Regulatory Capital for Market and Credit Risk

Discussion notes

Bocconi

Andrea Resti
Bocconi
andrea.resti@unibocconi.it

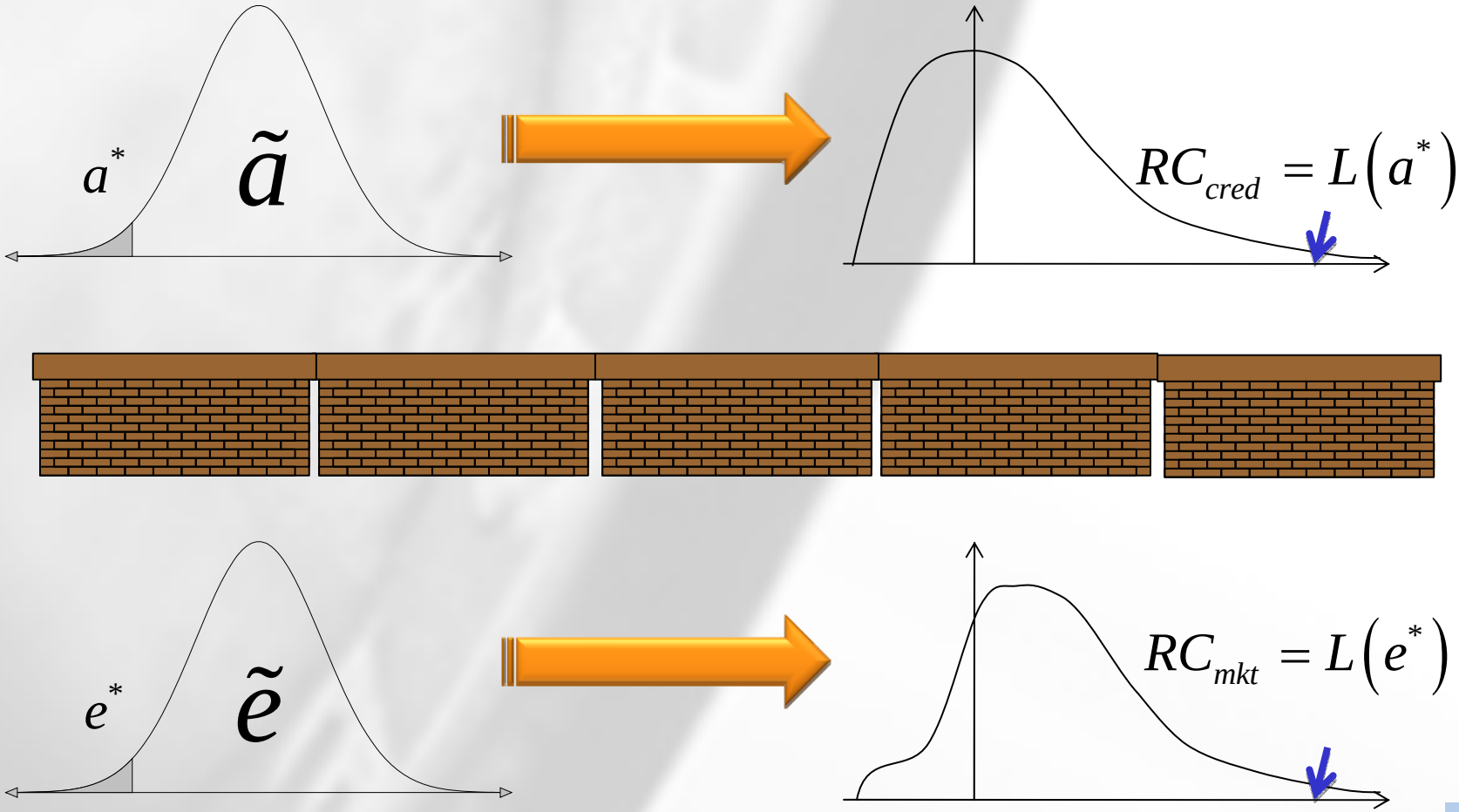
A refreshing and timely paper

- Risk diversification benefits are being extensively discussed by banks and regulators as part of Basel's "Pillar II"
- This paper challenges the conventional wisdom that adding risk measures always is a conservative approach to risk integration
- It does so in a clear, readable, enjoyable way

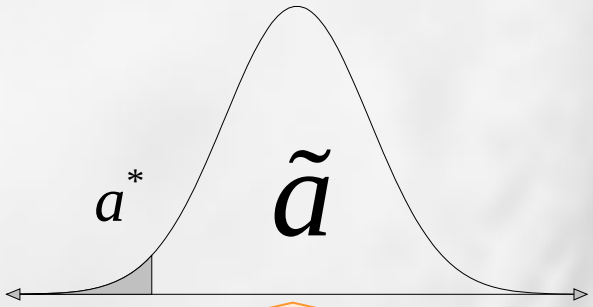
Computing and aggregating risk measures: the regulatory approach

- Estimate risk through percentile based measures (e.g. the 99th percentile of unexpected losses, i.e., the 1st percentile of changes in value)
- Add up risk measures to get a total figure
- This is correct if
  - Risk factors behind individual risk measures are 100%-rank correlated
  - A linear mapping is acceptable, that is, second-order mixed derivatives involving risk factors associated with different risks are negligible

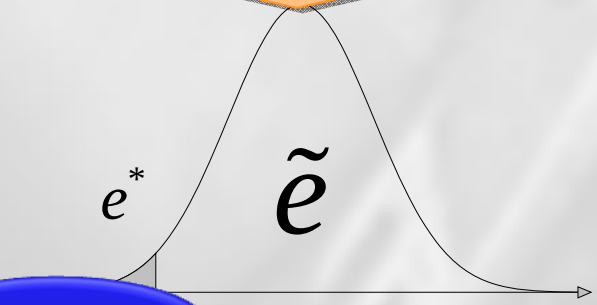
A simple example: credit and market risk in isolation…



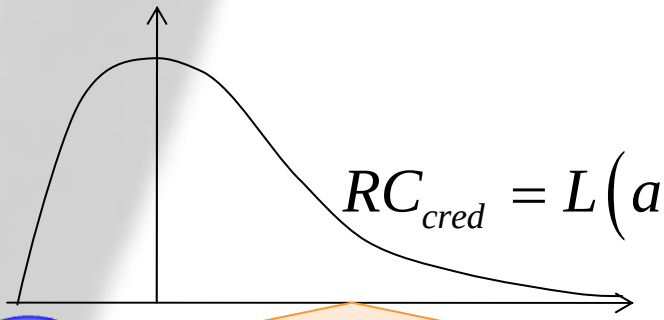
A simple example: credit and market risk <u>together</u>



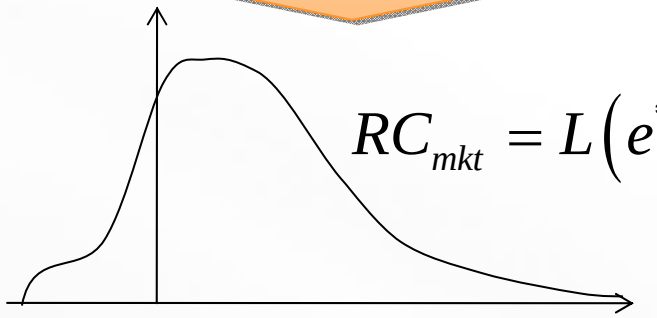
if *a* and *e* are **100% rank correlated**, so that a* and e* happen together



Then L(a*) and L(e*) can simply be added together to get overall risk



if *L(a)* and *L(e)* can simply be added together, as **there are no interaction terms**



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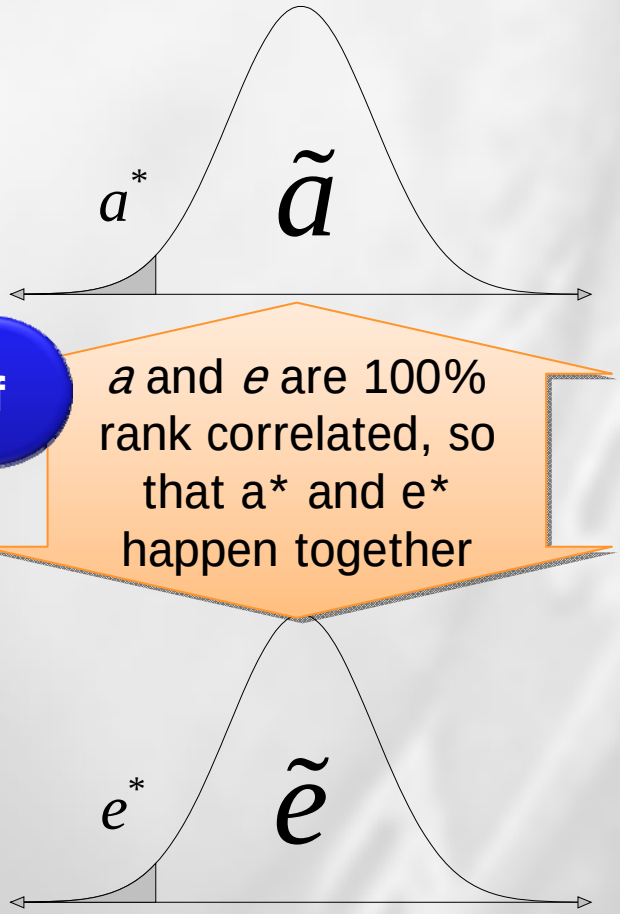
Aggregating credit and market risk: the current debate



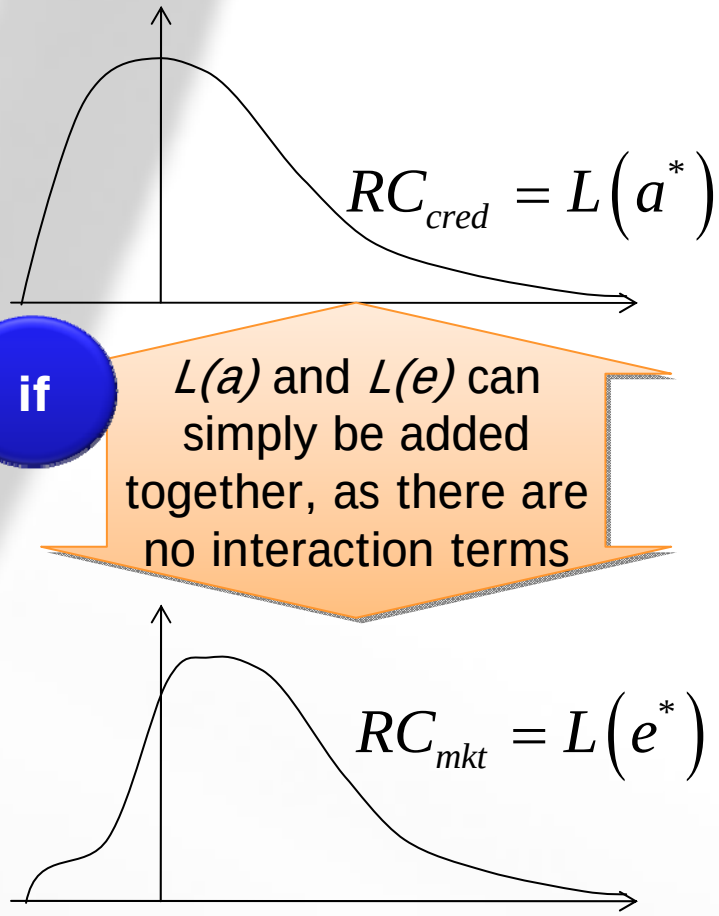
This is where banks have been drawing the regulators' attention, showing that assuming a 100%-rank correlation may prove over-conservative, even in times of stress (that is, using copulas that allow for stronger tail dependence)

Aggregating credit and market risk the focus of this paper

Interaction terms may actually be there each time that credit risk factors (eg, *a*) and market risk factors (eg, *e*) insist on the same portfolio.

E.g., a foreign-currency denominated risky loan (similar to linear mapping for foreign-currency denominated bonds)

But <u>how relevant is this in practice</u>? (remember VaR vs. ES)



Assessing the practical relevance: a sample portfolio

- A portfolio of foreign currency-denominated loans
- Akin to Merton (1973), obligor *i* defaults if her asset value ***a*** at time 1 falls below a default threshold ***o***

$$a_i(1) < o_i$$

$$a_i(0)\frac{GDP(1)}{GDP(0)}e^{\log \varepsilon_i} < l_i\left(1+r_f+s_f\right)\frac{f(1)}{f(0)}$$

How realistic are these assumptions?

While the elasticity of asset returns to the idiosyncratic risk factor ε is calibrated via parameter σ based on the borrower's PD, an arbitrary assumption of direct proportionality is made for systemic risk (GDP growth)

$$a_i(0)\frac{GDP(1)}{GDP(0)}e^{\log \varepsilon_i} < l_i\left(1+r_f+s_f\right)\frac{f(1)}{f(0)}$$

Relevant, as the macro factor loading affects risk diversification and portfolio credit VaR

How realistic are these assumptions?

All loans are assumed to be floaters, so interest rate risk enters credit risk through shifts in the default threshold

$$a_i(0)\frac{GDP(1)}{GDP(0)}e^{\log \varepsilon_i} < l_i\left(1+r_f+s_f\right)\frac{f(1)}{f(0)}$$

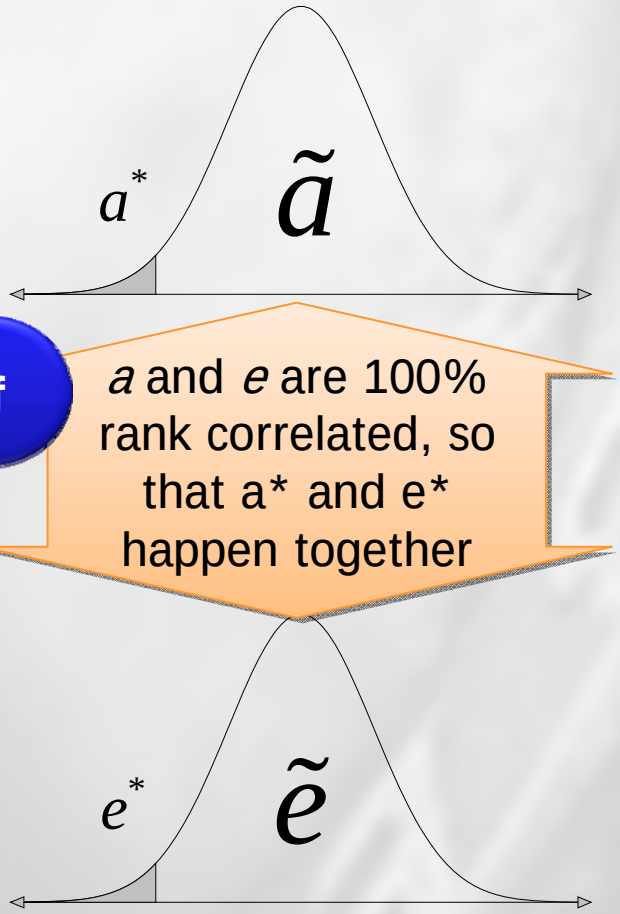
How realistic are these assumptions?

The obligor's leverage (l_i/a_i) ratio is assumed to be 10/12 (83%), not in line with S&P medians for B (53%) and BBB (24%) rated firms.

$$a_i(0)\frac{GDP(1)}{GDP(0)}e^{\log \varepsilon_i} < l_i\left(1+r_f+s_f\right)\frac{f(1)}{f(0)}$$

Sensitivity analyses look too shy (leverage kept in a 77-91% range)

What about rank correlations among factors?



As this is key to the banks' argument against adding Risk Capitals for different risks, the paper could disclose more clearly the rank correlations among different risk factors.

Also, the risk factors' grouping could be better motivated:

$$\mathbf{a} = [\varepsilon]$$

$$\mathbf{e} = [GDP, r_f, f]$$

Summing up

- This paper goes against conventional wisdom, forcing us to think again about diversification among risk types
- However, its conclusions might not be as general as one may expect
- It shows that for banks having large exposures on floating-rate, foreign currency-denominated loans, risk aggregation might lead to a super-additive result but
  - Does not disclose a number of parameters that might prove crucial in affecting its results
  - Makes a few strong assumptions in the experimental setup, including treating systemic credit risk as a market driver

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