The Actuarial Profession
making financial sense of the future

Capital Projections – Evolution or Revolution?
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Life Conference 2011

We can work it out

22 November 2011

Agenda

- What we mean by capital projections

- Why this topic is relevant now

- Insights into market practices

- Techniques for projecting capital and the pros and cons of alternative approaches

- Techniques currently used by life insurers

- Expectations for the future

- How has Legal & General selected their capital projection approach?

- Conclusions

What do we mean by capital projections?

- Valuation gives "time zero" position: assets, liabilities, capital position (capital resources – capital requirements)

- Could be on a regulatory or economic basis

- In this session, we take time zero balance sheet and capital position as given...

- ... and focus on how to project the capital requirements to end of years 1, 2, 3, etc

- In principle, projecting the assets, liabilities and capital resources is more straightforward (maybe not in practice!)

Why is this topic relevant now?

- Solvency I expects 3-5 year projections of capital resources and capital requirements
- Solvency II
  - New definition of capital requirements ("MCR" and "SCR")
  - ORSA projection requirements – may include balance sheet as well as regulatory / economic capital position projections
  - Technical provisions = best estimate liabilities + risk margin
  - Most firms using capital projections for risk margin
  - So capital projections needed for time zero balance sheet!
- Risk management
- Commercial decisions
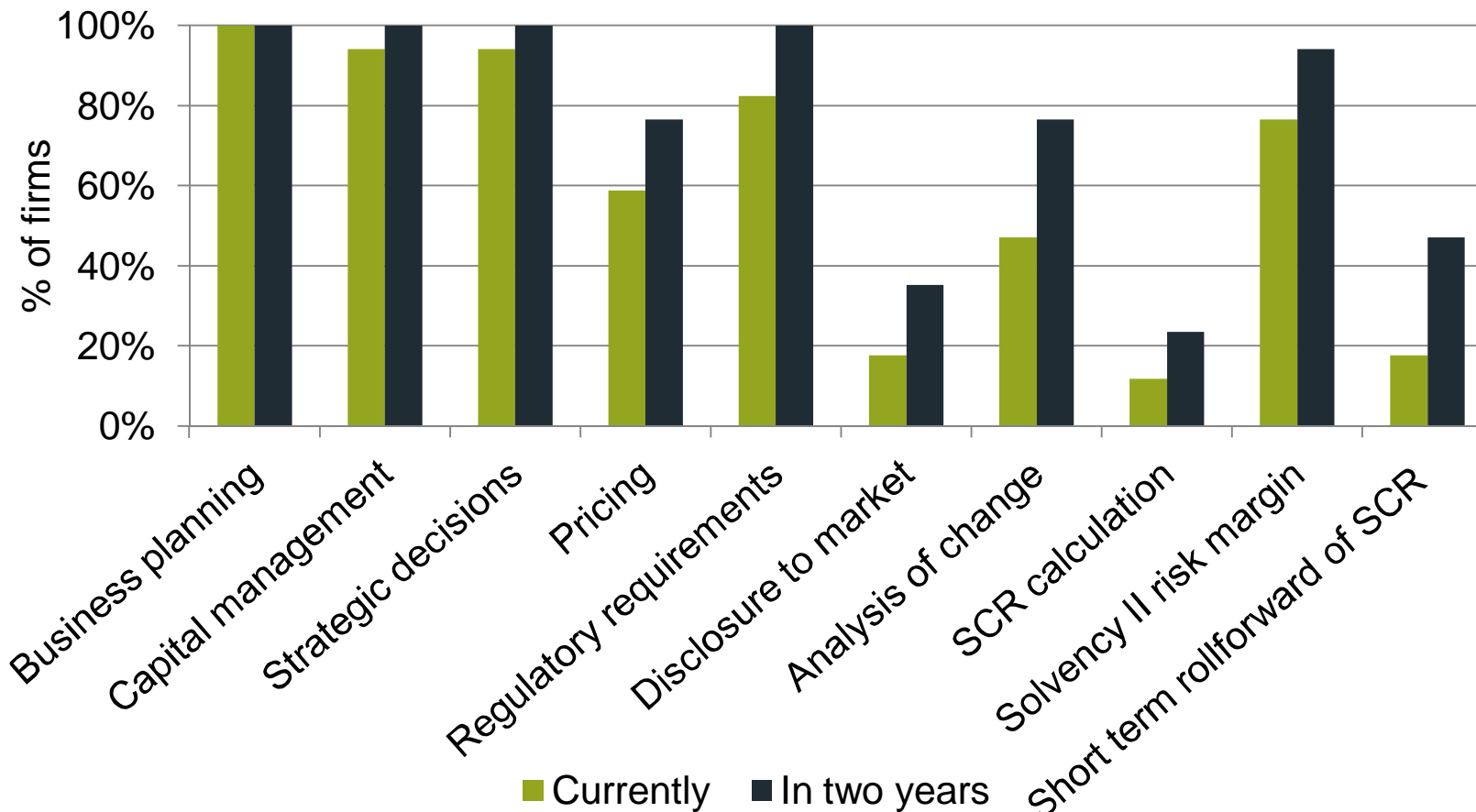- Risk margin for IFRS 4 Phase 2

Insights into market practices

- Deloitte Capital Projections Survey

- 17 survey participants
  - Mainly large
  - All direct writers, no reinsurers
  - Mostly "internal model firms" (i.e. hoping to be!)
  - Mostly open to new business

- Current state of play + expectations for next two years.
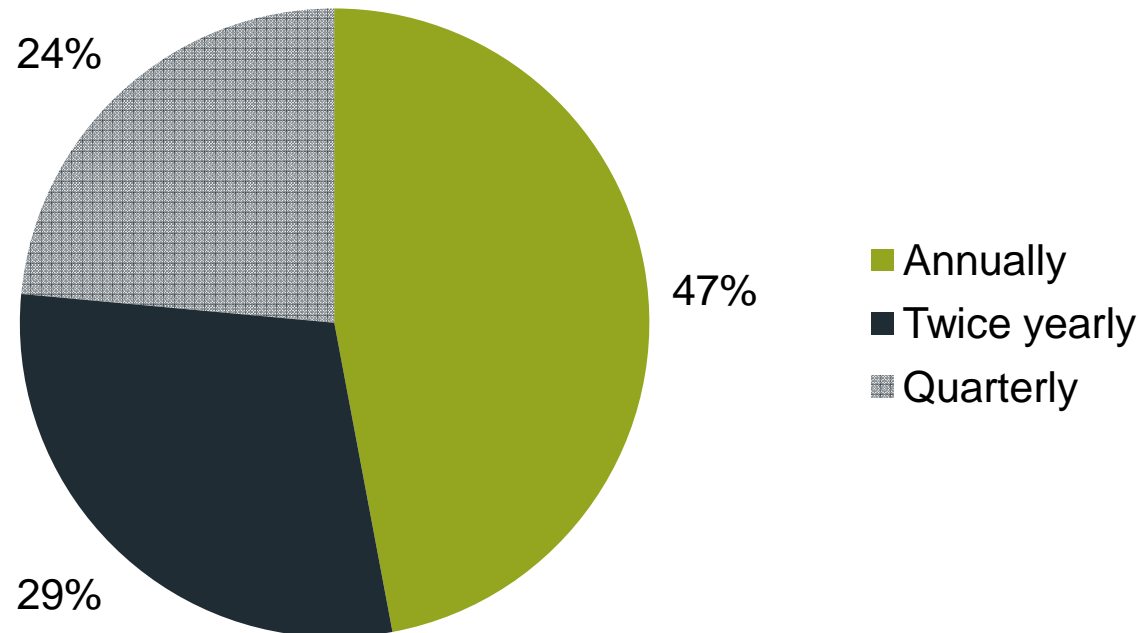
Uses of capital projections

Capital projections are expected to drawn upon more extensively for decision-making within the next 2 years

Capital measures projected
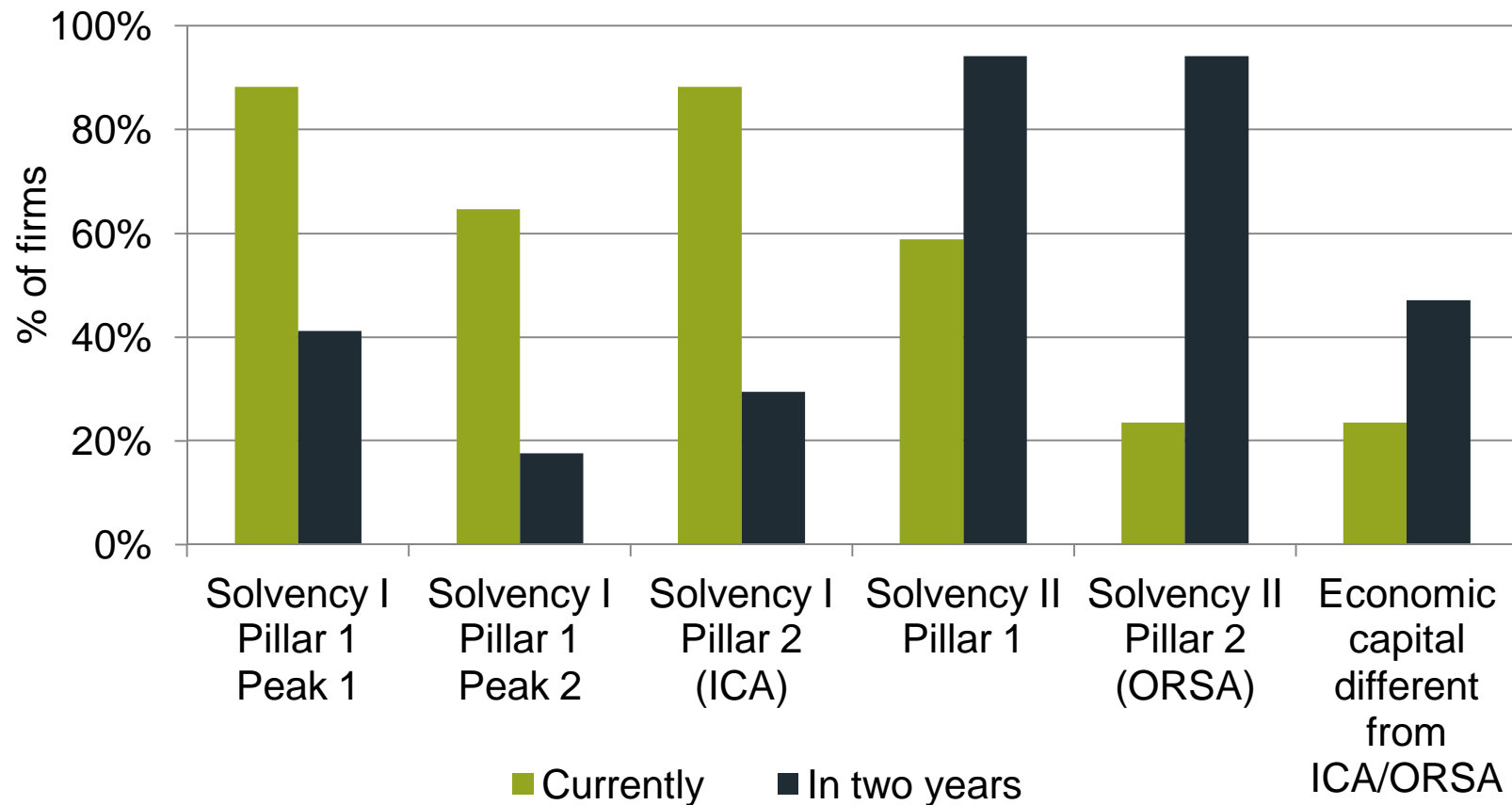
Around 60% are already projecting Solvency II SCR. Strong leadership required to steer the best course given plethora of current metrics

Frequency of capital projections

Legend:
- Annually
- Twice yearly
- Quarterly

Pie chart values:
- 47% (Annually)
- 29% (Twice yearly)
- 24% (Quarterly)

**3 / 8 "annual firms" expect to increase frequency within 2 years**

3 / 5 "twice yearly firms" expect to increase frequency within 2 years

None of the "quarterly firms" plan to increase projection frequency

Number of projection scenarios

6%

12%

24%

59%

- 2 - 4
- 5 - 10
- 10 - 20
- > 20
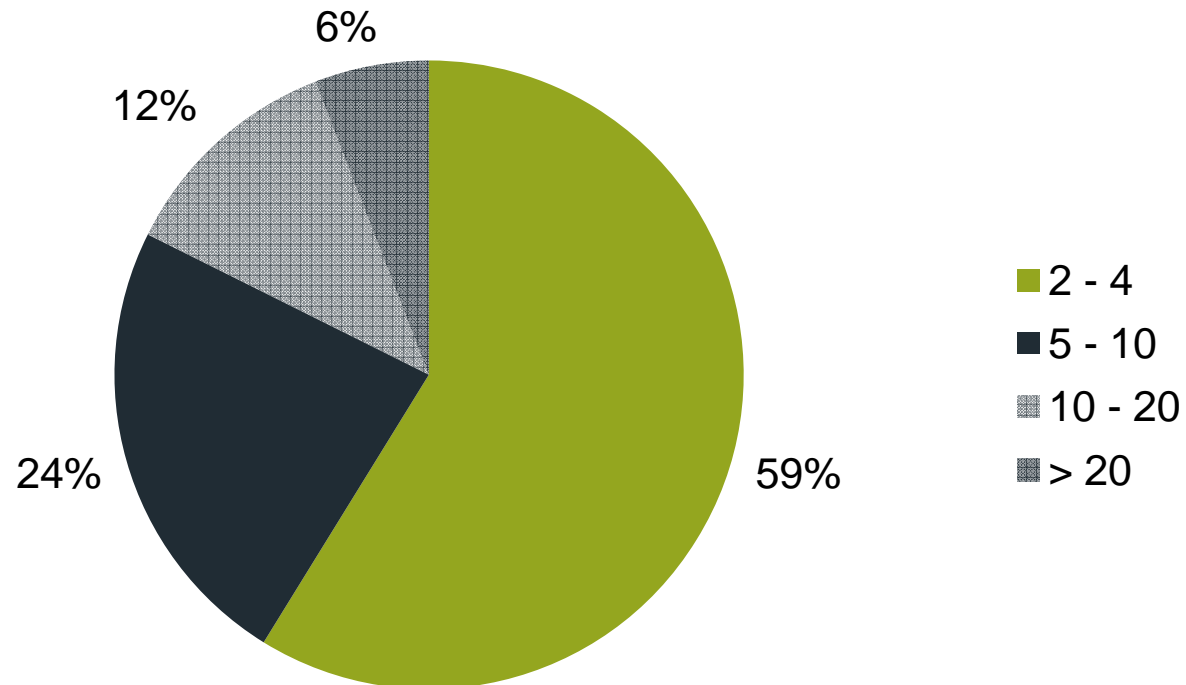
60% of firms using 2-4 scenarios expect to increase the number of scenarios over the next 2 years

Projection horizon

3 years	5 years	10 years	>10 years
29%	53%	12%	6%

% of firms
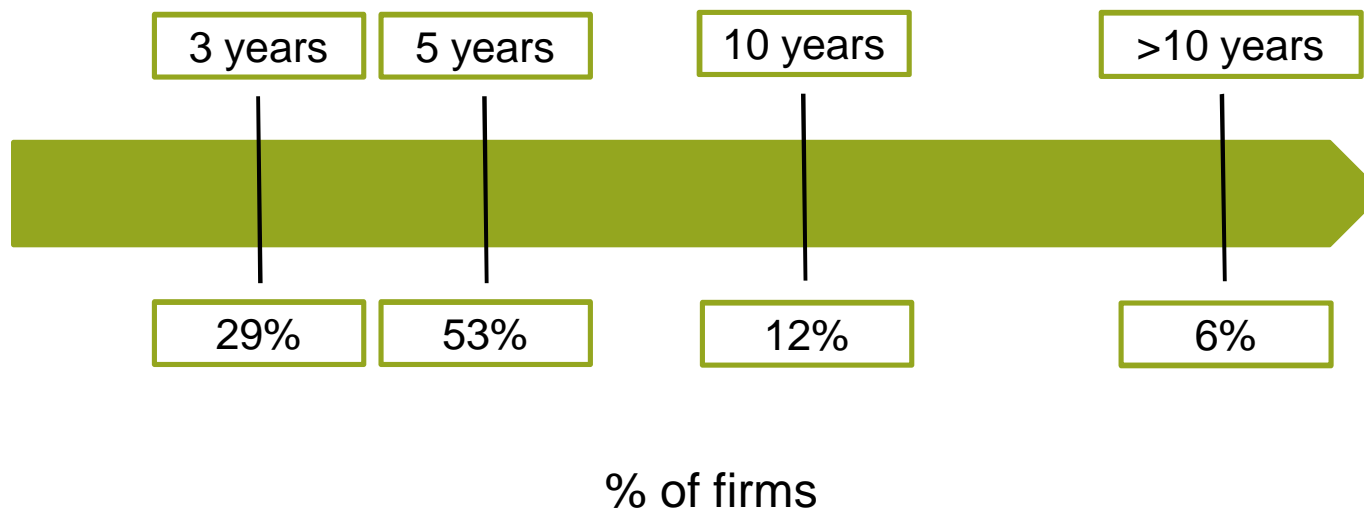
This split isn't expected to change significantly over the next 2 years

Methodologies for capital projections

- Capital projections not specific to Solvency II, but vastly more difficult

- Each of the approaches discussed on the following slides is broadly applicable to both existing capital requirements and Solvency II

- But the expectation is that an approach closer to a "full calculation" can be used for existing capital requirements due to relative lower complexity.

Spectrum of potential methods

Range of possible approaches

Full application of time zero methodology	Driver/carrier approach

QIS5 hierarchy of simplifications

Full calculation	Estimate of future SCR modules/sub-modules	Estimate of future SCRs	Estimate all future SCRs "at once"	% of BEL

Detailed approaches

Project and stress

Driver/carrier approach

Full calculation

Full calculation

- Rerun the time zero calculation fully at projected dates
- Complexity depends on what the capital calculation is:
    - Solvency 1 – Peak 1 is OK, Peak 2 and ICA harder
    - Solvency II SF more complicated, but achievable?
    - For IM firms may be Monte Carlo input copula
- Full rerun of IM at future points would involve projecting all inputs, potentially refitting formula/replicating portfolios, resimulating and reaggregating (although could fit a formula/portfolio that holds over time)
- Do you recalibrate scenarios at future time points – how conditional is the model?

Project and stress

- Project future balance sheets and stress them!

- Single stress based on time zero 99.5th percentile (and potentially the 0.5th)

- What granularity to use – can vary anywhere between

  – Single scenario at total level – "biting scenario"

  – Projections by risk and / or product

- More granularity increases the stability of the scenario over time, but increases the processing required, and introduces the need for aggregation.

Driver approach

- Derive a relationship between time zero and future capital

- Need appropriate driver(s)!

- Differences by product

- Same granularity questions as for single stress approach

- If a fine level of granularity is used, can mix and match between driver approach and stress approach.
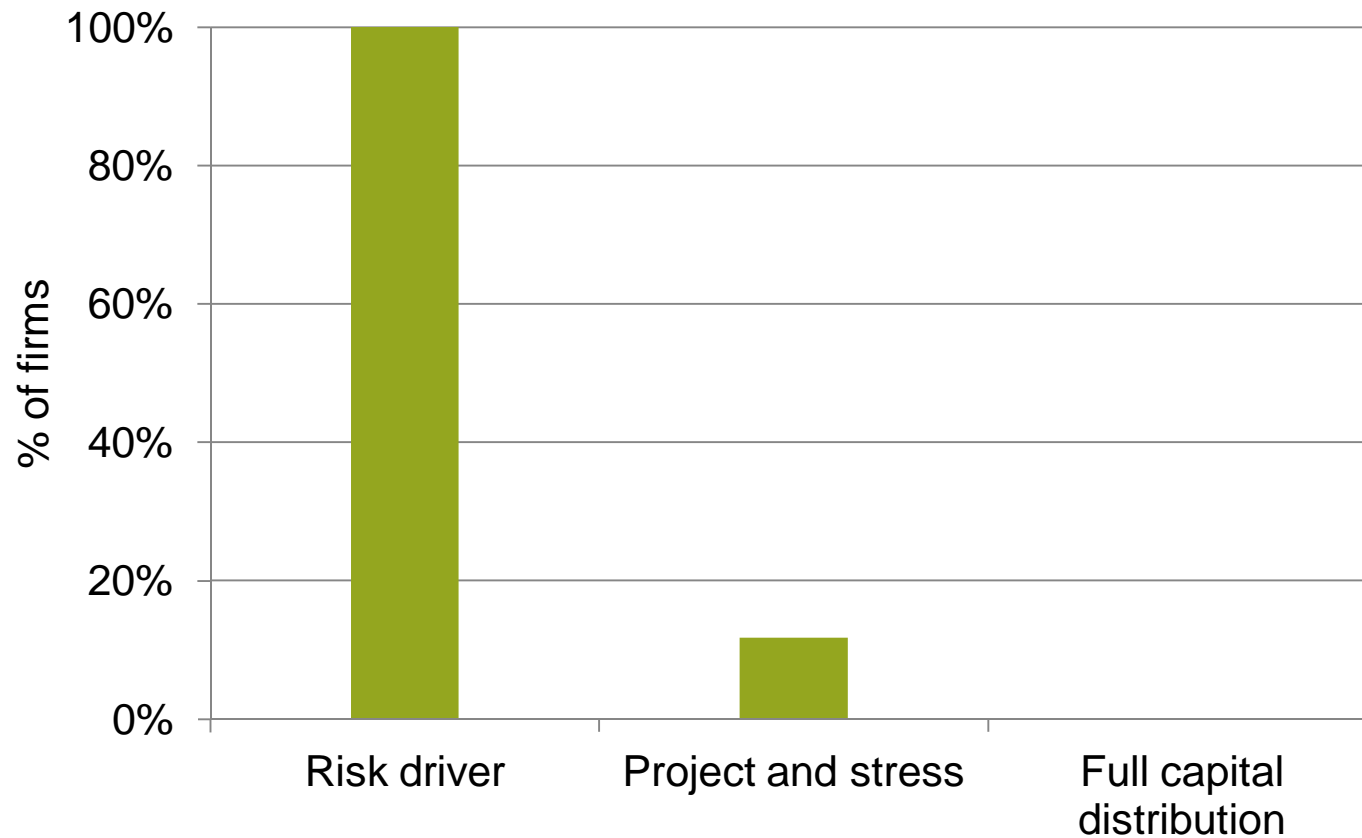
Pros and cons

- Accuracy vs practicality

- Data requirements

- Systems / technology requirements

- Run times

- Development effort

- Centralised vs decentralised process

- Onerousness for certain types of business

- Validation.

Methods – risk margin for time 0 balance sheet

For QIS5, most firms surveyed implemented a risk driver approach.

Will this picture change as SCR projection capabilities develop?

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Methods – SCR / economic capital projections
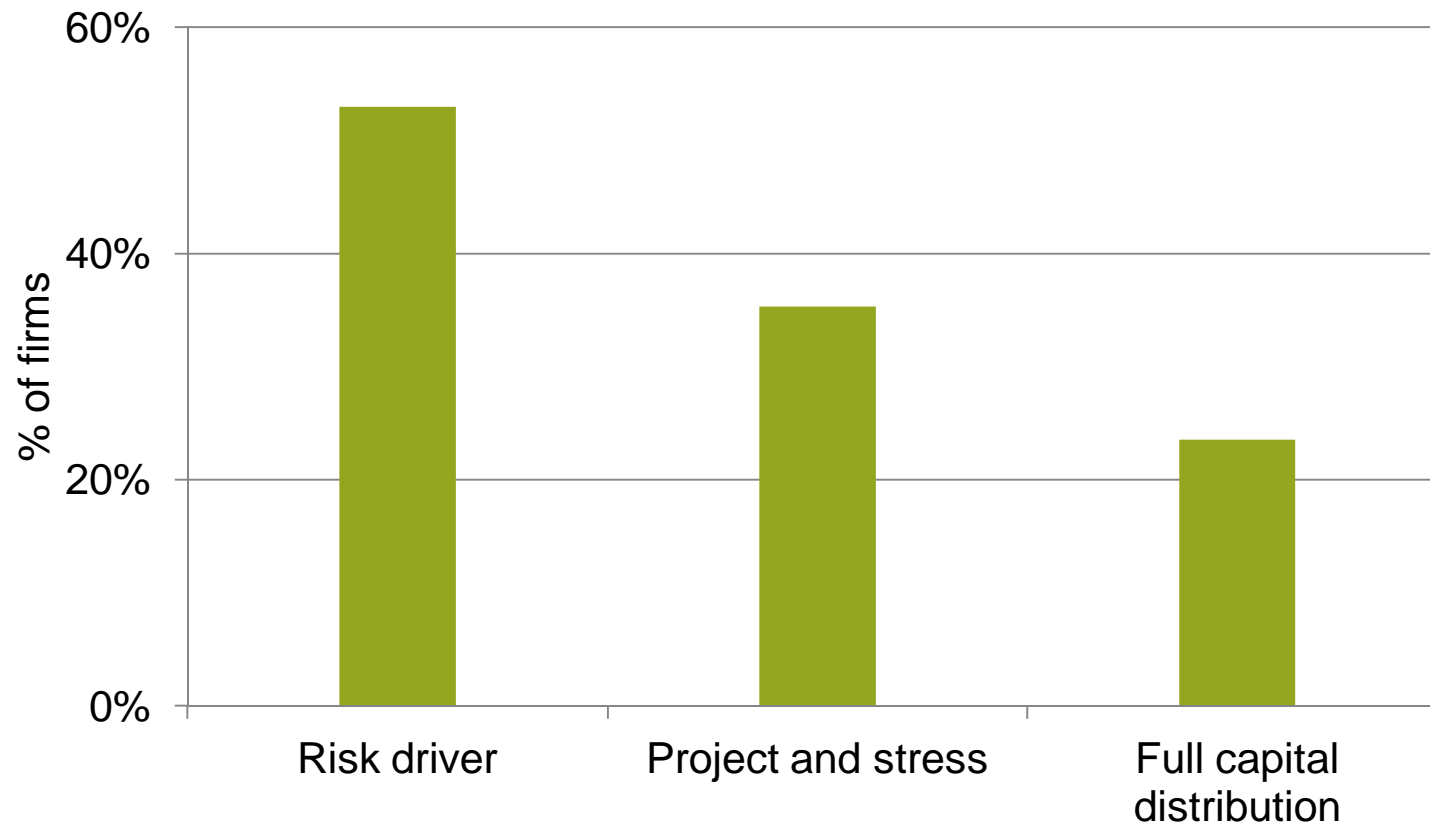
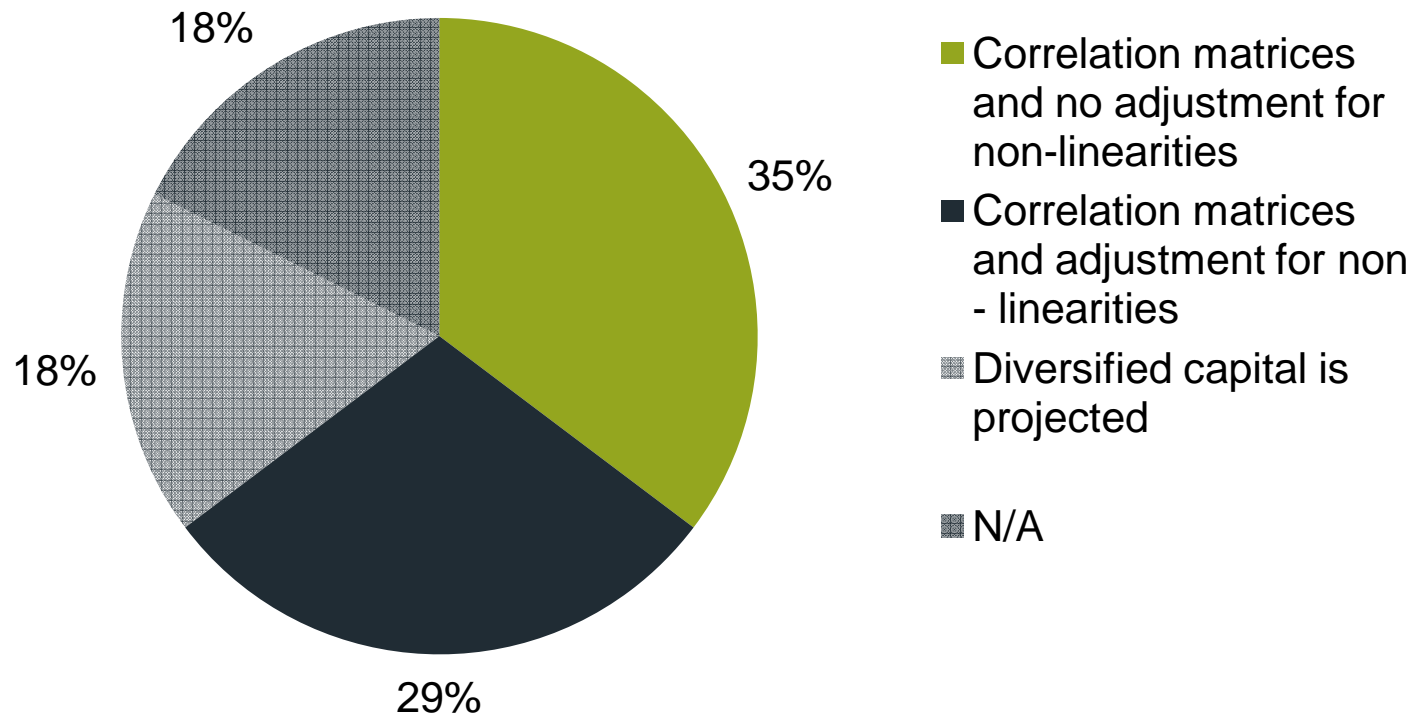More variation in approach, or intentions, for full SCR. Various approaches feasible with shorter time horizon

Granularity – SCR / economic capital projections
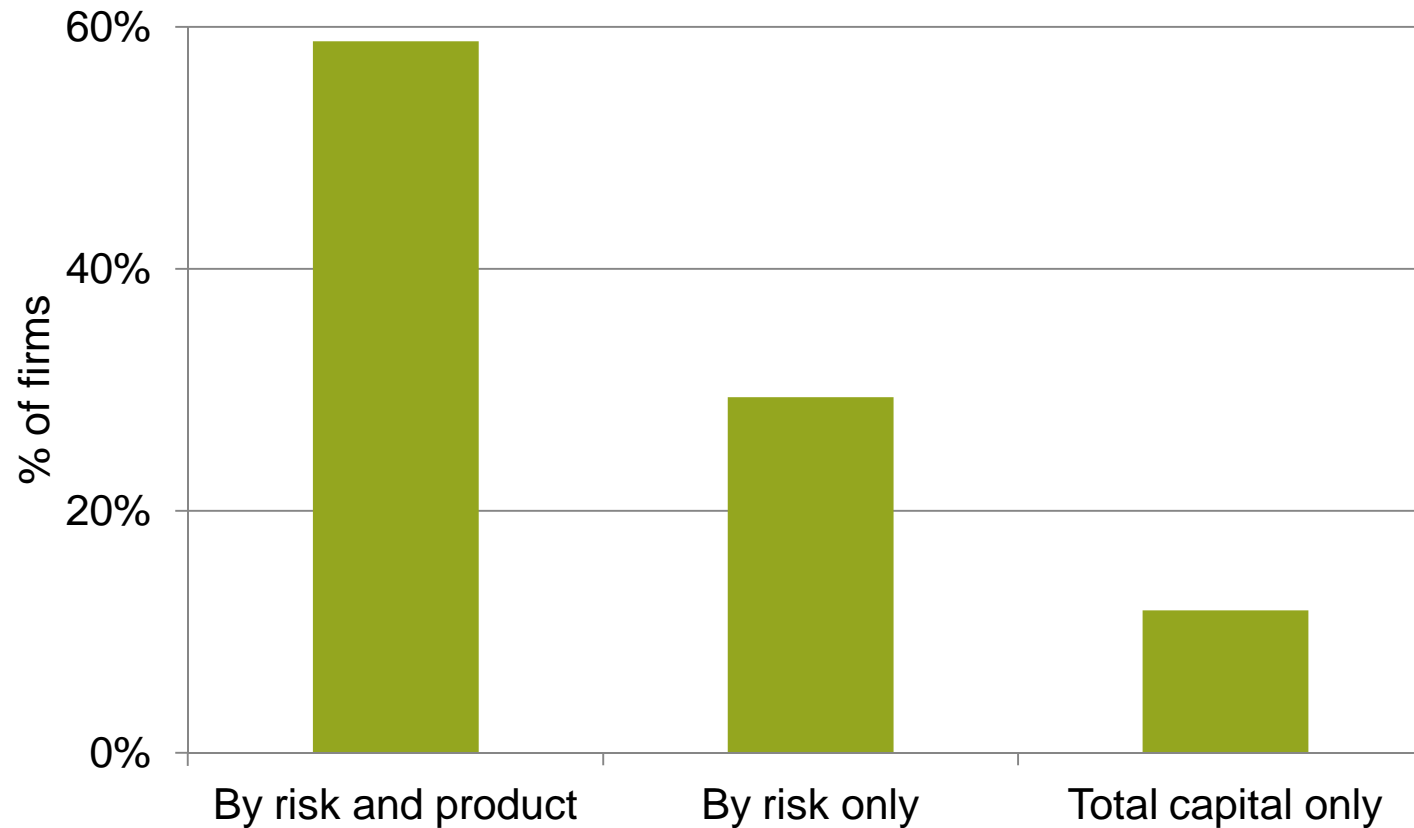
Almost 60% of firms surveyed are projecting, or intending to project, SCR and economic capital by risk and product

Aggregation – projected SCR / economic capital

Methods used to aggregate capital

18%

35%

18%

29%

- Correlation matrices and no adjustment for non-linearities
- Correlation matrices and adjustment for non - linearities
- Diversified capital is projected
- N/A

Most companies surveyed intend to use a correlation matrix approach – some also making allowance for non-linearities in projected capital

L&G Solvency II projections - background

- Strong existing platforms for projecting assets and liabilities
- Capital is the missing bit
- Time zero capital approach is a Monte Carlo input copula with
  - c. 150 risk drivers
  - grouped into c. 20 "risk families" (examples of risk families would be equity risk, interest rate risk, longevity risk etc.)
- Lots of product groups!

L&G choice of method

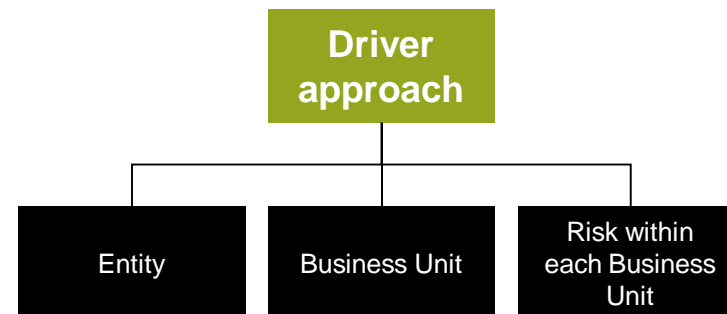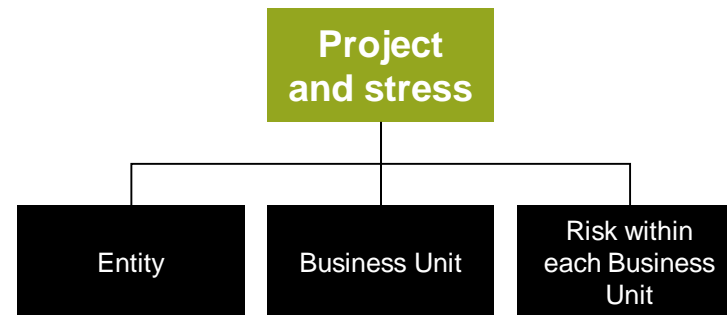- Proof of concept to compare approaches
- Capital projection approaches considered

    a) Full capital distribution

    b) Project and stress

    c) Driver approach

- Also consider level of granularity and aggregation issues
- SCR vs Risk margin.
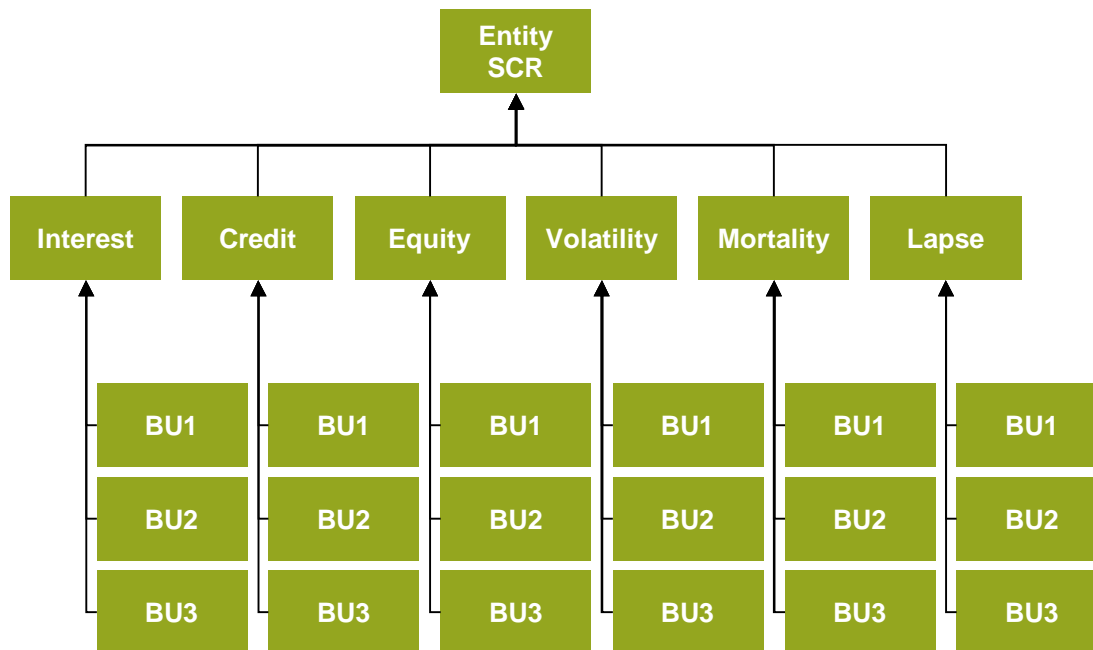
Potential methods - granularity


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                    ┌───────────────┐
                    │   Project     │
                    │  and stress   │
                    └───────┬───────┘
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    ┌──────────┐     ┌──────────────┐   ┌──────────────┐
    │  Entity  │     │Business Unit │   │ Risk within  │
    │          │     │              │   │each Business │
    │          │     │              │   │     Unit     │
    └──────────┘     └──────────────┘   └──────────────┘


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                    │    Driver     │
                    │   approach    │
                    └───────┬───────┘
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    │  Entity  │     │Business Unit │   │ Risk within  │
    │          │     │              │   │each Business │
    │          │     │              │   │     Unit     │
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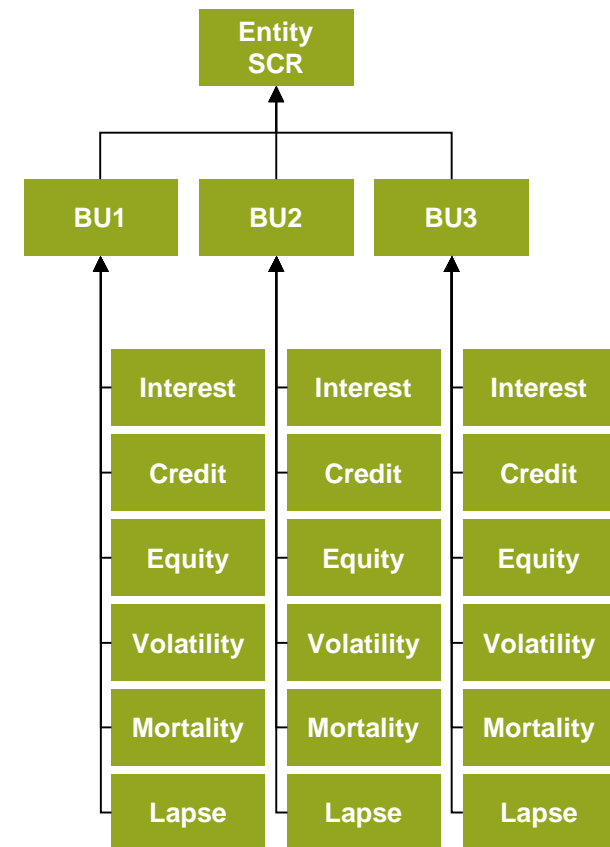
Potential methods - aggregation

Method 1 – aggregate BU then risk

Method 2 – aggregate risks then BU
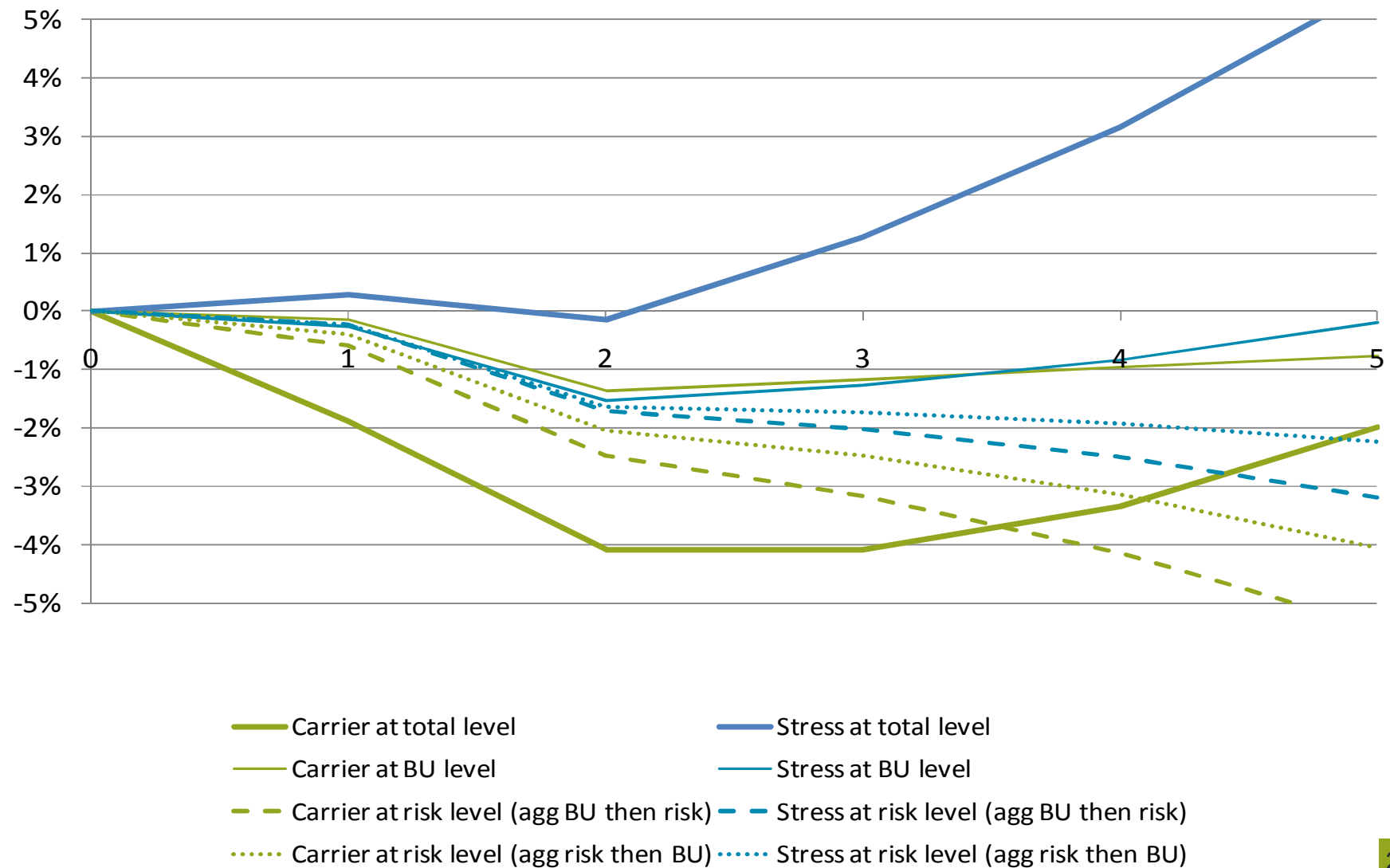
Proof of concept

- Very simple model office – three products
  - BU1 – term assurance
  - BU2 – annuity
  - BU3 – UL savings with maturity guarantee
- Not chosen to reflect L&G but to illustrate some key features:
  - Offsetting risk exposures
  - Differing degrees of hedgeable risks
  - Different outstanding terms
- Granular results combined using an output correlation matrix based on time zero results, with scaling to reproduce time zero results.

PoC results – non-hedgeable SCR
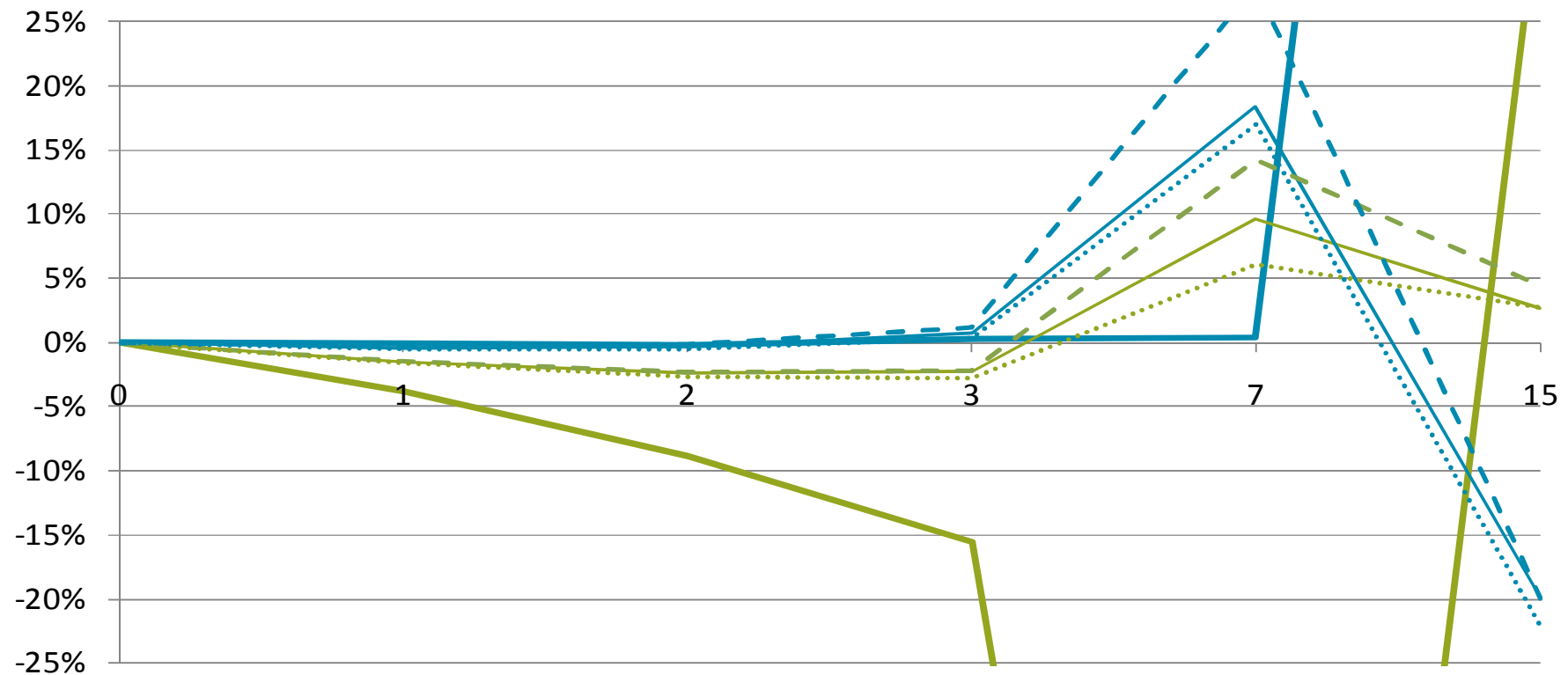
Legend:
- Carrier at total level
- Carrier at BU level
- Carrier at risk level (agg BU then risk)
- Carrier at risk level (agg risk then BU)
- Stress at total level
- Stress at BU level
- Stress at risk level (agg BU then risk)
- Stress at risk level (agg risk then BU)

PoC results – SCR

Legend:
- Carrier at total level
- Carrier at BU level
- Carrier at risk level (agg BU then risk)
- Carrier at risk level (agg risk then BU)
- Stress at total level
- Stress at BU level
- Stress at risk level (agg BU then risk)
- Stress at risk level (agg risk then BU)

Conclusions of proof of concept

- Entity level approach relatively stable, especially over short term if the business mix is stable

- But moving to finer granularity improves the stability

- Decision to use a risk & BU split and aggregate using method 1 (aggregate BUs first, then risks)

- Choice of method to project BU/risk level SCR delegated to BUs – neither method clearly superior
  - In practice BUs have chosen a mix of methods.

Evolution or revolution?

- Assets and liabilities projections under Solvency II are a simple extension of current capabilities

- However, to do the SCR "accurately" is far beyond current capabilities (and is unlikely to be feasible for many years) – new tools, processes and techniques have been developed to allow us to do this.

76% of capital projections survey respondents expected to significantly change their capital projections approach or process over the next 2 years

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Questions or comments?

Expressions of individual views by members of The Actuarial Profession and its staff are encouraged.

The views expressed in this presentation are those of the presenters.