Actuarial thoughts on the macroprudential concept of "growth-at-risk"

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Agenda

- Growth-at-Risk (GaR)
- The perspective underlying GaR
- Viewing financial stability as a public good in its own right
- Related Solvency II proposals

Growth-at-Risk (GaR)

- "Growth-at-risk" (GaR) applies Value-at-Risk (VaR) concepts to the whole economy rather than to just an individual firm or portfolio
  - Appealing to macroeconomic and macroprudential policymakers
  - Offers a metric that conceptually applies to the whole financial system (indeed the whole economy) and hence provides **an overarching narrative for all sources and aspects of systemic risk**
  - As with VaR, to apply the concept in practice requires a time horizon, a confidence level and a base position against which adverse outcomes are compared
- Related concept of "growth-given-stress" is like GaR but corresponds to Tail Value-at-Risk (TVaR) (otherwise known as Conditional Tail Expectation, CTE) rather than VaR

For example

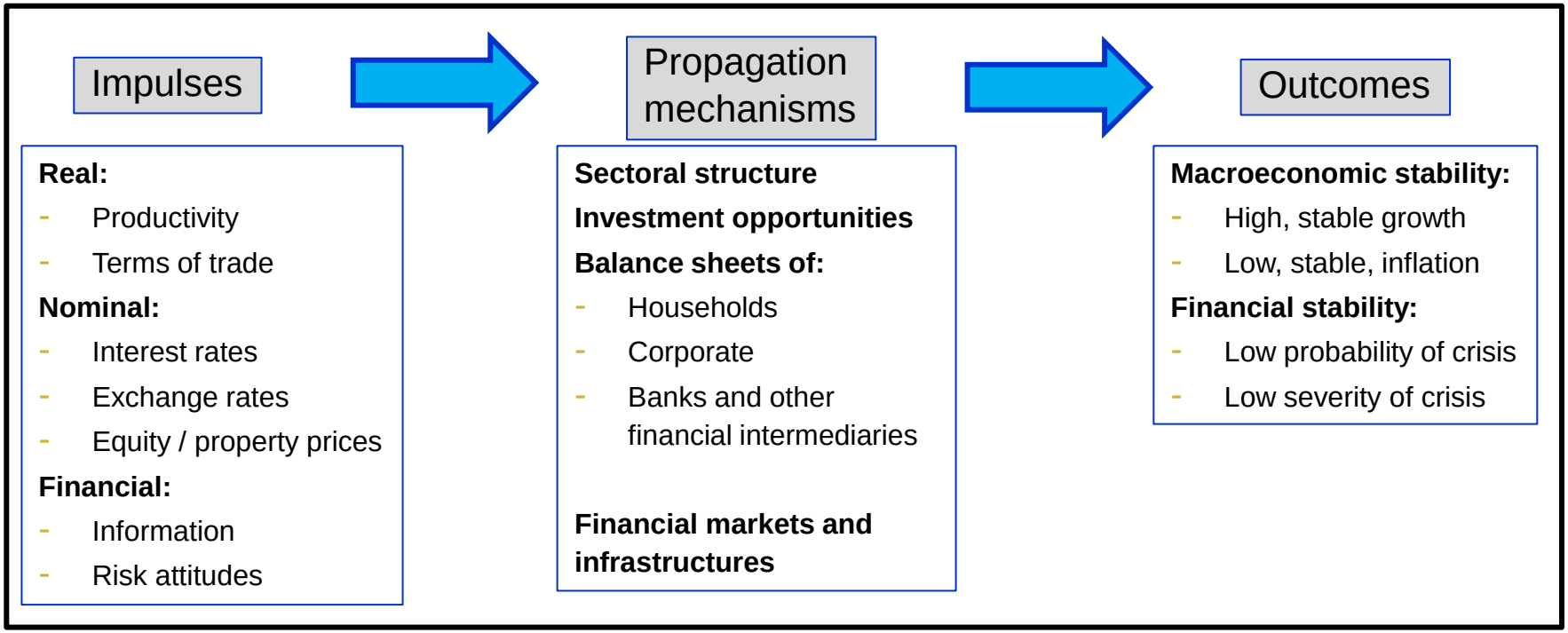
- Prasad et al. (2019). "Growth-at-risk: Concept and Application in IMF Country Surveillance". *International Monetary Fund,* Working Paper 19/36:
  - "*The growth-at-risk (GaR) framework links current macrofinancial conditions to the distribution of future growth. Its main strength is its ability to assess the entire distribution of future GDP growth (in contrast to point forecasts), quantify macrofinancial risks in terms of growth, and monitor the evolution of risks to economic activity over time. By using GaR analysis, policymakers can quantify the likelihood of risk scenarios, which would serve as a basis for preemptive action*"
- Cecchetti and Suarez (2021). "On the stance of macroprudential policy". *ESRB ASC* Report No 11:
  - *"… As an example of an empirically feasible approach, we discuss a case in which the ultimate goal of macroprudential policy is to minimise the frequency and severity of the economic losses arising from episodes of severe financial distress. To quantify this objective, we first take economic growth as a summary measure of the impact of economic performance on welfare. Then, based on empirical evidence, we argue that financial distress primarily influences the lower tail of the distribution of growth outcomes. This leads us to focus on the increasingly popular concept of growth-at-risk as a proxy for financial stability. Integrating growth-at-risk (or the related concept of growth-given-stress) into an optimal policy design problem allows us to deliver an empirically implementable prescriptive measure of macroprudential policy stance.*"

The perspective underlying GaR

- **Macroprudential policy** viewed principally as part of a **broader range of possible macro-economic policies** a society might follow
  - Macroprudential policymakers viewed as **risk managers of the financial system**
  - Ultimate objective: high stable economic growth
  - An inherent **trade-off** between economic trajectories that involve higher but more volatile medium-term / longer-term economic outcomes versus lower but more stable ones
- **Macroprudential** versus **monetary** policy: GaR perspective views them as having the same ultimate goal but different timescales
  - Monetary policy focuses on short-run output and inflation gaps
  - Macroprudential policy focuses on medium / longer term picture

Propagation dynamics

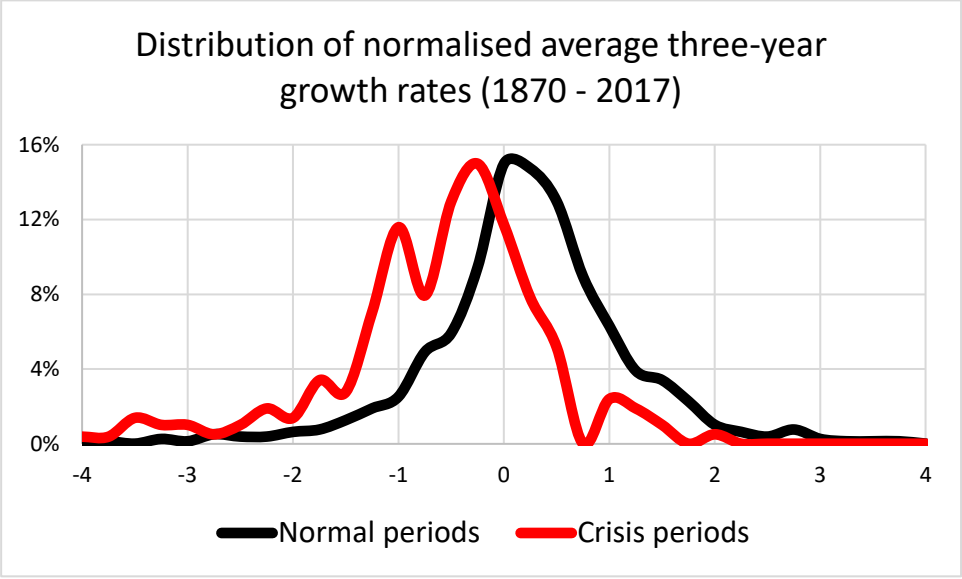
- Needs a (macroeconomic) model of impact of changes (impulses) on end economic picture. Assumes two overlapping goals targeting:
  1. Traditional macroeconomic stability, e.g. stable growth, high employment, stable inflation
  2. Financial stability, i.e. low frequency and modest severity of breakdowns in provision of essential financial services such as payments or credit



Source: Adapted from Cecchetti and Suarez (2021). "On the stance of macroprudential policy"

GaR concept links well with e.g. banking crises

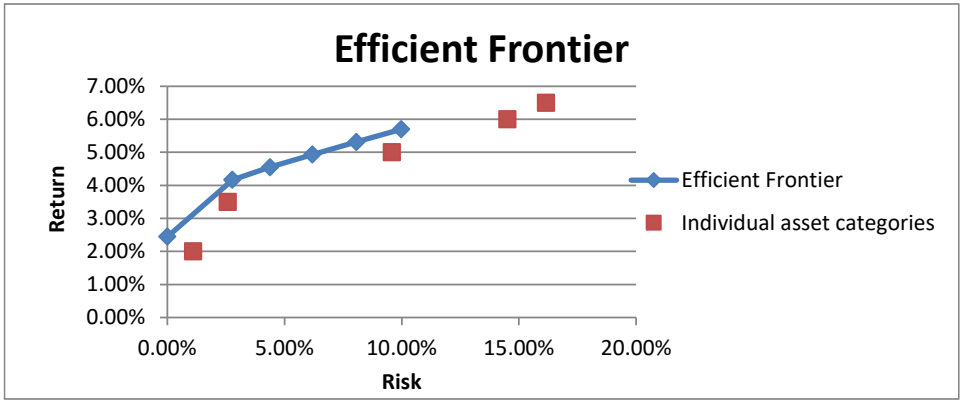
- Historically, banking crises have often coincided with economic crises
  - Since 1960, 13 crises that involved 3-year average growth more than 2 standard deviations below country mean growth
  - From 1980 to 2017, two-thirds of negative growth episodes of this magnitude were preceded by credit booms (and some evidence of causality)

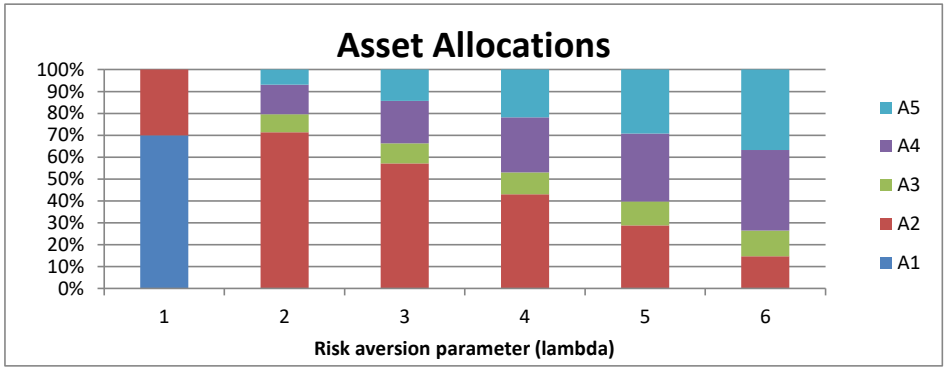


Source: adapted from Figure B.1, Cecchetti and Suarez (2021). "On the stance of macroprudential policy", dataset covers 46 countries from 1870 to 2017 and includes 207 crisis episodes

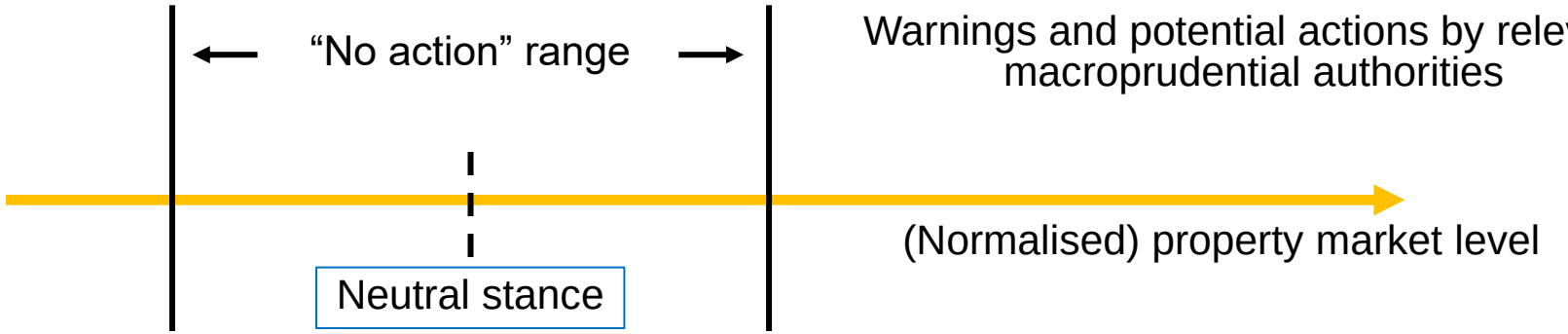
Policy formation: underlying mathematics

- Mathematically akin to portfolio optimisation
  - Maximise a utility function, here including a GaR (i.e. VaR-like) element
  - Desired position along efficient frontier provides the “neutral” policy stance, which can guide whether we should tighten or loosen policy depending on actual observed position
- Can apply concept to every part of the financial system (including insurance)
  - Provides a common “currency” for systemic risk





Policy formation: e.g. for real estate-based measures



- E.g. in Feb 2022 ESRB issued (further) warnings and recommendations on medium-term residential real estate vulnerabilities to a variety of member states in EU and EEA
- Possible policy actions for member states: borrower-based measures such as restrictions on high loan-to-value (LTV) mortgage provision, replenishing bank counter-cyclical capital buffers, …

The GaR paradigm: macroprudential or macro-economic?

- E.g. *Economics* by P. Samuelson (1976) states:
  - "*The main function of legal reserve requirements is not that of making deposits safe and liquid, payable on demand. Their vital function is to enable the Federal Reserve authorities to control the amount of demand deposits – or bank money – that the member banks can create. By imposing fixed legal reserve requirements the Fed can limit the growth of bank deposits to its desired target … Every central bank has one prime function: It operates to control the supply of high-powered reserves, and thereby the economies supply of money and credit … Monetary policy 'leans against the wind' of prevailing deficient or excessive aggregated demand spending, to promote optimal real growth and price-level stability*"
- GaR provides a prescription for how to "lean against the wind" that Samuelson may have viewed as macro-economic in nature
  - Porous border between macro-economic policy and macroprudential policy
  - GaR paradigm works best where macroprudential policy links closely to macro-economic policy

Not all macroprudential issues fit this paradigm well

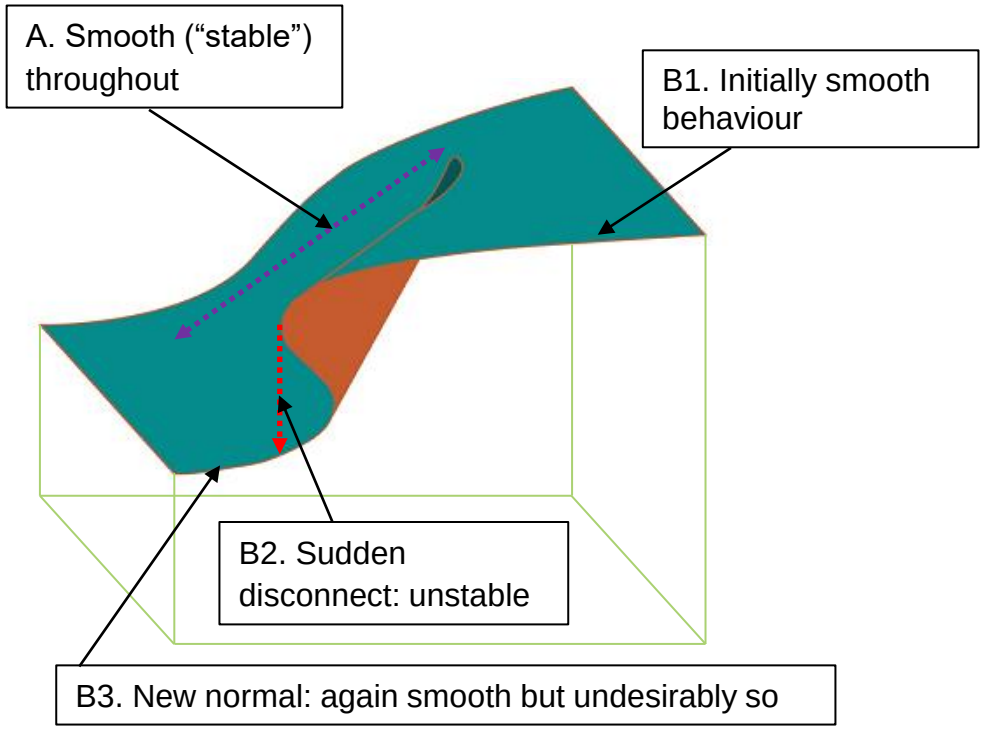
- (Investment) actuaries who have needed to apply portfolio optimisation techniques have often discovered that:
  - Not always easy to identify how best to measure “reward” (or “risk”)
  - Non-linearities can complicate the underlying mathematics
  - Some common responses to risk, e.g. imposition of limits, deliberately forego potential reward in return for other deemed benefits
  - Often hard to identify a clear place to strike the risk/reward trade-off
  - Answers can be very sensitive to (input) assumptions
  - Not all sensible input assumptions support practical solutions
- Each of the above perhaps provides insights that can inform macroprudential policy formation

Identifying the “right” measure of risk/reward

- GaR assumes measure to target is (stable) economic growth.
- Some macroprudential tools do link well with this objective, particularly ones with a close macro-economic link
  - E.g. LTV or debt affordability limits designed to smooth the credit cycle
- Others less so, e.g. dividend restrictions in times of crises
- Might view **financial stability as a public good** (FSPG) in its own right
  - C.f. we have speed limits on roads
  - Lengthens supply times, so arguably “bad” for unbridled economic growth, but hopefully reduces traffic accidents and smooths traffic flow
- Or we may seek to mitigate “existential” threats such as climate change

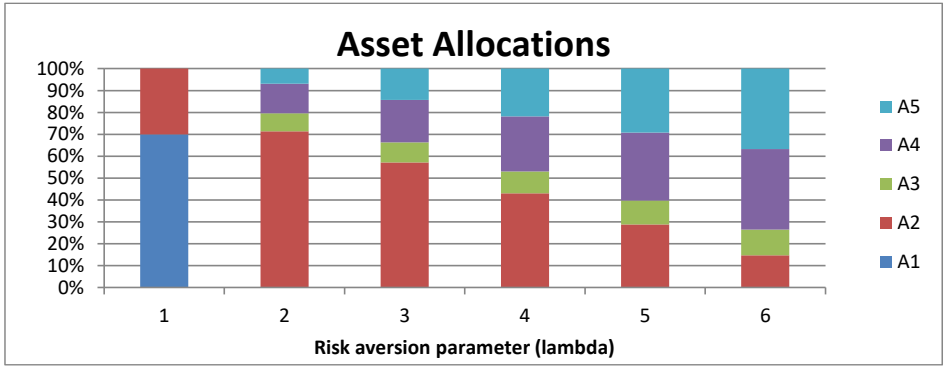
Impact of non-linearities: catastrophe theory

- Systems pushed too far can switch to unstable behaviours
- Many severely bad outcomes involve excessive build-up of unresolved stresses
  - E.g. large earthquakes: sudden shifts in plate boundaries
  - Large financial stability issues: sudden unravelling of system stresses
- C.f. actuarial catastrophe modelling techniques



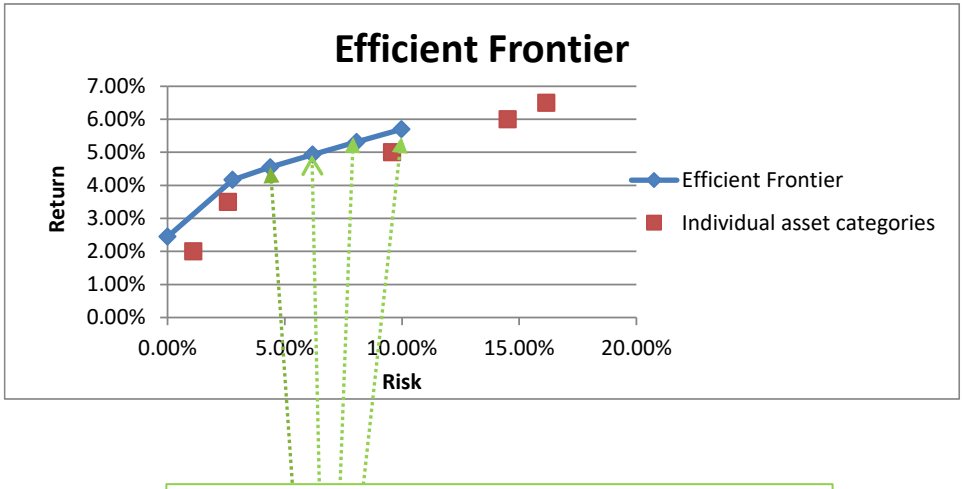
Introducing limits deliberately alters dynamics

- Asset/liability and other portfolio optimisation exercises typically impose limits (“constraints”)
  - E.g. often require asset allocations to be non-negative (or within specific ranges)
- Constrains the portfolio optimiser, so penalises risk/return trade-off but justified, e.g. because
  - “Intrinsically sensible”
  - Introduces greater “discipline”
  - Mitigates model risk



Hard to select a clear trade-off between risk and reward

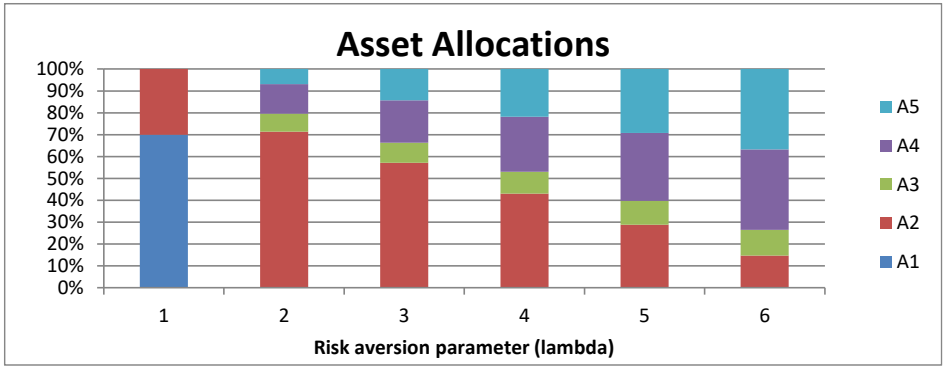
- Efficient frontier often nearly straight
- Actual selection tends to be driven behaviourally
  - E.g. by consultant presenting three possibilities that are “lower”, “middle” and “higher”
  - Most committees tasked with reaching ultimate decisions in this space tend to favour “middle” options
- VaR (so likewise GaR) doesn’t always respect diversification principles
  - Replace VaR with TVaR / Expected Shortfall (likewise replace GaR by growth-given-stress)

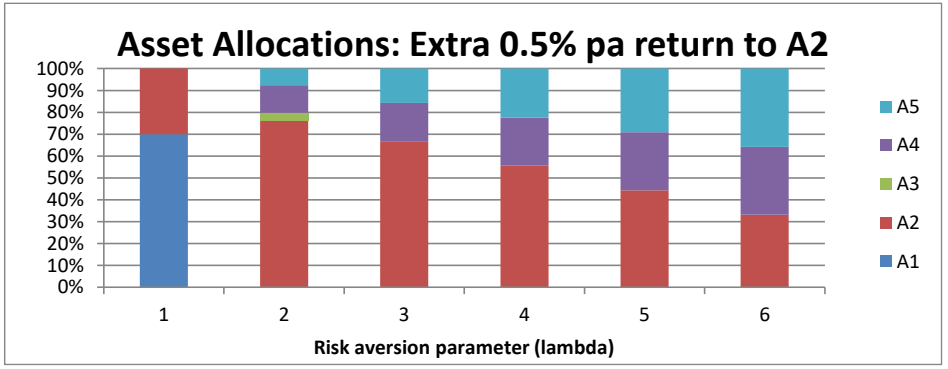


Which of these strategies is obviously better than the others?

Answers often very sensitive to assumptions

- Even quite small changes (well within the range of what can plausibly be derived from either forward or backward looking assumption setting) can result in noticeably different answers
  - Particularly if problem is multi-dimensional
  - Very hard to cater robustly for fat-tails, see e.g. Kemp, M.H.D. (2011). *Extreme Events: Robust Portfolio Construction in the Presence of Fat Tails*





Original assumptions had per annum expected returns (standard deviations) of A1: 2% (2%), A2: 3.5% (4%), A3: 5% (8%), A4: 6% (14%) and A5: 6.5% (15%), a minimum risk stance of 70% to A1 and 30% to A2, no short-selling and some assumed correlations, see http://www.nematrian.com/WebServiceExampleSpreadsheets?s=PortfolioOptimisation

Not all sensible assumptions create policy-relevant solutions

- Suppose we try to apply portfolio optimisation to the problem of selecting how much to give to different (active) managers within the same asset class
  - Larger institutional investors often face this problem
- Who can robustly forecast which (active) manager will have a higher expected (relative) return going forwards?
- Usual focus is on heuristic decision-making that draws on both qualitative and quantitative analysis
  - More robust in terms of **"regret" risk**
- Some macroprudential policies intrinsically sensible (at least to policymakers) but may have little clear link with economic growth
  - E.g. rationalising bankruptcy codes

“Public” / “social” / “common” goods

- Are defined in different ways by different commentators, usually referring to idealised characteristics which none fully exhibit, e.g.:
  - Administered by governments? e.g. law enforcement, national defence
  - A “basic” right? E.g. access to clean air and clean drinking water (but who then ensures this access exists)
  - Non-excludable (users cannot typically be barred from accessing the good)? E.g. access to the high seas?
  - Non-rivalrous (use by one user doesn’t deplete ability of others to use it)? E.g. legal frameworks?
- **FSPG** also an imperfect paradigm, open to differing interpretations
- Like **GaR**, fits within broader concept of maximising **social welfare**

Related Solvency II proposals

- EU Commission 2021 Solvency II review highights financial stability:
  - Page 1: "*The principal objectives of Solvency II are to protect policyholders and beneficiaries, as well as to preserve financial stability… These "long-term guarantee measures" aim to mitigate … More stable solvency ratios avoid undue competitive disadvantages for business models based on offering long-term guarantees and, ultimately, increase financial stability.*"
  - Page 2/3: "*Solvency II, unlike the prudential framework for credit institutions, currently has no specific macro-prudential tools to explicitly address the build-up of systemic risks, and there is so far no dedicated common framework for crisis preparedness and resolution for failing insurers, in the interests of policyholders and the public at large. Against this background, the present review aims to … better address the potential build-up of* ***systemic risk*** *in the insurance sector …*"
- Proposed changes to **Own Risk and Solvency Assessment** (ORSA) requirements and to **Prudent Person Principle** / investment decision-making

ORSA proposal

- Add text to Article 45 (“Own risk and solvency assessment”):
  - “*1(d) consideration and analysis of the macroeconomic situation, and possible macroeconomic and financial markets’ developments, and, upon a reasoned request of the supervisory authority, macroprudential concerns, that may affect the specific risk profile, the approved risk tolerance limits, the business strategy, the underwriting activities or the investment decisions, and the overall solvency needs referred to in point (a) of the undertaking;*
  - *1(e) consideration and analysis of the activities of the undertaking that may affect the macroeconomic and financial markets’ developments, and have the potential to turn into sources of systemic risk;*
  - *1(f) the overall capacity of the undertaking to settle its financial obligations towards policyholders and other counterparties when those obligations fall due, even under stressed conditions.*”
- For (d) and (e) add text to ensure “*macroeconomic and financial markets’ developments*” include, at least, changes in:
  - “*the level of interest rates and spreads; the level of financial market indices; inflation; interconnectedness with other financial market participants; climate change, pandemics, other mass-scale events and other catastrophes, which may affect insurance and reinsurance undertakings*”

Prudent Person Principle proposal

- Add text to Article 132 (“Prudent person principle”):
  - “*5. Member States shall ensure that insurance and reinsurance undertakings take account of possible macroeconomic and financial markets’ developments and, at the request of the supervisory authority, macroprudential concerns when they decide on their investment strategy.*
  - *6. Insurance and reinsurance undertakings shall assess the extent to which their investment strategy may affect macroeconomic and financial markets’ developments and have the potential to turn into sources of systemic risk, and incorporate such considerations as part of their investment decisions.*
  - *7. For the purpose of paragraphs 5 and 6 of this Article, macroeconomic developments and macroprudential concerns shall have the same meaning as in Article 45*”

- (Larger) insurers will likely need to pay more attention to systemic risk going forwards

Summary

- **Growth-at-risk** (GaR) provides a conceptually appealing if incomplete paradigm for considering financial stability across the whole financial system
  - Policymakers are seeking to expand the reach of financial stability policy over institutions that actuaries are more familiar with
- Robust practical inclusion of macroprudential concerns within insurers' ORSAs and prudent person principles will be challenging
- GaR a helpful tool, but
  - Financial stability can have characteristics that don't fit the GaR paradigm well
  - Lessons can be drawn from actuaries' involvement with portfolio optimisation
- Viewing **financial stability as a public good** in its own right may help to address some of GaR's limitations

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