Misstatement of Regulatory Capital Requirements: Some Implications for Retail Banking Profits

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Overview

- Motivation, Approach, and Results (P. Beling)
  - Motivating questions.
  - Models for evaluating the effects of capital misstatement.
  - Numerical example using a retail credit scorecard.
  - Conclusions.
- Relation to literature on capital adequacy (G. Overstreet)

Motivating Questions

- Is it worthwhile to try and come up with highly accurate capital requirements models for retail credit? Or will pretty much anything do?
- What are the effects of getting a capital requirements formula wrong? What are the sensitivities?
- Can the very act of setting a capital requirement introduce a new kind of risk, one that is of the same scale as the unexpected default loss that the capital requirement is designed to mitigate?

Why Might Capital Requirements be Misstated?

- Conceptual errors in the underlying models.
- Errors in parameter estimation.
- Political influences on the choice of parameter values.
- Supervisory overrides of correct models.

Approach

- Build a model that will allow us to determine the portfolio that maximizes (economic) profit for a given regulatory capital requirement (e.g. Basel).
- Determine the sensitivity of portfolio expected profit to misstatements in capital requirements. (This is more tricky than it might seem).
- Calculate effects for some realistic scorecards and parameter settings.

Oliver & Thomas Portfolio Optimization Model

- We adopt a model that was developed by R. Oliver and L.C. Thomas.
- Models basic retail bank in which all loans come from borrowed funds and all capital is shareholder equity.
- Allows one to compute a score cut-off that maximizes expected (economic) profit, given basic financial and risk parameters.

Oliver-Thomas Basel 1 and Basel 2 Expected Profit Formula

$$E[P(s)] = r_L p_G F^C(s|G) - f_D p_B F^C(s|B) - r_B F^C(s) - r_Q f_D \int_s^\infty K(p(u))dF(u) - C_F$$

where:

$P(s)$ = profit = revenue from good accounts – default losses – cost of capital – fixed operating expenses

p_G, p_B = proportion of population good, bad

r_L, r_B = lending rate, borrowing rate

r_Q = cost of capital

f_D = loss given default

$F^C(s)$ = proportion of population with score below s (may be conditioned on good, G, or bad, B, status)

$K(p)$ = capital requirement per unit loaned (for Basel 1 this a function of the probability of default).

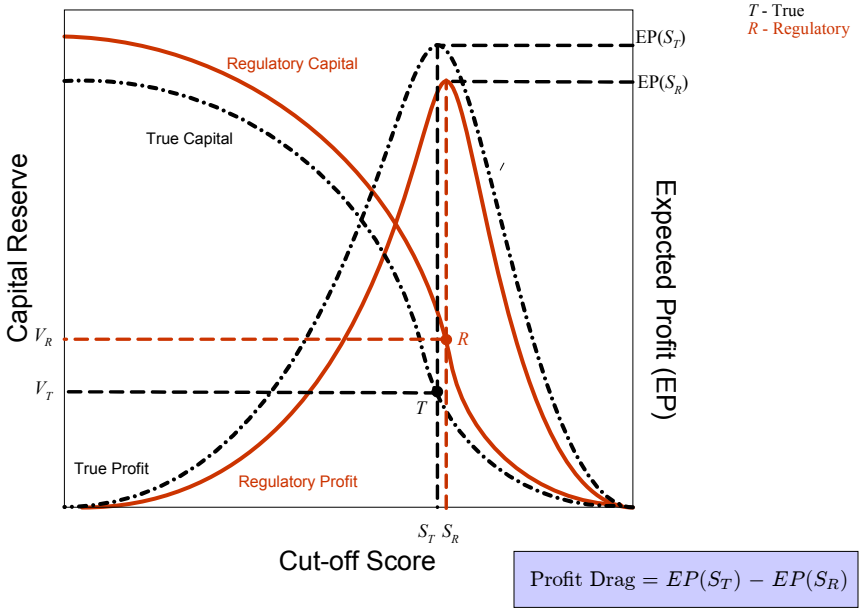
Fundamental Scenario

- Oliver and Thomas derive optimal cutoff scores that are easy to calculate for Basel 1 and hard (but manageable) for Basel 2.
- Before using the Oliver-Thomas model, however, we need a framework for considering misstatement of capital requirements.
- What do we mean by misstatement?
- Conceptually, if not yet numerically, how could misstatement of capital requirements effect profit?
- To answer these questions it is helpful to consider the following entity:

First Omniscient Bank

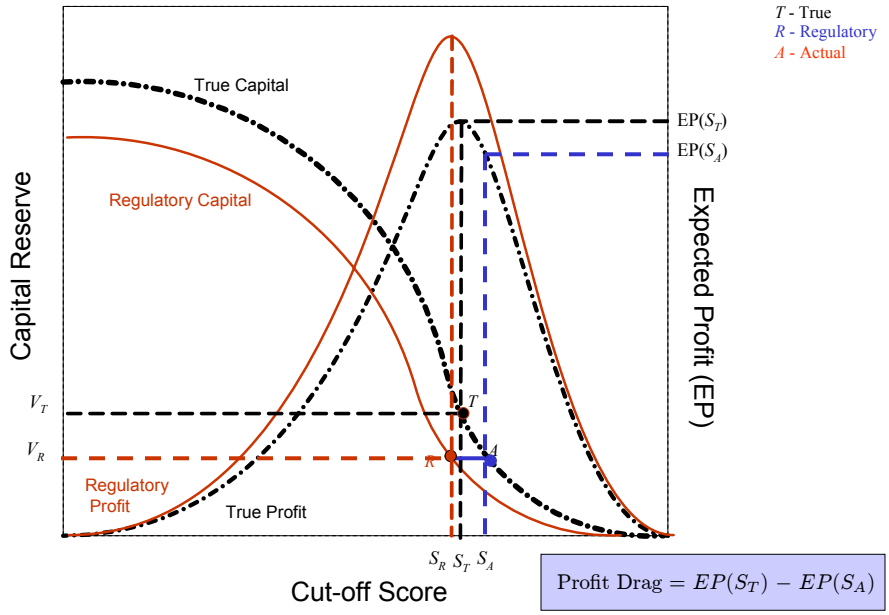
- Follows regulatory requirements (as does the Oliver-Thomas bank).
- Will always operate at the risk levels that the regulatory requirements are intended to cover (e.g., 99.9% chance that capital will suffice to cover default losses).
- For any portfolio, knows precisely the capital required to achieve the regulatory risk level. (We call this capital level the *true* requirement).

Overstatement of Capital Requirements



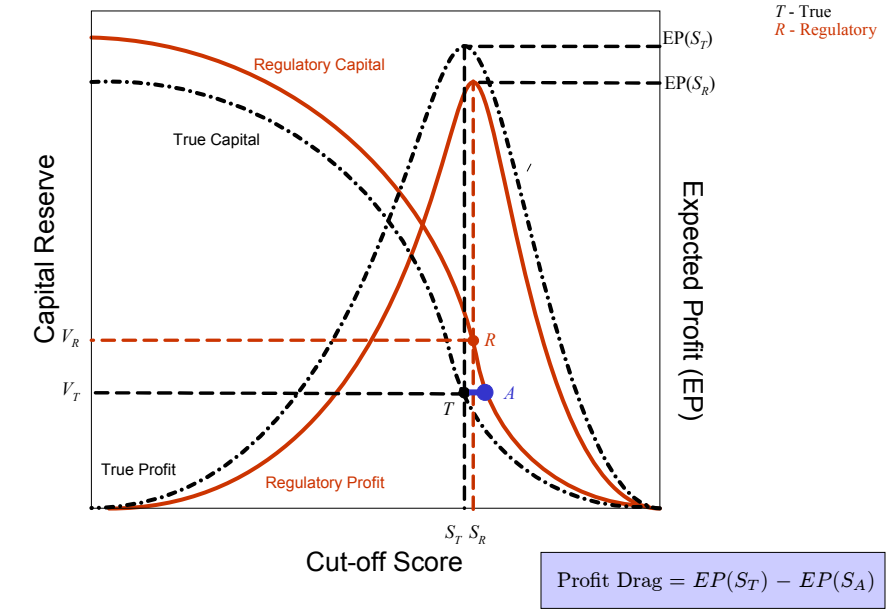
Profit Drag = $EP(S_T) - EP(S_R)$

Understatement of Capital Requirements



Profit Drag = $EP(S_T) - EP(S_A)$

Overstatement with Limited Capital



Profit Drag = $EP(S_T) - EP(S_A)$

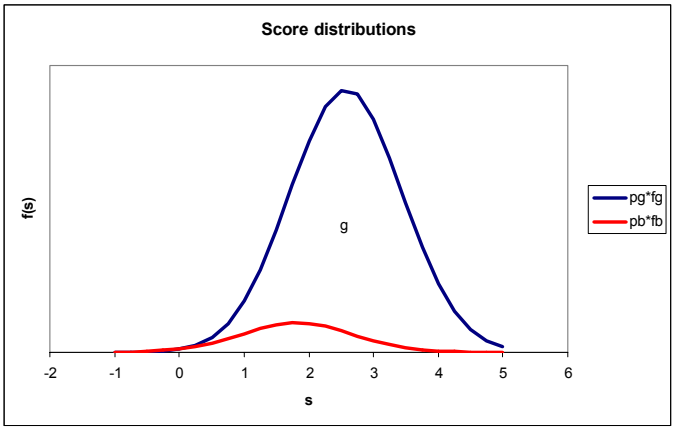
Observations and Next Steps

- Profit drag whenever the regulatory capital requirement deviates from the true requirement:
  - If capital requirements are overstated our bank will lose profit it otherwise could have earned.
  - If capital requirements are understated our bank will lose profit it otherwise could have earned.
- We now try to quantify some of these effects by considering a numerical example.

Parameters for our Retail Card Scenario

- $p_B = 0.088, \quad p_G = 0.912$
- $R = 0.04$
- $f_B(s) \sim N(3.985, 1.815);$
- $f_G(s) \sim N(0.6911.815);$
- $f_d = 0.5$
- $EAD = 1$;
- $r_L = 0.10;$
- $r_B = 0.05;$
- $r_Q = 0.20$

Retail Card Scenario

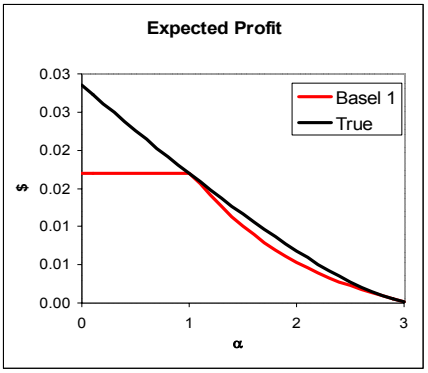


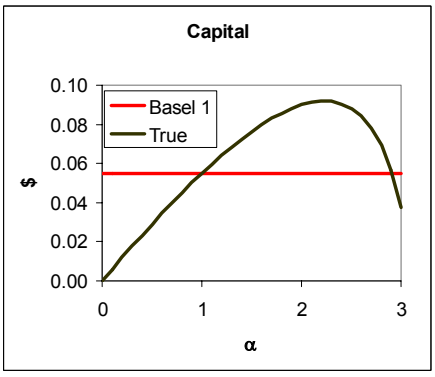
The prior probabilities are $p_B = 0.088$ and $p_G = 0.912$. Setting the cutoff score to maximize profit yields a portfolio bad rate (PD) around 1%.

Misspecification of Capital Requirements by a Formula Multiplier – Basel 1

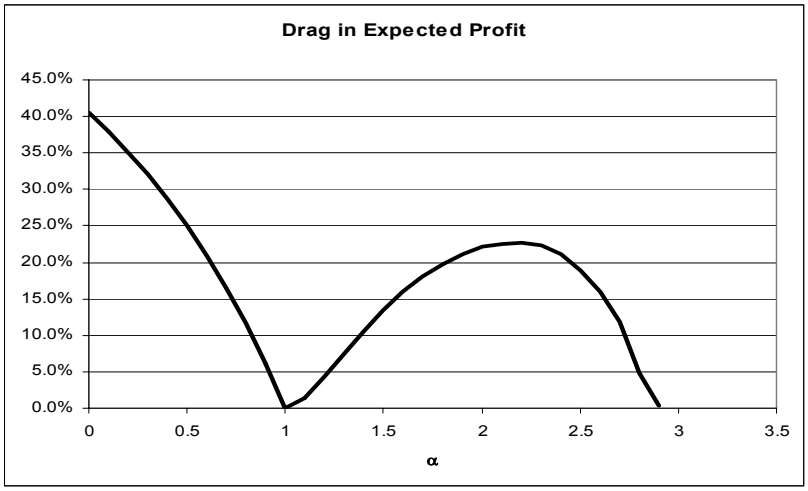
- Suppose that the capital requirements formula specified by the regulators is *F*.
- We assume that the true formula is αF.
- Hence we note:
  - values of $\alpha < 1$ corresponds to regulatory overstatement of capital,
  - values of $\alpha > 1$ corresponds to regulatory understatement of capital.
- Examine profit drag for a range of multiplier values.

Basel 1 with Unlimited Capital Availability



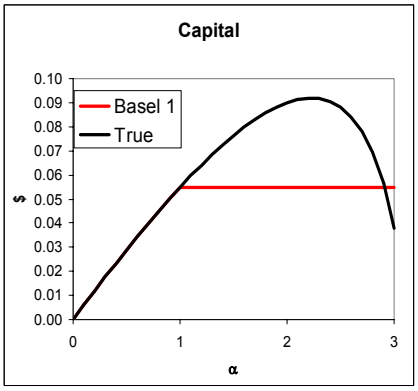


Basel 1 with Unlimited Capital Availability



Drag is calculated relative to expected profit without regulation. Note that fixed operating expenses have not been subtracted from the denominator.

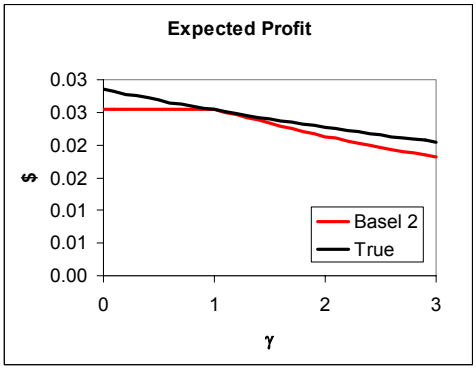
Basel 1 with Limited Capital Availability

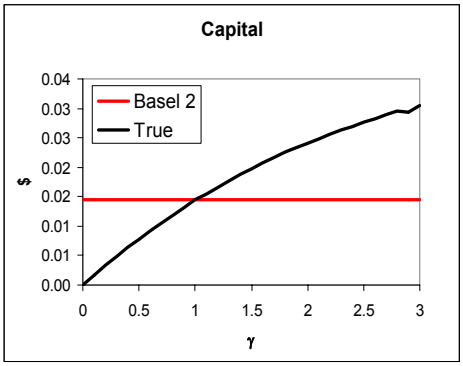


Misspecification of Capital Requirements by a Formula Multiplier – Basel 2

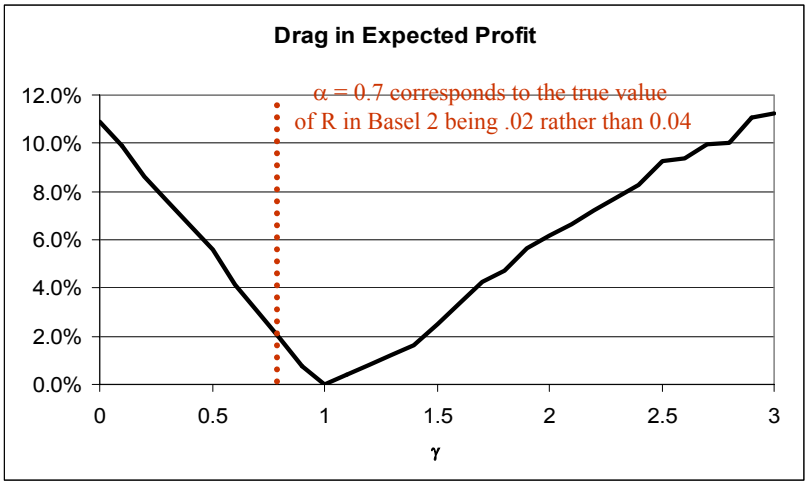
- Suppose that the capital requirements formula specified by the regulators is F.
- We assume that the true formula is γF.
- Hence we note:
  - values of $\gamma < 1$ corresponds to regulatory overstatement of capital,
  - values of $\gamma > 1$ corresponds to regulatory understatement of capital.
- Examine profit drag for a range of multiplier values.

Basel 2 with Unlimited Capital Availability





Basel 2 with Unlimited Capital Availability



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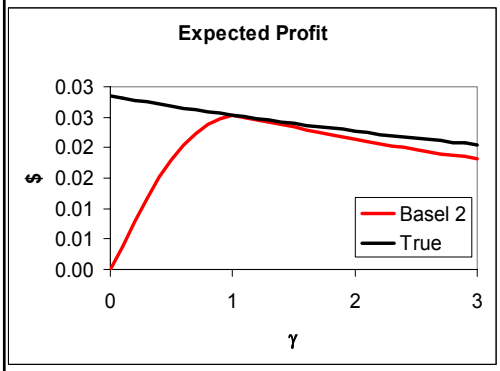
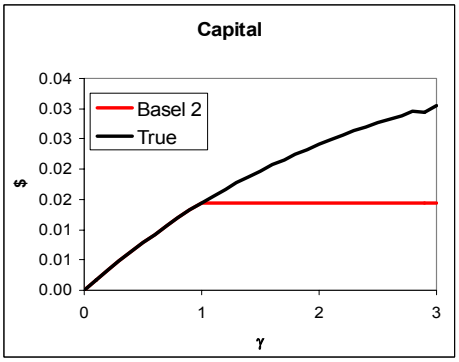
Basel 2 with Limited Capital Availability





Conclusions

- Profit is lost whether capital requirements are understated or overstated. In both cases, regulation leads to smaller, less profitable portfolios than we would otherwise have.
- This effect appears to be significant. We suggest further study is warranted.
- Overstatement leads to more lost profits than understatement (especially under limited capital availability):
  - Well at least this is true for First Omniscient Bank.
  - For less than omniscient banks, the observation suggests that it may be very desirable to put resources into dynamic monitoring and control of portfolios; be dynamic not conservative.