

# Understanding the dynamics of an Internal Model using Internal Model Output (IMO)

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17 January 2018

## Agenda

- What is IMO?
- Purpose and Objectives of IMO Analyses
- · Limitations and Quality of Data
- Key Messages



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#### Why IMO?

- PRA statutory objectives
  - Safety and Soundness of Firms
  - Protection of Policyholders
  - Secondary objective: effective competition
- Internal Models (IMs) are central to capital setting and their role has been elevated under SII
- · Continuous credibility of Internal Models is important
- Constructive discussion of the IMO analysis with Firms has led into beneficial changes
- PRA appreciates the effort that Firms put in preparing the IMO submission



#### What is Internal Model Output (IMO)



## **Objectives of IMO Analysis**



#### **Objectives of IMO Analysis**





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#### Why we ask for this information? specifics

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- · Gross and Net of Reinsurance · One Year and Ultimate
  - Gross for parameter comparisons
  - Net for SCR impact
- Discounted and Undiscounted
  - Undiscounted for parameter comparisons
  - Discounted for SCR impact
- Own Lines and SII Classes
  - SII classes for comparisons
  - Own lines for better understanding of the risk

- - FALs for Lloyd's
  - Methodology
- Linear and Rank correlations
  - Rank for removing the impact of marginal distributions
  - Linear for impact on SCR and sensitivity analysis
- Market risk Information •
  - Firms adjust ESG parameters



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# Identifying and Understanding Key Risk Drivers

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### **Most Material Lines and Correlations**

- Assume capital requirement is  $C = \sqrt{C_i^2 + 2\sum_{j < i} \rho_{ij}C_iC_j}$ , where  $C_i = 99.5th$  percentile – mean for the *i* – th risk
- Calculate  $\frac{\frac{\partial C}{\partial C_i}}{c}$  and  $\frac{\frac{\partial C}{\partial \rho_{ij}}}{c}$  (leads to neat and intuitive results)



Impact of Reinsurance on capital charges

- · Understand a Firm's risk mitigation methods and assess impact
  - Monitor changes over time
  - Check against SII reinsurance data





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#### Key catastrophe exposures

- Improve preparedness in the case of a catastrophic event
- Exposure of a Firm to different perils
- Exposure of Firms to a certain peril



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## Identifying key risk drivers - summary



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# Monitoring IM Changes over time



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**Reasons for changes in SCR** Exposure IM Methodology and Parameters Changes in Changes in volume of business volatility parameters • • mix of business correlations • • underlying risk assumed profitability ٠ ٠ reinsurance methodology • • and many other reasons... • and many other reasons... ٠

- We need to distinguish changes in SCR due to genuine changes in exposure and changes in assumptions and parameters.
- Easier said than done even by Firms, for many practical reasons.



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# Analysis of SCR change based on IMO



#### Heat Map and Areas for further Investigation

- · Net reserves, net premiums and SCR have generally increased.
- Reserving risk parameters have been reduced. We are investigating.
- Certain areas have been flagged up for individual Firms



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# **Analysis of Change Summary**

IMO tools can carry out an approximate analysis of change and distinguish between changes in exposure and changes in IM assumptions

This enables us to investigate changes in assumptions in IM and helps us identify possible capital drift

We flagged up certain areas of individual firms for further investigation

Drift is something which can be better identified over a longer than one year period. PRA will monitor changes over the years

#### Warning

- IMO analysis is approximate, it does not cover all risks and depends on data with limitations and whose quality can not be checked thoroughly.
- In Particular, SII Class data are not used by Firms and therefore these data may not be subject to sufficient checking. We have seen evidence of this.
- IMO data do not capture changes in the underlying risk
- Analysis of change is distorted by many factors and results could be due to artefacts of the data
  and method
- IMO analysis can flag up issues, but it can not capture all potential issues and capital drift.
  Possible false warnings and undetected positive warnings

# **Checking for consistency**



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# **Checking for consistency**

· Avoid herding, but ensure that Firms are being treated fairly



# **Consistency summary**



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# Limitations and Quality of Data



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### **Some Limitations**

- · All methods include material approximations
- Approximations often assume an underlying multivariate normal; wherever relevant allowance should be made for
  - skewness and
  - stronger tail copulae
- IMO does not include information on
  - reinsurance programme
  - expense details
  - underlying drivers, such as inflation model, and
  - many other elements of the Internal Model
- SII granularity may not be appropriate
  - Move to Firm's own lines granularity



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#### **Quality of Data**

- In 2018 (YE17 IMO) the IMO template will remain unchanged
- The quality of data has improved over time, but there is scope for further improvement
  - Quality of data varies by Firm
- Structure of IMO template does not necessarily correspond to the structure of the model
- Given the elevated role of IMO in monitoring the evolution of the IMs, it is important that the quality of IMO data improves



### Utilising other available information



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#### **Key Messages**



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