

Exam 2: Catastrophe Risk Insurance Fundamentals
Learning Objectives

Assignment 1. Introduction to Exposures and Data Quality

Module Title	Learning Objectives
1. Exposure Data	(LO1) Describe what is meant by 'exposure data' in the context of catastrophe models.
READINGS	
<ul style="list-style-type: none"> Natural Cat Risk Management and Modelling: 2.5 – Catastrophe Risk Management and Catastrophe Modelling; 1.9 – Model Input; 1.8.3 – Exposure; 5.4.2.7 – Coverage Type 	

Module Title	Learning Objectives
2. Data Quality and Exposure Analysis	(LO2) Describe the importance of data quality to the production of cat modeling results. (LO3) Describe how 'unknown' risk characteristics are handled in the cat model. (LO4) Describe what geocoding is and its importance in cat modeling.
READINGS	
<ul style="list-style-type: none"> Natural Cat Risk Management and Modelling: 2.5 – Catastrophe Risk Management and Catastrophe Modelling; 5.4.2.6 – Geocoding; 5.4.2.7 – Coverage Type; 1.9 – Model Input; 2.6.3 – Practicalities of Using Catastrophe Model Output for Pricing; 1.8.3 - Exposure 	

Assignment 2. History of catastrophe models

Module Title	Learning Objectives
1. Advantages of cat models	(LO5) Describe the evolution of catastrophe models, from its earliest years to current. (LO6) Explain the rationale for the use of catastrophe models within the insurance industry.
READINGS	
<ul style="list-style-type: none"> Cat Modeling: A New Approach to Managing Risk: 2.1 – History of Cat Models Natural Cat Risk Management and Modelling: 2.11 – Regulation and Best Practice in Catastrophe Modelling; 1.4 – 1.5 – Why Cat Models http://www.actuaries.org/LIBRARY/Papers/RiskBookChapters/Ch5_CatRisk_2015-08-12.pdf Use of Catastrophe Modeling Output: https://www.actuary.org/files/publications/Catastrophe_Modeling_Monograph_07.25.2018.pdf 	

Module Title	Learning Objectives
2. Model evaluations and regulations; limitations of historical data, advances in science.	(LO7) Identify weaknesses in current historical data availability and collection methodologies. (LO8) List the purpose of outside model evaluations. (LO9) List the arguments for and against regulation of catastrophe modeling firms.
READINGS	
<ul style="list-style-type: none"> Natural Cat Risk Management and Modelling: 2.11 – Regulation and Best Practice in Catastrophe Modelling; 1.4 – 1.5 – Why Cat Models Atlantic Hurricane Database Reanalysis Project: http://www.aoml.noaa.gov/hrd/data_sub/re_anal.html 	

Assignment 3. Use of catastrophe models within insurance industry

Module Title	Learning Objectives
1. Underwriting and pricing.	(LO10) Identify the utility and challenges of using catastrophe models for individual risk selection, loss mitigation, and pricing. (LO11) Identify the utility and challenges of using catastrophe models for reinsurance treaty selection and pricing.
READINGS	
<ul style="list-style-type: none"> Catastrophe Risk Insurance Readings: 1 – The Underwriting Function; 2 – Insurance Ratemaking Basics Natural Cat Risk Management and Modelling: 2.6 – Underwriting & Pricing Cat Modeling: A New Approach to Managing Risk: 5 – Use of Cat Models in Insurance Ratemaking (5.1, 5.2, 5.3) 	

Module Title	Learning Objectives
2. Internal risk management, capacity management, capital management.	(LO12) Identify the utility and challenges of using catastrophe models for risk transfer and management of groups of risks against market and corporation financial constraints.
READINGS	
<ul style="list-style-type: none"> Natural Cat Risk Management and Modelling: 2.7 – Accumulation, Roll-up and Capacity Monitoring; 2.8 – Portfolio Management & Optimization; 2.10 – Capital Modeling, Management and Dynamic Financial Analysis Cat Modeling: A New Approach to Managing Risk: 6 – Insurance Portfolio Management 	

Module Title	Learning Objectives
3. Rating agency use of catastrophe model output.	(LO13) Describe the threats to insurance companies after large catastrophic events. (LO14) Explain the perspective and role of rating agencies regarding the use of catastrophe models.
READINGS	

- Insurance Fundamentals: 6 – Insurance Operations (6.16-6.17 – Rating Agencies)
- Natural Cat Risk Management and Modelling: 1.2 – Catastrophes, Risk Management and Insurance; 1.4 – Why Do We Need Catastrophe Models?; 2.11 – Regulation and Best Practice in Cat Modeling
- Cat Modeling: A New Approach to Managing Risk: 1.2 – Private Sector Stakeholders in the Management of Risk;

Module Title	Learning Objectives
4. Financial reporting.	(LO15) Describe the types of disclosures related to catastrophe modeling results that appear in the 10-K and why they are important.
READINGS	
<ul style="list-style-type: none"> • Study Note: Cat Risk Management Insurance Fundamentals 	

Module Title	Learning Objectives
5. Real time use for catastrophe claims deployment.	(LO16) Describe the use of catastrophe models by the (re)insurance companies during real-time, ongoing catastrophes.
READINGS	
<ul style="list-style-type: none"> • Natural Cat Risk Management and Modelling: 2.9 – Event Response and Integration with Claims Teams • https://www.catriskcredentials.org/wp-content/uploads/2021/07/Viewpoint-catastrophe-models.pdf 	

Assignment 4. Historical context of catastrophe losses

Module Title	Learning Objectives
1. Major global catastrophe losses since 1900.	(LO17) Identify the largest historical natural and man-made catastrophe events in the U.S. (LO18) Identify the perils that have historically generated the largest economic and insured loss.
READINGS	
<ul style="list-style-type: none"> • Cat Modeling: A New Approach to Managing Risk: 1.1 – Need to Manage Risk • III: https://www.iii.org/fact-statistic/facts-statistics-us-catastrophes • MunichRe NatCatSERVICE: Relevant natural loss events in North America 1990-2017 	

Module Title	Learning Objectives
2. Economic vs. insured losses.	(LO19) Explain the difference between Economic and Insured losses for large catastrophes. (LO20) Explain what the “protection gap” is and the role it plays in economic and insured loss. (LO21) Explain contributors to the protection gap.
READINGS	

- Cat Modeling: A New Approach to Managing Risk: 1.1 – Need to Manage Risk
- https://www.genevaassociation.org/sites/default/files/research-topics-document-type/pdf_public/research_brief_-_global_insurance_protection_gaps.pdf
- <https://www.insurancejournal.com/news/international/2018/01/17/477266.htm>

Module Title	Learning Objectives
3. Impact of trends: monetary, developmental, social, and building code evolution and their impact on historical loss projections.	<p>(LO22) Explain the general trends in historical losses over time from catastrophe events. Would these events cause less, similar, or more economic loss if they occurred today?</p> <p>(LO23) Describe what the purpose of a building code is and who defines the building codes.</p> <p>(LO24) Explain how historical events have driven changes in the building code over time.</p> <p>(LO25) Describe how building codes mitigate loss potential.</p>
READINGS	
<ul style="list-style-type: none"> • Klotzbach, Pielke Jr., 'Continental U.S. Hurricane Landfall Frequency and Associated Damage': https://journals.ametsoc.org/view/journals/bams/99/7/bams-d-17-0184.1.xml • IBHS Building Codes: https://ibhs.org/public-policy/building-codes/ • IBHS: Hurricane Andrew & Building Codes (Video): https://vimeo.com/47966637 • 2018 Rating The States: https://ibhs.org/wp-content/uploads/wpmembers/files/Rating-the-States-2018_IBHS.pdf • FEMA Building Codes: https://www.fema.gov/building-codes 	

Assignment 5. Standard of Practice

Module Title	Learning Objectives
1. Actuarial standards of practice	<p>(LO26) Describe the purpose of Actuarial Standards of Practice in general and specifically ASOP 38 in relation to catastrophe modeling.</p> <p>(LO27) Describe how a catastrophe modeler (non-actuary) might use the ASOP to their benefit.</p>
READINGS	
<ul style="list-style-type: none"> • ASOP 23: Data Quality http://actuarialstandardsboard.org/wp-content/uploads/2014/07/asop023_097.pdf • ASOP 38: Outside of Expertise http://www.actuarialstandardsboard.org/wp-content/uploads/2014/02/asop038_155.pdf • ASOP 39: Ratemaking http://actuarialstandardsboard.org/wp-content/uploads/2014/07/asop039_072.pdf • ASOP 41: Actuarial Communications http://www.actuarialstandardsboard.org/wp-content/uploads/2014/02/asop041_120.pdf 	

Module Title	Learning Objectives
2. Regulatory requirements.	<p>(LO28) Define the objectives of insurance industry regulation</p> <p>(LO29) Describe the catalyst behind the development of ORSA, Solvency II, and other similar requirements</p>

	(LO30) Define what ORSA represents and its goals.
READINGS	
<ul style="list-style-type: none">• https://www.abi.org.uk/globalassets/sitecore/files/documents/publications/public/migrated/solvency-ii/industry-good-practice-for-catastrophe-modelling.pdf• Natural Catastrophe Risk Management and Modelling: Section 2.11.4 – Case Study: Catastrophe Models and Solvency Regulation, Solvency II• http://www.naic.org/cipr_topics/topic_own_risk_solvency_assessment.htm	