Academy Research on Scalars:
Aggregating Regulatory Capital Requirements across Jurisdictions

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Academy research: Why study scalars?

- As part of the National Association of Insurance Commissioners (NAIC) Group Capital Calculation work, and as part of the International Association of Insurance Supervisors' (IAIS) effort to build an Aggregation Method to compare to the International Capital Standard (ICS), many important decisions must be made.

- One of those is how to translate available and required capital from entities in non-U.S. jurisdictions into values which can be added meaningfully to those of U.S. entities to build group capital adequacy metrics.

- That translation mechanism: Scalars.

- Sentiment that gave rise to pursuit of Academy research paper: "Scaling has not previously been the subject of academic research, and industry practitioners don't agree on the best methodology."

2 [Federal Reserve Board, September 2019]

What is a scalar?

- A scalar is a method of adjusting capital adequacy metrics across geographic jurisdictions and/or industries.

- A scalar is a necessary component of any metric indicating the adequacy of capital for an insurance group if:
  - Any of the entities within the group operate in a different jurisdiction and/or industry; and
  - One wishes to use a "building block approach" or "aggregation method" to measuring capital adequacy.

What we hope you will learn…

- Scalars are difficult to construct.
- Methods that rely on data rather than assumptions are, other things equal, superior but challenging.
- There is no ideal scalar.

Why are scalars important? Part 1

- Scalars are important because measuring group capital adequacy is important.
  - HIH Insurance (2001, Australia)
  - AIG (2008)
- Investigations: Dingell (1990), Sharma (2002), HIH Royal Commission (2003)
- Point: Solvency of one insurance company can be threatened by actions of another related insurance company.
- Point: Solvency of an insurance company can be threatened by actions of a related non-insurance company.

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Why are scalars important? Part 2

- Once a decision is made to measure the solvency risk for a group of entities, making sure the elements compared and/or combined are comparable is key.

- For example: if what is counted in one jurisdiction as available capital is different from what is counted in another jurisdiction, then two entities in different jurisdictions might have identical capital resources but report different levels of available capital. If they are to be combined, they need to be on one consistent basis.

How can capital be combined?

- International Capital Standard 2.0: ICS 2.0 is a market-based approach, relying on a consolidated balance sheet and assessing risk through the application of shocks.

- Aggregation Method: Build group metric relying on the existing methodologies for each entity within the group, aggregating capital requirements across regulatory frameworks with the use of a "translating mechanism" called a scalar.

'Ideal' scalars

- The ideal form of scalars is one where an entity in one jurisdiction hypothetically calculates its available and required capital as if it operated in the originating jurisdiction while adjusting (or controlling for) other factors that might affect the safety of the group's ongoing operations.

- In practice, might be impossible.

- In principle, considering entities in distinct industries, might be impossible.

- Hence, search for "best" scalar methodology operates in the world of "the second best."

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'Ideal' scalars illustrated: One U.S. company

| JURISDICTION	USA		Foreign 1	Foreign 2	Foreign 3
COMPANY	A		A1	A2	A3
Reserves	$7,500		$7,500	$8,500	$6,500
Available Capital	$15,000		$15,000	$15,000	$15,000
Required Capital	$2,000		$3,000	$2,000	$3,000
Capital Adequacy Ratio (Narrow)	7.5		5	7.5	5
Implied Scalar (Narrow)			0.67	1.00	0.67
Capital Adequacy Ratio (Broad)	1.58		1.43	1.43	1.58
Implied Scalar (Broad)			0.90	0.90	1.00
			Same Reserves	Higher Reserves	Lower Reserves
			Higher Req Cap	Same Req Cap	Higher Req Cap

Research questions?

What are some possible methodologies?

- No Scalar

- Capital Ratios

- Equivalence of Two Points

- Probability of Negative Outcomes

Is there published work assessing potential scalar methodologies?

- American Academy of Actuaries. *Aggregating Regulatory Capital Requirements across Jurisdictions: Theoretical and Practical Considerations*. April 2021.

- Board of Governors of the Federal Reserve System. *Comparing Capital Requirements in Different Regulatory Frameworks*. 2019.

APRIL 2021

AGGREGATING REGULATORY CAPITAL REQUIREMENTS ACROSS JURISDICTIONS
THEORETICAL AND PRACTICAL CONSIDERATIONS

American Academy of Actuaries
Research Paper 2021, No. 1

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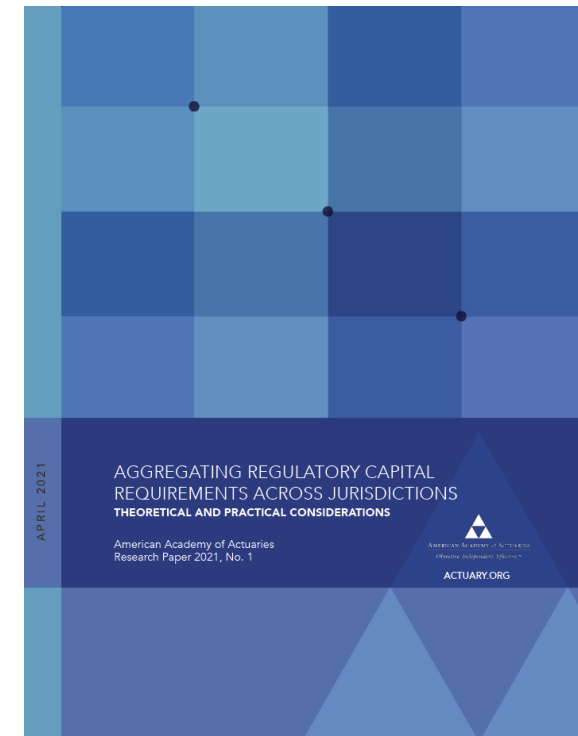
How do they vary in broad terms?

Figure A: Validity and Simplicity of Scalar Methodologies
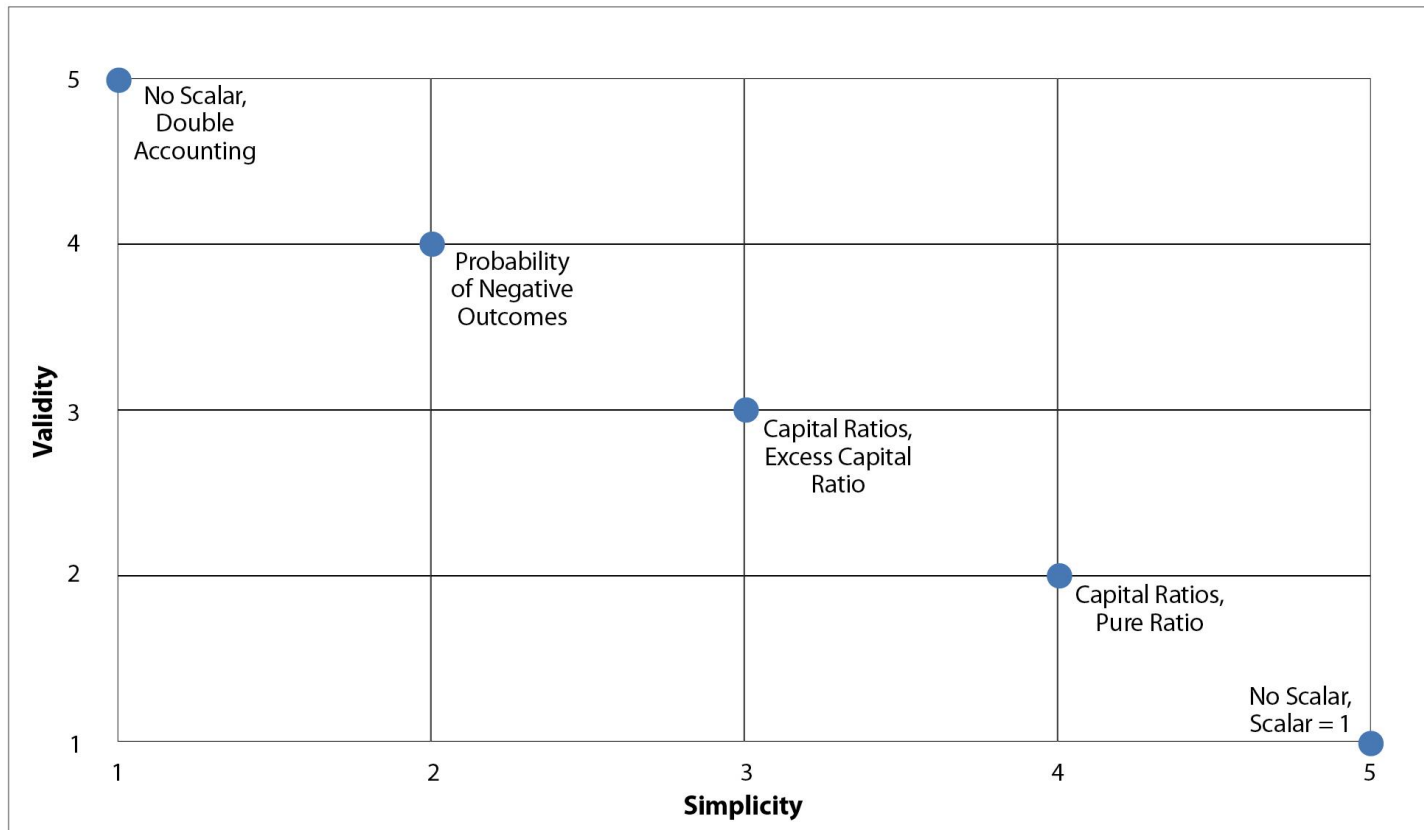
What are relevant criteria for assessing, more specifically?

- **Validity** is about the closeness of what is being measured to what is intended to be measured.

- **Reliability** describes how far a particular test, procedure or tool, such as a questionnaire, will produce similar results in different circumstances, assuming nothing else has changed.

- **Ease of Implementation**: If a methodology cannot be implemented, it is not useful.

- **Stability of Parameters**: metrics are more useful if the measure observed at one moment would be unlikely to be substantially different if the measure were constructed shortly before or shortly after the actual moment of measurement.

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No Scalars

- Scalar = 1
  - Validity: negligible
  - Reliability: perfect
  - Ease of implementation: perfect
  - Robustness of parameters: high
- Double Accounting
  - Validity: high
  - Reliability: low
  - Ease of implementation: low
  - Robustness of parameters: medium-high

Capital Ratios

- ## Pure Ratio
  - Validity: low
  - Reliability: high
  - Ease of implementation: high
  - Robustness of parameters: medium-high
- ## Excess Capital Ratio
  - Validity: medium
  - Reliability: medium-high
  - Ease of implementation: medium-high
  - Robustness of parameters: medium-high

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Probability of Negative Outcomes

- Probability of Default
  - Validity: high
  - Reliability: medium
  - Ease of implementation: low-medium
  - Robustness of parameters: medium

- Probability of Reaching First Intervention Level
  - Validity: high
  - Reliability: medium
  - Ease of implementation: lower-medium
  - Robustness of parameters: medium

Research Questions?

Conclusion: Issues

- The application of these methodologies to entities in different industries: special challenges
- The dependence of the anchors for these methodologies on regulatory actions and company responses (the "problem of endogeneity")
- The dependence of stability and validity of results on jurisdictional regime stability
- The value of sensitivity testing in selecting a most desirable method

Conclusion: Observations

- Scalars are difficult, because they involve accounting for differences in all conditions in different jurisdictions which might affect the meaning of solvency metrics.

- Methodologies based on observable data are preferable to methodologies based on assumption, other things being equal.

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Conclusions

- The question facing regulators involves balancing degrees of validity—i.e., how imperfect the measures are, given what they would be if ideally conceptualized and measured—against degrees of reliability, ease, and stability.

- The only reliable way in which to balance the validity of methodologies against their complexity is through the application of sensitivity testing.

- Almost all methodologies will be prone to increased imperfection if regulatory regimes change after scalars have been estimated: periodically recalculate.

Thank You

Questions?