Insurance Risk & Analytics Forum

A practitioner casebook on ERM, catastrophe modeling, and insurance analytics

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1. Insurance Risk & Analytics Forum

Unified Casebook

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1.1. About

A company-agnostic, practitioner-led forum documenting **ERM best practices**, **catastrophe modeling**, **actuarial pricing**, and **risk transfer** for P&C insurance.

This edition is hosted by the **Verisk EES Chapter (Boston)**.

1.1.1. Organization

- **Tracks** are multi-month thematic series.
- Each Track is a **Part** with self-contained chapters and exhibits.
- Shared **Appendices** provide templates, checklists, and a glossary.

1.1.2. Publishing

- Built with **Quarto** → HTML site & PDF export.
- Exhibits emphasize **reproducibility** (inputs, assumptions, version logs).

Part I.

Track-1: ERM Best Practices at Major P&C Carriers (Fall 2025)

2. Track-1 Overview

Chapter Host: Verisk EES Chapter (Boston)

2.1. Why this Track

Track-1 establishes a unified, practitioner-oriented view of **Enterprise Risk Management (ERM)** for large P&C carriers, balancing **catastrophe modeling** (Touchstone / Touchstone Re and peers) with **actuarial pricing**, **capital adequacy**, and **risk transfer** practices.
We aim for **reproducible analyses**, transparent assumptions, and decision-grade exhibits you can reuse in committee packs and model governance memos.

2.2. Learning Objectives

By the end of Track-1, participants will be able to:

1. **Frame ERM for a cat-exposed P&C portfolio**

- Set risk context, identify accumulations, and define measurable risk appetite.

2. **Operationalize catastrophe models** for decision support
   - Produce and interpret **AAL**, **OEP/AEP EP curves**, **PML**, **TVaR** (gross → net), and articulate key modeling assumptions and sensitivities.
3. **Link modeling outputs to capital and reinsurance**
   - Translate tails to **capital sufficiency**; design/compare **quota share** and **XoL** towers; quantify **ROL**, **net AAL**, and **tail reduction**.
4. **Embed underwriting & pricing discipline**
   - Combine cat loss costs with actuarial models (GLM/GBM) and implement guardrails (elevation, roof, surge proximity, code compliance).
5. **Design portfolio-level mitigations and diversification**
   - Evaluate mitigation credits, code impacts, and cross-segment diversification for volatility and capital efficiency gains.
6. **Build durable ERM governance**
   - Institute quarterly ERM packs, model change logs, controls, and event-response playbooks; document validation and versioning.
7. **Drive an innovation backlog**
   - Prioritize climate deltas, non-stationarity, ML property attributes, and near-real-time event analytics with clear pilot KPIs.

2.3. What You'll Produce (Track Deliverables)

- **Case Exhibits**: EP curves, AAL bridges (gross → net), tail tables, retention/layer trade studies.
- **Reinsurance Trade Study**: Options vs. **ROL / net AAL / TVaR / capital relief** with recommendation.
- **Risk Appetite Statement**: Measurable limits/targets aligned to capital and liquidity.
- **Governance Artifacts**: Model change log, quarterly ERM pack checklist, event-response runbook.
- **Capstone Case Study**: Florida single-family homeowners, wind & flood; premium = **$1B**.

2.4. Prerequisites

- Familiarity with cat modeling concepts (perils, exposure attributes, vulnerability, demand surge).
- Working knowledge of actuarial pricing basics (GLM/relativities) and reinsurance structures (QS, XoL).
- Access to modeling and analytics tools listed below.

2.5. Tooling & Data

- **Cat Platforms**: Touchstone / Touchstone Re (primary), RMS (peer review), JBA/KatRisk (flood detail), Hazus (public baseline).

- **Data**: Policy admin, geocodes, FEMA FIRM, NOAA SLR, LiDAR DEM, parcel/roof attributes where available.
- **Analytics**: Python/R for analysis and plotting; QGIS/ArcGIS for hazard mapping; Quarto for reproducible publishing.

2.6. Track Cadence & Chapter Map

- **T1.02** Overview
- **T1.03** Exposure & Hazard Mapping
- **T1.04** Cat Modeling Frameworks (Touchstone, RMS, JBA)
- **T1.05** AAL, EP, TVaR — Metrics & Interpretation
- **T1.06** Capital Adequacy & Risk Appetite
- **T1.07** Reinsurance & Risk Transfer Best Practices
- **T1.08** Underwriting & Pricing Beyond CAT
- **T1.09** Portfolio Diversification & Product Mix
- **T1.10** Risk Mitigation & Engineering
- **T1.11** Governance, Monitoring & ERM Best Practices
- **T1.12** Innovation & Research Pipeline
- **T1.13** Capstone: Florida Wind & Flood Portfolio (Premium = $1B)

Each chapter includes: objectives, minimal datasets, step-by-step workflow, exhibits, and decision notes.

2.7. Assessment & Exercises

- **Hands-on labs**: Run EP curves, build AAL bridges, and compare RI towers.
- **Short memos**: 1–2 page decision briefs (risk appetite, RI recommendation).
- **Peer reviews**: Cross-check assumptions, inputs, and reproducibility for a selected exhibit.

2.8. Governance & Reproducibility

- **Versioning**: Record model version, options, exposure snapshot date, vulnerability set, stochastic seed.
- **Change Log**: Capture deltas and expected impact; attach pre/post exhibits.
- **Controls**: Two-person review for all capstone figures; retain CSVs and parameter files.

- **Publish**: Commit `.qmd` + assets; render HTML/PDF with date-stamped footers.

2.9. Reading & References (Starter)

- Paul Hopkin, *Fundamentals of Risk Management* (for ERM framing)
- Swiss Re Sigma reports (NatCat market insights)
- NAIC RBC materials (capital context)
- FEMA FIRM / Hazus references (hazard baselines)
- AIR/Verisk Touchstone & Touchstone Re documentation; RMS technical docs

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2.10. Attribution

- **Editor:** *Name, Title/Team — Role in this track*
- **Chapter Host:** Verisk EES Chapter (Boston)
- **Contributing Authors:**
  - *Name, Title/Team — Role in this track*

  - *Name, Title/Team — Role in this track*

- **Invited Speakers:**
  - *Name, Organization — "Talk Title" (Date)*
  - *Name, Organization — "Talk Title" (Date)*

2.11. Notes to Contributors

- Keep exhibits reproducible: include inputs, seeds, and model options.
- Use consistent figure/table captions and units.
- Add a short "Decision Relevance" paragraph under each exhibit.

3. Exposure Analysis & Hazard Mapping

Objectives. Build exposure inventory (TIV, construction, year built, mitigation), map **wind/surge/flood** hazards, and quantify accumulations.

Data & Tools. Policy admin, geocoding, FEMA FIRM/NOAA SLR/LiDAR DEM; QGIS/ArcGIS; parcel attributes.

Workflow. 1. Data QC & geocoding checks 2. Zonal aggregations (county/ZIP/grid) 3. Accumulations & thresholds (e.g., %TIV within 2km coast) 4. Mitigation inventory (roof, shutters, FBC compliance)

Outputs. TIV choropleths, surge/flood overlays, accumulation tables.

4. Catastrophe Modeling Frameworks (Touchstone, RMS, JBA, etc.)

- **Touchstone / Touchstone Re** (AIR/Verisk): wind, surge, rainfall flood; portfolio & treaty views.
- RMS; JBA/KatRisk for flood granularity; Hazus (public baseline).

Governance. Version control; validation memos; sensitivity to vulnerability, demand surge, clustering, climate deltas.

Touchstone flow. 1) Import exposure & assign attributes
2) Run wind/surge/flood modules
3) Extract **AAL**, **OEP/AEP**, **TVaR**
4) In Touchstone Re: apply **QS/XoL**; iterate retention/layers; export net views

5. AAL, EP Curves, and Tail Metrics in Practice

- Interpret **AAL**, **OEP/AEP**, **PML**, **TVaR**, **ROL**.
- Views: **Gross**, **Net of RI**, **Net of reinstatements** by geography/attributes.
- Example thresholds: AAL 12–15% of premium; capital+RI 120–150% of **AEP 1-in-100**.
- Exhibits: EP curve plots; Gross→Net AAL bridges; tail tables.

6. Capital Adequacy & Risk Appetite

- NAIC RBC / internal economic capital.
- Draft **Risk Appetite Statement** (limits on AAL, AEP/OEP PMLs, TVaR, reinsurer credit).
- Scenarios: Ian/Irma/Michael; compound flood; multi-event with reinstatements.
- Outputs: sufficiency vs AEP 1-in-100/250; triggers for plan re-balancing.

7. Reinsurance & Risk Transfer Best Practices

Structures: Quota Share, XoL (per-occ/agg), reinstatements, ILWs, cat bonds, parametrics.
Optimization loop: Target retention → tower options → **ROL / net AAL / TVaR** → counterparty/credit → capital relief.
Exhibits: Layer tables, placement map, QS vs XoL bridges.

8. Underwriting & Pricing Models Beyond CAT

- GLM/GBM blending **experience**, **exposure**, **cat loss costs**; ZIP & construction relativities.
- Guardrails: elevation certs, roof age/material, distance to water, code compliance, moratoria.
- Monitoring: rate adequacy heatmaps, hit ratios, loss ratio by segment.

9. Portfolio Diversification & Product Mix

- Geography (inland FL; Southeast spillover) & product mix (renters/condo/small commercial).
- Analytics: correlation matrices; volatility reduction; capital efficiency.

10. Risk Mitigation & Engineering

- Wind mitigation credits; code compliance; secondary modifiers.
- Flood elevation & NFIP coordination; IoT pilots.
- KPIs: mitigation adoption; AAL deltas; ROI of credits.

11. Governance, Monitoring & ERM Best Practices

- Quarterly Risk Committee; model validation cadence; change-log controls.
- Dashboards: AAL% premium, EP coverage, treaty utilization, accumulation drift.

12. Innovation & Research Pipeline

- Climate adjustments / non-stationarity; ML property attributes; near-real-time event response.
- Pilot design: hypothesis → data → experiment → KPI lift → go/no-go.

13. Case Study: Florida Wind & Flood Portfolio (Premium = $1B)

Setup. Exposure snapshot; hazard overlays; baseline AAL/EP (gross).
Decisions. Risk appetite; target retention; selected RI program (QS/XoL/parametric).
Results. Gross→Net AAL bridge; tail reduction; capital alignment.
Lessons. Model sensitivity; governance wins; roadmap.

Part II.

Track-2:(TBD)

14. Track 2 Overview

Part III.

Track-3:(TBD)

15. Track3 Overview

A. References

- Swiss Re Sigma Reports (NatCat)
- Florida OIR guidance & model filing references
- AIR/Verisk Touchstone & Touchstone Re documentation
- RMS technical documentation
- NAIC RBC materials
- FEMA FIRM / Hazus references

B. Appendix A: Templates & Checklists

B.1. Cat Model Run Template

- Scope/perils, versions & options, exposure snapshot, outputs (AAL/OEP/AEP/TVaR), reviewer/approver

B.2. Reinsurance Trade Study Template

- Objective, tower options, **ROL / net AAL / TVaR** table, counterparty limits, recommendation

B.3. Governance Checklists

- Quarterly ERM pack, model change log fields, event response readiness

C. Appendix B: Glossary

AAL — Average Annual Loss …
EP Curve — Exceedance Probability curve …
TVaR — Tail Value at Risk …