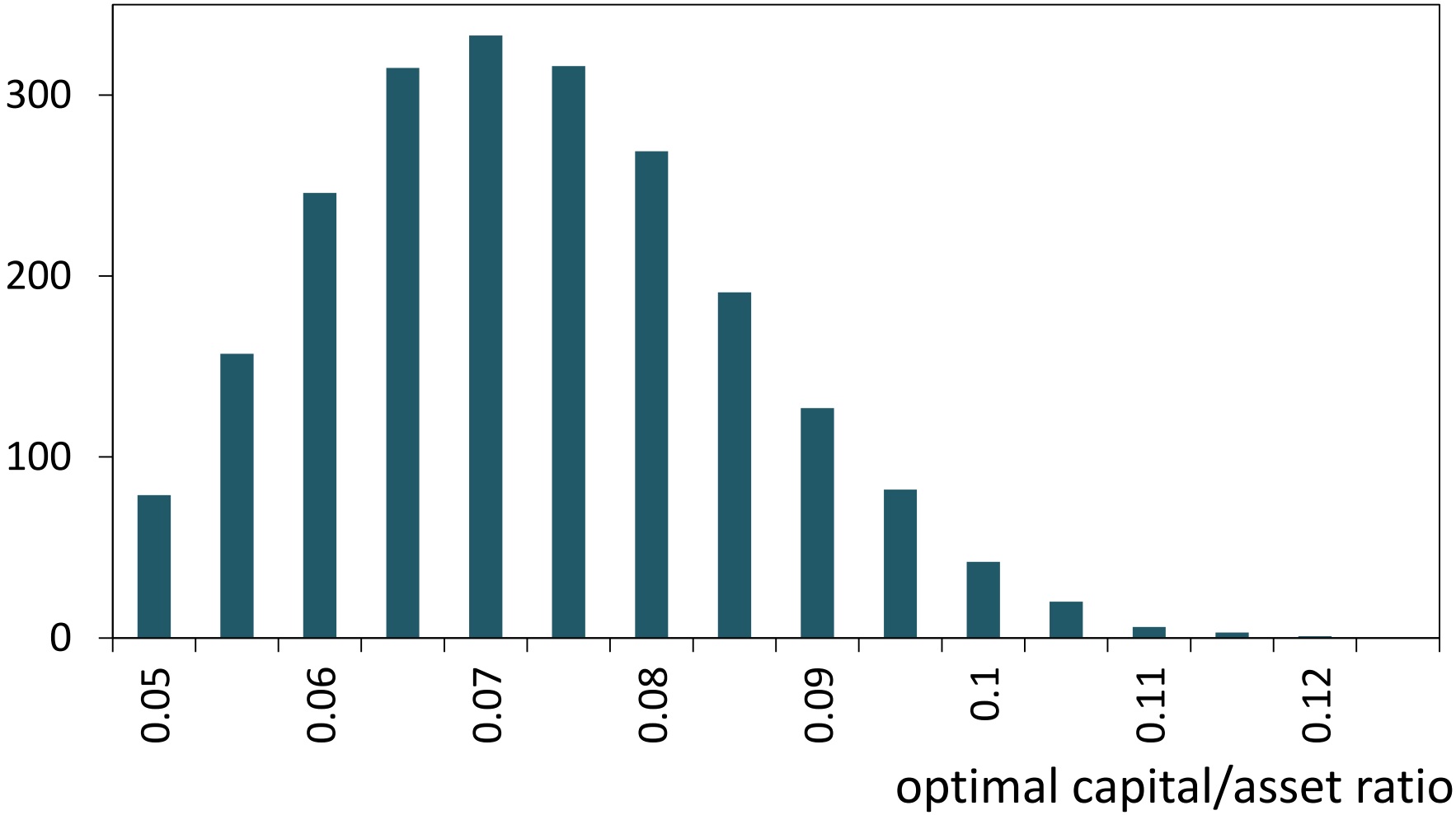
Benefits and costs of additional bank capital



Simulation parameters

Parameter	Concept	Low OCR	Base	High OCR
λ	Loss from crisis	0.3	0.64	1.0
ρ_B	Equity cost to banks	0.13	0.10	0.07
μ	M&M offset	0.35	0.45	0.60
θ	Nonbank spillover	0.7	0.5	0.2
α	Capital elasticity	0.43	0.40	0.33
σ	Substitution elast.	0.8	0.5	0.4

Frequency, optimal capital ratio



Optimal Capital Requirements
(tce/rwa %)

STUDY	K/RWA	STUDY	K/RWA
Admati-Hellwig	36-53	Yan et al	10
Hanson et al	27	Kragh-Sørensen	16-23
Dagher et al	9-17	De-Ramon et al	10
Basel Cttee	13	Van den Heuvel	<5
Barrell et al	9	Clerc et al	11
Miles et al	16-20	Mendicino et al	10
Kato et al	11-14	Cline	12-14
Gambacorta	12	MEDIAN	13

Great Recession change, net income/assets, and log asset size, 50 large US banks