Lloyd's Market Working Group Update

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Institute and Faculty of Actuaries

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1

Content Page

1. Introduction

2. Market Risk

3. Model Change

4. Dependencies

5. Questions and Answers

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Introduction

- Three working groups were set up after the 2019 SCR review season to investigate the following areas:

  – Market risk

    • To assess and agree the appropriateness, or otherwise, of a negative market risk contribution to capital and clarify the treatment and requirements related to this in the 2020 SCR guidance, including discussions on the causes and their plausibility

  – Model changes

    • To clarify the requirements for agents and aim to alleviate pressures on the market and/or Lloyd's review (enabling faster turnaround of applications)

  – Dependencies

    • Reviewing tests on diversification to establish a minimum level of dependency required by Lloyd's (mainly between risk types) and establishing the (dis) advantages of different tests

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3

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Market Risk

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Background

- Across the market there are syndicate models with an overall negative contribution to capital from market risk – i.e. capital would be higher without consideration of market risk
  - This contravenes the high level principle that the addition of risk should be additive to capital.

- During the 2019 SCR reviews, many syndicates received a capital (one year and ultimate) load
  - The load magnitude was equal to the negative contribution to capital from market risk

- The working group aim:
  - To understand the cause of the negative contribution and assess appropriateness of this, to conclude what would be acceptable for 2020 SCR and update guidance accordingly

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Agenda

The following areas were investigated to establish source of the negative post-diversified contribution
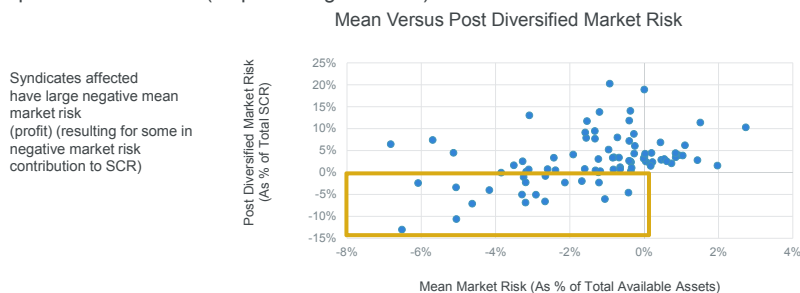
#	Point Investigated
1	Discounting using ESG risk free yield curve instead of EIOPA curve in Internal Model
2	Mean asset returns
3	Impact of discounting
4	Mean FX
5	Investment Return on FIS/FAL
6	Insurance risk vs market risk correlations

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Mean asset returns
Main driver of negative contributions

- Issue: Assets are making a return (i.e. a profit at the mean) – and since market risk is modelled fairly independently from other capital drivers in many cases market risk is sometimes also a profit at the tail – in particular if a syndicate holds a fairly risk-free portfolio.

- Investigation: Graph shows the mean market risk (as percentage of an approximation of total available assets) versus the post diversified risk (as percentage of SCR)

Mean Versus Post Diversified Market Risk

Syndicates affected
have large negative mean
market risk
(profit) (resulting for some in
negative market risk
contribution to SCR)

Post Diversified Market Risk (As % of Total SCR)

Mean Market Risk (As % of Total Available Assets)

- More likely to have negative post diversified market risk as mean market risk becomes more negative i.e. mean asset returns are more profitable

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Mean asset returns

Conclusion:

- Mean asset returns main driver for negative contribution – Working group will recommend that this should be allowed

- There are a lot of potentially plausible reasons for this though – Lloyd's will publish a template for syndicates with questions to fill in, to address some of the other points the market risk working group has discussed and which are NOT allowable

- Lloyd's will require syndicates with a negative market risk contribution to provide their mean asset return as a proportion of available assets split by asset class

- Lloyd's expects a negative contribution from market risk to trigger syndicate validation to review asset mean returns and underlying assumptions.

  - What level of asset return is reasonable by class?

  - Time horizon of market risk?

  - Is the asset portfolio run off in line with TPs?

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Impact of discounting
Unwind of discount

Unwind of Discounting Benefit = Closing discount benefit less opening discount benefit

$$= (U_t - U_t.DF_t) - (U_o - U_o.DF_o)$$

On an ultimate basis, $U_t = U_\square = 0$, and so the equation becomes $- (U_o - U_o.DF_o)$ and

this is known in advance and deterministic, as per SCR Guidance 2017 YoA p41:

> *"The risk free rate to be used on an ultimate basis is fixed at T0; there is no risk associated with changes in the risk free rate on an ultimate basis."*

On one year basis, $U_t = U_1$ and so the equation is

$$= (U_1 - U_1.DF_1) - (U_0 - U_0.DF_0)$$

- In practice, this will be a deterministic loss on the ultimate basis of the opening discount benefit
- On a one year basis, its not as simple

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Impact of discounting
Unwind of discount

- Issue:
  - Are syndicates allocating this to market risk, with insurance risk modelling undiscounted liabilities? If discounting is a profit on market risk then this should be allowed?
- Investigation:
  - Lloyd's collected a version of form 314 from working group participants splitting interest rate risk on assets and liabilities to see the impact of discounting separately
  - This showed that impact of discounting on an ultimate basis is to generate a loss equal to the value of the opening discount asset. There in no uncertainty associated with this. Therefore, this will only act to increase market risk by this fixed amount→ **on ultimate basis discounting NOT the reason for negative contributions to capital.**

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Impact of discounting
Unwind of discount

- On a one year basis (assuming no capping). If in a steady state scenario (i.e. volumes constant for a number of years) and yield curves stay the same, then there will be zero profit/loss relating to discounting. However, in an adverse scenario (1 in 200), the closing reserves will have deteriorated and therefore give a larger closing discount benefit and so this generates a profit. This will act to reduce market risk

- The impact of this is reduced if capping is applied though. A finding was that not all syndicate models appear to apply capping

- Conclusion

  - Unwind of discount benefit not a cause of negative contribution to capital on an ultimate basis but can be on a one year basis → Lloyd's will allow this on a one year basis

  - Syndicates who approximate ultimate market risk using a one year model need to make sure their closing discount benefit is zero

  - LCR Form 314 will be split into interest rate volatility on assets and liabilities

  - Ensure capping is applied in syndicate models

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Insurance risk vs market risk correlations

- Issue:

  - Syndicates level of dependency between insurance risk and market risk ranges from implicit dependency (via ESG) to including explicit dependency structures

  - Weak dependency between these risk types makes it more likely that profitable market risk scenarios contribute to capital

- Investigation:

  - Lloyd's is investigating this dependency in detail for its own internal model

  - The working group is also testing the impact of this dependency in a simple Excel template

- Conclusion: Syndicates should justify their assumptions – in particular if they have a negative market risk contribution to capital and/or substantial exposure in the FinPro classes, as these are the most obvious contender on the insurance risk side for a dependency.

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Other issues
Issues discussed that make market risk more profitable – but are disallowed if material

- FX Risk – some syndicates have a profit for FX risk at the mean. Syndicates should not expect to make profit/loss from FX movements

  - → Lloyd's expects syndicates to adjust capital if this material (however, ESGs don't have to be adjusted)

- Use of inconsistent discount rates in the TPs and the model could lead to a "risk-free lunch" – i.e. a profit on market risk. Technical provisions have to be discounted at EIOPA rates (SII guidance), often ESG risk-free rates are used in models

  - → Lloyd's will keep allowing this practice, syndicate model has to be consistent within itself and impact should be tested by validator (and model adjusted for if material)

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Summary

The following areas were investigated to establish source of the negative post-diversified contribution

#	Point Investigated	Conclusion
1	Discounting using ESG risk free yield curve instead of EIOPA curve in Internal Model	Switching to an EIOPA curve has varying impact on syndicates. Syndicates should test the materiality of this regularly.
2	Mean asset returns	The post-diversified contributions for some syndicates are driven by high mean asset returns. Syndicate validation should review underlying assumptions.
3	Impact of discounting	The running off of the opening discount benefit is a loss to the ultimate SCR. Discounting credit does reduce risk on a one-year SCR and this should be taken into account in the loadings.
4	Mean FX	FX risk is currently not a key driver of the negative contributions. Syndicates should self load if material
5	Investment Return on FIS/FAL	One year shows a greater negative market risk than ultimate, partially driven by models with no capping on investment return on FAL/FIS – clarify guidance to implement capping on both bases.
6	Insurance risk vs market risk correlations	Likely to be a driver of the negative contribution to capital. Syndicates should test dependence and validate their choice.

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Model Change Working Group

Cameron Beveridge

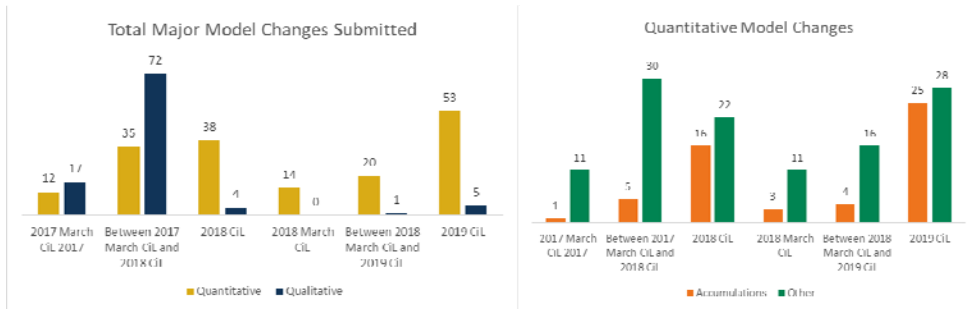Institute and Faculty of Actuaries

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Purpose of Model Change Working Group

- Discuss areas of the guidance which would benefit from clarification or would act to alleviate time pressures on the market or Lloyd's review (enabling faster turnaround of applications)

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16

Background

- Why did we decide to set up a Model Change Working Group?
  - Number of years of model change submissions
  - Experience with review of a number of submissions of varying quality
  - Increasing number of submissions coinciding with CiL reviews

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Topics covered in MCWG

- Categorisation of model changes

- Batching

- Application timings

- Quality of submissions / standard expected by Lloyd's

- Thresholds

- Model Change Template

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Categorisation

- Quantitative / Qualitative
  - Can now be either or both
  - Any change with potential for capital change, must be at least quantitative
- New Change Type – 'Non-functional'
  - Where a change is expected to have no change to capital, but does change due to simulation error, can be excluded from accumulation towards Major change thresholds
  - Should be able to provide suitable evidence to support this
- Data vs Risk Profile (vs Parameter)
  - More involved topic of discussion, covered in next slides

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Categorisation – Data vs Risk Profile

- Several options considered, particularly in how changes should accumulate for the purposes of determining whether a Major change threshold has been exceeded, triggering a Major Model Change
- **1**. Keep categorisation as is, but take data changes out of scope. Clarify difference between data and risk profile change by setting clear quantitative/qualitative criteria.
- **2**. Keep categorisation as is, but take data and risk profile changes out of scope of model change policies, review data/risk profile changes as part of capital submissions only.
- **3.** Drop distinction between risk profile and data changes. Take them INTO scope but increase thresholds for aggregation (e.g. major change as aggregation of minor changes can be 40% in terms of absolute change).
- **4**. Drop distinction between risk profile and data changes. Take them INTO scope but aggregate them separately from methodology/parameterisation changes with different trigger.
- **5.** As per 3, but aggregate changes in capital/exposure measure instead of capital only for this type.
- **Option selected: 1**

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Categorisation – Data vs Risk Profile (vs Parameter)

- What could be considered a 'data' change and what could be considered 'risk profile' change?
- Current guidance (risk profile):
  – "significant changes to the nature, scale and complexity of the risk profile of the syndicate"
  – "includes material changes in the business model, business strategy, products and lines of business, emerging risks and any other relevant changes to the risk profile"
  – "significance should be justified on a quantitative and qualitative basis (i.e. using indicators specified in the policy)"
- New guidance:
- As discussed on previous slide, data will be out of scope, but risk profile will be in scope
- Guidance will give examples where possible on what can be considered 'data', e.g.
  – New business plan
  – Change in asset mix
- But, also require that such changes could be defined as a risk profile change, e.g. should the change breach a pre-determined risk:exposure ratio
  – Examples to be provided in guidance, these will largely be similar to those used in Lloyd's AoC

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Categorisation – Data vs Parameter

- Any input that has required some level of judgement to determine its value, is arguably a parameter
- Lloyd's will try to be more prescriptive in new guidance, but noting this is a difficult area to be fully prescriptive
- In all cases, agents should be able to reasonably justify categorisation of a change
  – E.g. New business plans, changes in premium volumes, RI programme etc. could be considered Data in most cases
  – E.g. Update to reserving volumes can be considered Data
  – E.g. Update to reserving CoVs, due to additional year of data, may be difficult to justify this as a Data change
- Implications with batching

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Batching

- Current guidance does cover this (batching of parameter changes)
- Yet quality of submissions varied. E.g.

Model Change No.	Description of Change	Impact on uSCR	Impact on 1-yr SCR
1	2019 SCR calculation	£20m	£15m

- This change may have included:
- CoV changes
- ESG update
- New SBF
- Emergence factor updates
- Etc.

- New guidance
- Will reiterate similar themes to current guidance
- 'Related' changes can be batched
- Will give examples of what will <u>not</u> be accepted, and <u>can</u> be accepted (non-exhaustive)
- Initial triage

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Application timings

- Current guidance
- Dedicated resource during 3 windows in the year: March LCR submission, June to August, September LCR submission.
- Mid-year, application turnaround 6 weeks from submission (in 2019 SCR guidance).
- New guidance
- Lloyd's to engage with agents in Q2 regarding model development plans
- Initial assessment of completeness, 2 weeks from submission.
- Similar windows for MMCA submission, except mid-year prior to 1 July. However, mid-year submission for methodology / model design changes, that do not need to be submitted with March/September LCRs
- Mid-year, target 8 week turnaround

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Quality of submissions

- Current guidance
- Examples on what should be submitted with any MMCA
- Yet, large variation in quality
- New guidance
- Prescriptive minimum list of items to submit
    - Application form and Model Change Template
    - Supporting validation report
    - Supporting documentation describing change, including an analysis of change (1-yr and uSCR)
    - Information presented to Board
    - Board minutes evidencing discussion, challenge and sign-off (can follow shortly after application)
    - Also, suggested to submit "relevant" LCR forms and SuppQ quantitative tabs

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Thresholds for MMC trigger

- Same requirement to have 4 thresholds
- 2 for ultimate SCR, 2 for 1-year SCR
- 2 for aggregate changes, 2 for absolute accumulation
- New guidance
- Absolute triggers "expected to be no more than double the aggregate trigger points"
- Triggers cannot apply separately by risk category – everything needs to be accumulated together

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Model Change Template

- <u>Minimal changes made</u>:
- Addition of stand-alone risk category impacts (ultimate and 1-yr)
- Rationale for change and Description for change – separate columns

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Current status

- Draft guidance – parts have been circulated through MCWG
- Expected guidance to be issued in July 2019
  - Changes in guidance only effective after October 2019
  - However, clarifications (e.g. minimum requirements on what documents should be submitted with the model change application, batching) apply immediately

- <u>Finally</u>
- Only two half-yearly submissions of Model Change Template now required (September and March)
  - Unless MMC also submitted throughout the year

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Measuring Dependency

Alan Westrip

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Introduction

- Lloyd's needs to approve capital for over 100 syndicates

- The level of diversification/correlation/dependency included in capital model is a key driver of capital

- Syndicates use a variety of methods to introduce dependency within their models – copulas, tail drivers, economic scenario generators etc

- Syndicates also use different hierarchies to establish dependencies – between classes of business, years of account, different claims types and different risk types

- Although a qualitive assessment can be made about whether the structure is appropriate or not it is difficult using a bottom up approach to assess whether the end result is appropriate

- Therefore need clear, objective measures of what level of dependency exists within the output of capital models.

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Current Metrics

- Joint exceedance probabilities

  - "probability both distributions exceed a given percentile in the joint distribution"

  - Example output for insurance risk

	50th	75th	90th	95th	99.5th
Insurance risk - Joint exceedance probability prem/reserving risk	29.9%	8.7%	1.5%	0.27%	0.006%
Independence	25%	6.3%	1.0%	0.25%	0.0025%
Multiple of independence	1.19	1.39	1.46	1.07	2.40
No of sims in "bucket" for independence (50,000 sims)	12,500	3,125	500	125	1.25

  - Does not measure contribution to insurance risk, unstable

- SST "Square root of the sum of squares"

	Premium Risk	Reserve Risk	SST	Modelled
99.5th stress	125	90	154	175

  - Not statistically robust for skew distributions – not clear by how much the SST may be distorted across market

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Aim of the working group on diversification

"Assess and agree the most suitable test(s) to be applied to measure the level of diversification credit in the capital figures submitted to Lloyd's. Test(s) will be applied to capital submissions for the 2020 SCR"

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Back to the drawing board – what criteria should a test/measure meet?

Criteria	Explanation
Clear base line	Does the metric provide a clear base line for independence *and ideally* a minimum level we would expect to see?
Measures capital contribution	Does the test ensure that each risk type provides a positive capital (using SII definition)?
Stability	How much simulation error is present within an individual run?
Flexibility	Can test can be applied to different models and different levels of granularity?
Simplicity	Is it simple to explain and to calculate from most models?

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Metrics suggested and tested by working group

The metrics below were assessed against these criteria:

- Sum of Squares Test *– current Lloyd's metric used*
- "Scrambled sims" *– captured to create base line*
- Average Percentile Contribution
- Banded ACEP (Average conditional exceedance percentile)
- JEP's – *current Lloyd's metric used*
- Banded JEPs (Joint Exceedance probability).

Information collected for insurance risk (premium and reserving)

- Multiple Seeds to assess stability
- As modelled and "scrambled" to assess true independence.
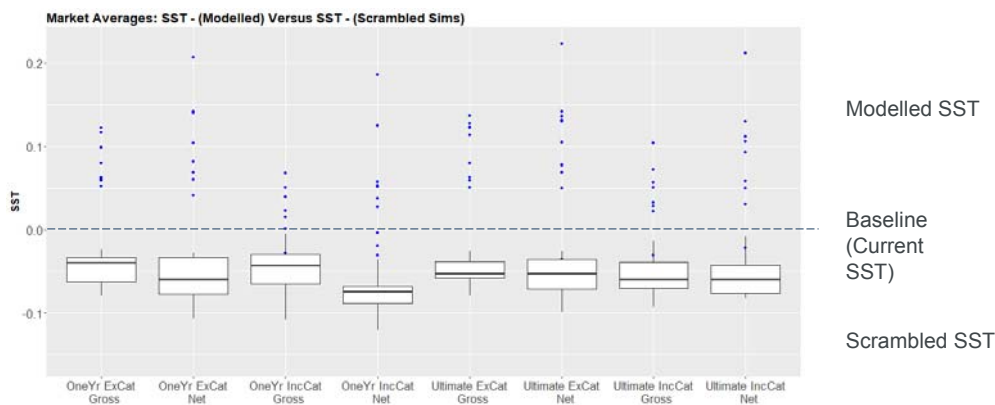- We have included output that appears reliable for each test.

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Tests vs criteria

Test/Criteria	Clear Baseline	Measures capital contribution	Stability	Flexibility	Simplicity	Information collected (insurance risk)
Sum of Squares Test	✔	✔	✔	✔	✔	✔
Sum of Squares Test (with Scrambled Sims)	✔	?	✔	✔	✔	✔
Average Percentile Contribution	✘	✔	✔	✔	✔	✔
Banded ACEP	✔	✘	✘	✘	✔	✔
JEP	✔	✘	✘	✔	✔	✘
Banded JEP	✔	✘	✘	✔	✔	✔

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Sum of squares test – market results

Market Averages: SST - (Modelled) Versus SST - (Scrambled Sims)

Modelled SST
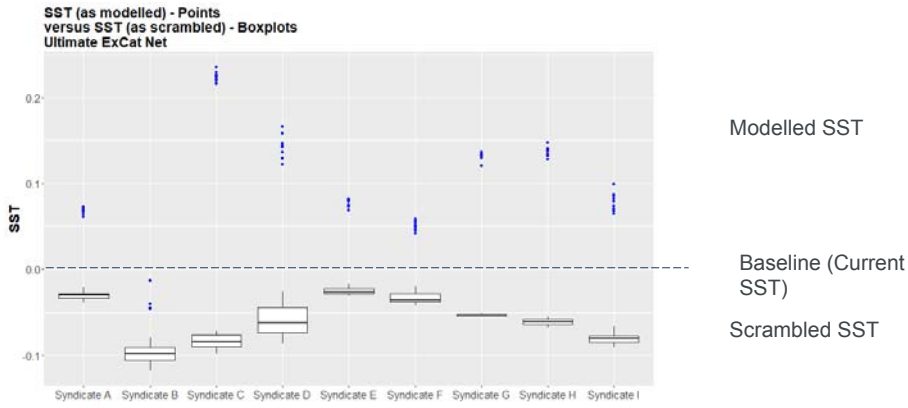
Baseline (Current SST)

Scrambled SST

- **Blue points** = modelled SST observations by syndicate (averaged across seeds)
- **Box and whisker** = Market "scrambled" SST observations by syndicate (averaged across seeds)

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Sum of squares test – syndicate results
Ultimate Net Ex Cat by Syndicate

**SST (as modelled) - Points
versus SST (as scrambled) - Boxplots
Ultimate ExCat Net**

Modelled SST

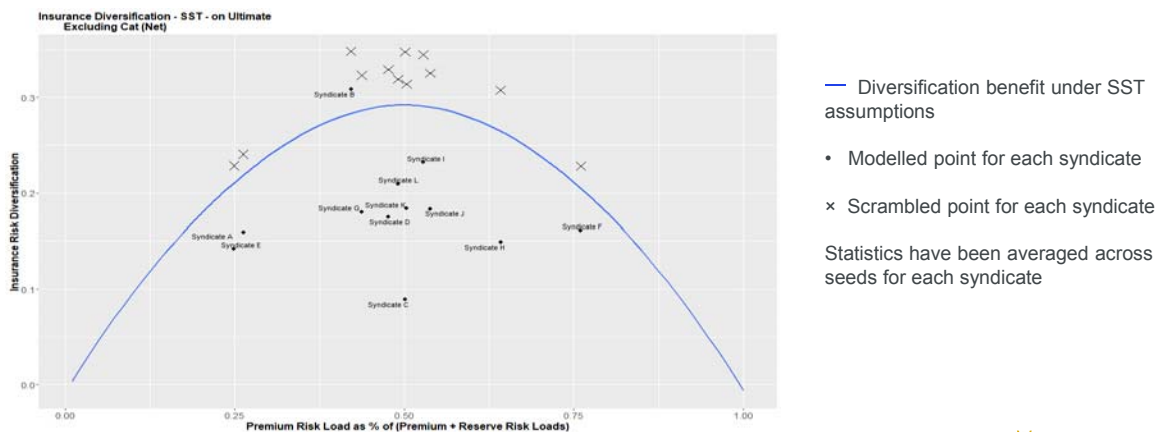Baseline (Current SST)

Scrambled SST

- **Blue points** = Syndicate modelled SST observations under different seeds
- **Box and whisker** = Syndicate "scrambled" SST observations under different seeds
- Box and whisker should be centred around zero if SST assumptions hold

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Sum of squares test – insurance diversification
Ultimate Net Ex Cat

Insurance Diversification - SST - on Ultimate
Excluding Cat (Net)

— Diversification benefit under SST assumptions

- Modelled point for each syndicate

× Scrambled point for each syndicate

Statistics have been averaged across seeds for each syndicate

X axis: LHS is Reserve risk dominated and the RHS is Premium risk dominated syndicate
Y axis: More diversification expected in centre where premium and reserve risk stresses are equal size
Scrambled SST points (crosses) should be on the blue line if the SST assumptions held.

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Average Percentile Contribution

Average contribution of the risk type to a band of simulations in the combined distribution, expressed as a percentile of that risk types standalone contribution.

Example:

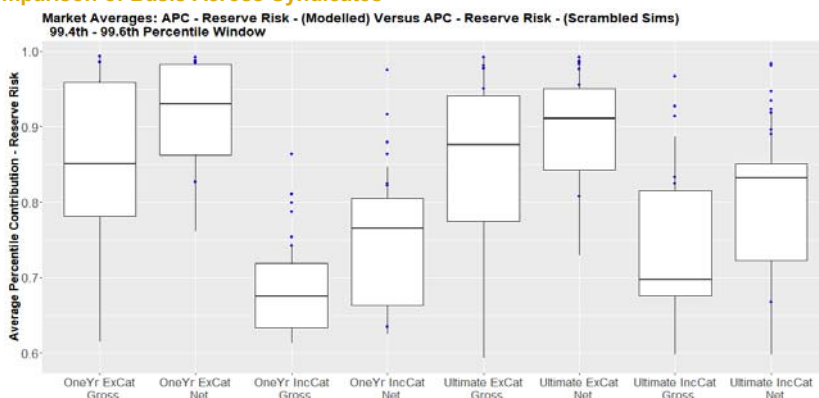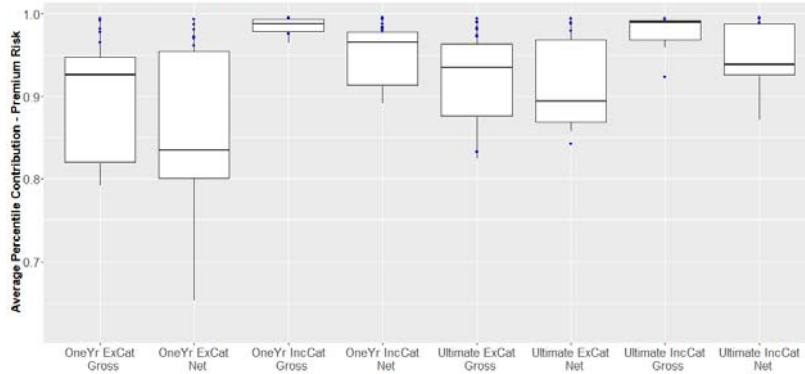| Window of sims (insurance risk)	Average value of insurance risk in window	Average value of Reserve Risk in window	Average value of Premium Risk in window
99.4th - 99.6th	195	120	75

Percentile	Standalone Reserve Risk
75th	80
90th	110
95th	130
99.5th	170

Average Percentile Contribution Reserve Risk = c92.5th percentile

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Average Percentile Contribution – Reserve Risk (99.4 to 99.6 Insurance risk distribution)

Comparison of Basis Across Syndicates

Market Averages: APC - Reserve Risk - (Modelled) Versus APC - Reserve Risk - (Scrambled Sims)
99.4th - 99.6th Percentile Window

- **Blue points** = Market modelled Banded APC observations for different syndicates (averaged across seeds)
- **Box and whisker** = Market "scrambled" Banded APC observations for different syndicates (averaged across seeds)

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Average Percentile Contribution – Premium Risk (99.4 to 99.6 insurance risk distribution)

Comparison of Basis Across Syndicates

Market Averages: APC - Premium Risk - (Modelled) Versus APC - Premium Risk - (Scrambled Sims)
99.4th - 99.6th Percentile Window

- **Blue points** = Market modelled Banded APC observations for different syndicates (averaged across seeds)
- **Box and whisker** = Market "scrambled" Banded APC observations for different syndicates (averaged across seeds)

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41

Conclusions

- Still a work in progress
    - Gathering additional information

- SST overstates level of independence by approx. 5% to 10%
    - Overstatement varies more between syndicates than between basis (e.g. one year/ultimate, including/excluding catastrophe)

- Average Percentile Contribution
    - Requires additional information to provide a baseline

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42

Appendix – definitions of other metrics tested

- Banded Average Conditional Exceedance Percentile (ACEP)
  - Average of premium/reserve risk percentile when reserving/premium risk is in band of simulations from 99.4th to 99.6th

- Banded Joint Exceedance Probability
  - Proportion of total sims in combined distribution for which both premium and reserve risk distributions are simultaneously in the window of the 99.4th-99.6th of their respective standalone distribution

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Questions

Comments

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