Centre for Risk Studies

5th Risk Summit: Special Topics Seminar

Catastronomics: The economics of catastrophes

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Scenarios and Their Variants: Shape of Impacts



Judge Business School



Why Catastronomics?



Theoretical Framework

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Indices and Metrics





What is catastronomics?



Catastrophe

- Greek word for 'overturn'
- Sudden, and often great calamity or disaster
- High morbidity and fatality
 - Widespread economic disruption and loss
 - State of emergency

Economics

- The study of production, distribution and consumption
 - The allocation and use of scarce resources
- The distribution of wealth
 - The 'dismal' science

L Catastronomics

"the economic analysis of catastrophes"



The Cost of Natural Catastrophes is Increasing



Damage caused by catastrophes



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Data source: EM-DAT, OFDA/CRED (http://www.emdat.be/)

Most Costly Natural Catastrophes





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Data source: EM-DAT, OFDA/CRED (http://www.emdat.be/)

Theoretical Framework



Eight Concepts behind Catastronomics



Hazard, vulnerability and resilience



Networks of networks



Stocks and flows



Complex dynamic feedback



Direct and indirect effects



Superstructure



Ripple and cascade phenomenon



Evolutionary dynamics



Hazard, Vulnerability and Resilience





Hazard, Vulnerability and Resilience





Relationship between Stocks and Flows





Direct and Indirect Effects





Centre for Risk Studies (Leontief, 1951)

Ripple, Cascade and Avalanche Phenomenon





Dynamic Feedback (System Dynamics)





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Superstructure, Infrastructure and Capital





Networks of Networks



(Newman, 2003)



Evolutionary Catastrophe Fitness-Scapes



By Max Olson for FutureBlind

Depiction of a fitness landscape from evolutionary biology



Centre for Risk Studies (Mustonen & Lässig, 2009)

With the real part
$$r > 0$$

With the real part $r > 0$
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Traditional Approach





Catastronomics Approach





Important Macroeconomic Variables

Economic Drivers	Geopolitical	Pandemic	Cyber	Social Unrest	Impact on GDF
Foreign Direct Investment	HIGH				LOW
Government Consumption	LOW	LOW			MED
Exports	HIGH	MED			
Imports	HIGH				HIGH
Exchange Rate	LOW				
Capital Destruction	MED				
Share Price Index	LOW	MED	HIGH		
World Oil Price	MED			LOW	
Unemployment		HIGH		HIGH	
Consumption		MED	HIGH	HIGH	
Production			MED		
Inflation				MED	
Bank Loans				LOW	



Estimating GDP@Risk



GDP@Risk: Cumulative first five year loss of global GDP, relative to expected, resulting from a catastrophe or crisis



Global GDP@Risk from 1% Annual Probability Scenarios



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GDP@RP (Risk Percentage)





Summary

Why Catastronomics?

- Cost of catastrophes is increasing
- Macroeconomic losses still not well understood



- Introduced eight concepts to describe catastronomics
- Introduced new risk framework for describing macroeconomic impacts

Indices and Metrics

Compared traditional risk analysis with catastronomic risk analysis
 Introduced two new metrics GDP@Risk and GDP@RP



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