



Integrative Risk Management

The ETH Centre for Integrative Risk Management

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The Swiss Federal Institute of Technology (ETH) is launching its innovative Integrative Risk Management initiative, supported by the framework of a dedicated Risk Centre.

Vision

A enormous body of works in the natural and social sciences have revealed that the evolution of complex systems is punctuated by large events, the effects of which frequently play a dominant role in the dynamics and structure of organisations. This statement is usually quantified by events with heavy-tailed distributions and long-term consequences. Moreover, interdependencies can develop between events that were previously thought uncorrelated, leading to often unforeseen catastrophic scenarios and crippling losses.

We are continually confronted with these significant, if infrequent, events. The volcanic eruption of Eyjafjallajökull in Iceland on March 20, 2010 (after almost 200 years of silence) grounded most of West European air traffic for a week. The ongoing British Petroleum Deepwater Horizon oil spill in the Gulf of Mexico that began in April 20, 2010 is expected to eclipse the 1989 Exxon Valdez oil spill as the worst US oil disaster in history. The unfolding of the Greek debt payment crunch has led to an unprecedented EUR 750 billion loan and guarantee package unveiled on May 10, 2010 to stop a sovereign-debt crisis that threatened to shatter confidence in the euro and cascade into a fully-fledged crisis of the European Union. The possibly epoch-changing consequences of this European fiscal debacles and the responses to it remain to be seen. Events occurring within one system often spillover to other systems, connecting them through unexpected and surprising channels. The September 11, 2001 terrorist event led to large claims against insurers. Insurers were being concurrently impacted by portfolio losses resulting from the extremely negative market reaction to the attack. This particular linkage led to a paradigm shift in the appreciation of risk exposure. Models of a future Tokyo earthquake have the potential to severely damage one-third of the industrial production capacity of Japan. The last major Tokyo earthquake in 1923 completely destroyed the city. The next event can broadly be expected at any time over a 50 year time horizon. Given the global importance of Japan's economy, and the fact that Japan holds more than USD 1 trillion of US

Treasury bonds that it will have to sell to fund its reconstruction, the consequences for the world economy could be massive.

Major catastrophes shock the social and economic landscape of our societies. Be they from environmental, technological, terrorist or societal causes, the impacted populations undergo significant economic losses and social changes, in addition to often deep and damaging psychological scars. In such contexts, the correspondingly reliable and appropriate response of insurance companies has become a necessity for the management of the consequences of catastrophes. The work of the insurance industry is thus at the core of an integrative risk management approach, combining many involved disciplines, to evaluate, anticipate and manage large risks with a long-term vision of sustainability. In parallel, academic research is acting as a vanguard, bringing forth new concepts, methods and cross-fertilisations between disciplines to monitor, diagnose, understand and forecast risk in all its dimensions.

The Integrative Risk Management initiative and the "Risk Centre"

Integrative Risk Management (IRM) is an emerging concept aiming at concurrently managing a portfolio of natural, technical, economical, and social risks for a specific geographic region and/or event. It starts with identifying and understanding risks, leading to the creation of a comprehensive risk map. The subsequent results are transferred to a series of aggregated risk metrics. IRM selects portfolios of risk mitigation activities and designs novel collaboration schemes for networks of academic, government, industry and private agents. This allows the evaluation of a mixture of prevention, recovery, and risk transfer actions, resulting in an optimal balance of public and private contributions to risk management, aiming at creating a more resilient society.

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Zurich is one of the major European financial markets with a strong presence of leading reinsurance companies. The Federal Institute of Technology (ETH) Zurich, in collaboration with major industry partners in Zurich, has recently created an initiative to establish an innovative nucleus for IRM, which develops, implements, and disseminates knowledge and tools for cross-risk measurement and aggregation. As our society is confronted by risks of very different types (economics, environmental, political), the IRM initiative has to rely on an interdisciplinary approach, where experts of different research areas share their knowledge and experience in order to develop innovative solutions.

The goal at ETH Zurich is to become a leader in IRM, with the development of an interdisciplinary research centre, entitled the Risk Centre. Activities developed in the Centre will aim at establishing an integrated view of different risks, and developing means to assess, compare, understand and manage these risks. Research output will allow societies to better manage risk portfolios, to find risk-reducing solutions and to design novel collaboration schemes aimed at risk-reduction. The ETH Risk Centre is designed to be the strategic instrument that will achieve the objectives of the IRM initiative, being developed in particular with industry partners.

The Risk Centre will foster both top-down initiatives and bottom-up collaborative fundamental research projects linked with R&D. The Risk Centre will also be an interface between academia and industry. The effect of this unique Risk Centre will be to:

- generate a new, internationally visible and innovative research cluster and hub for integrated risk management in Zurich;
- accelerate research know-how and output of ETH Zurich in risk domains overall and to insurance and banking in particular;
- strengthen the resource pool of talents at ETH Zurich, with impact for the private and public sector in Switzerland.
- provide an attractive communication platform with beneficial effects for the image of potential donors and for the ETH Zurich.

In conclusion, the IRM initiative and its operation arm, the Risk Centre, are uniquely positioned to be at the forefront of the interdisciplinary revolution needed to address the many key issues that societies are facing and will be confronted with in coming decades. The commitment of ETH Zurich and of major industry partners within the Risk Centre will ensure the development of a new interdisciplinary culture of risks that transcends traditional disciplines focused on specialised risks.

The Risk Centre will include the following professors from different departments at ETH Zurich:

Professor	Department	Title	URL
Antoine Bommier	D-MTEC	Chair of IRM and Economics	as of August 2010
Lars Erik Cederman	D-GESS	Chair of International Conflict Research	www.icr.ethz.ch/people/cederman/
Paul Embrechts	D-MATH	Chair of Mathematics, Director of RiskLab	www.math.ethz.ch/~embrechts/
Hans Gersbach	D-MTEC	Chair of Macroeconomics: Innovation and Policy	www.cer.ethz.ch/mip/people/gehans
Hans Heinimann	D-UWIS	Director of the Institute of Terrestrial Ecosystems	www.env.ethz.ch/people/professors/fullprofessors/hanshei/index
Frank Schweitzer	D-MTEC	Chair of System Design	www.sg.ethz.ch/people/fschweitzer
Didier Sornette	D-MTEC	Chair of Entrepreneurial Risks	www.er.ethz.ch/people/sornette