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**How Societies Manage Risk –**  
the big picture of (re)insurance, and beyond

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# About the speaker

- Dr. (rer. nat.) Michael Fackler, Munich, Germany
- Qualified actuary (DAV), self-employed
- Studied Math at Univ. Munich, Pisa, Oldenburg
- Doctorate in parallel with working: on experience rating, completed 2017
- 10 years with leading reinsurers
- 15+ years consulting actuary
- Specialized in: non-life reinsurance pricing, dealing with scarce data

# Abstract

Modern society **mitigates and transfers risks** in a variety of ways, which range from *catastrophe prevention* and *(re)insurance* solutions through to *injustices* of a minor and inconspicuous nature.

We illustrate that the measures taken depend on the uncertainty about the risks in question, and involve **three trade-offs**:

- *innovation vs. risk avoidance*;
- *liability vs. collective risk sharing*;
- *equity vs. practicable claims settlement*.

We study two highly instructive **examples** (*nuclear liability* and the measures taken in the wake of the *9/11 terrorist attack*) and discuss the **insurability** of systemic risks like a **pandemic**.

# Outline

- Introduction
- Nuclear Liability
- Insurability of pandemics
- Regulation of 9/11 loss

# Statements about risk

- 1) Risk management has been there for ages.
  
- 2) Modern society trades off:
  - *innovation vs. risk avoidance,*
  - *liability vs. collective risk sharing,*
  - *equity vs. practicable claims settlement.*

# Prevention and mitigation of accidents

More visible (e.g. Dikes), or less:

- Fire brigades
- Safety codes
- Insurance (and its regulation)
- Legal system

Problem: How much prevention/protection is adequate?

- Hard to decide for novel risks

# Types of risk

*risk vs. uncertainty*

Frank H. Knight, Economist, USA, 1921

*small worlds vs. large worlds*

Leonard J. Savage, Statistician, USA, 1954

*known unknown vs. unknown unknown*

Donald H. Rumsfeld, Politician, USA, 2002

D. H. Lawrence, Poet, UK, c. 1915

Ibn Yamin, Poet, Persia, 13<sup>th</sup> cent.

*insurable vs. uninsurable*

# Liability ... and its restrictions

Ideal: accountability, *polluter-pays principle*

Reality: Who would take a *large-world* risk if one is fully liable?

How liberal societies cope:

- Let (all) people **innovate**
- **Spread** certain risks on many shoulders, e.g. via public funds
- Lax or **limited liability**, limited company, insolvency



# Uninsurable risks (almost / partly)

- Certain natural hazards:  
storm surge Netherlands, earthquake Japan,  
hurricane Florida
- Pandemic
- War etc.
- NBCR (nuclear, biolog., chem., radiolog.) events
- Terrorism
- Software errors
- Nuclear liability

# Nuclear liability

- Complex framework of operator liability, public guarantees ... and possibly insufficient limits
- Trend towards increased operator liability (no fault), but slow

## Background:

- Nuclear energy often of “national interest”
- Private operators don’t build/run plants if fully liable
- Public shall believe that mayor accidents are *impossible* (with the national technology)

# Layers of protection per event: high end

**Germany** (unlimited liability, in ''' €, i.e. billions)

- 0.256 XS 0 insurance
- 2.244 XS 0.256 operators' pool
- illimitée XS 2.5 operator ("self-insured")

**USA** (*Price-Anderson Act*, in ''' \$)

- 0.45 XS 0 insurance
- ≈13 XS 0.45 operators' pool
- ill. XS ≈13.4 at discretion of Congress

# Layers: international “standard”

*2004 Protocol to Paris convention on Nuclear TPL*  
(minimums, in ’’’ €)

- 0.7 XS 0 operator / insurance
- 0.5 XS 0.7 country of plant
- 0.3 XS 1.2 pool of signatory countries
- ill. XS 1.5 nil

**Switzerland:** 1<sup>st</sup> layer insurance, above operator (ill.)

# Problems

- No protection above €1.5 billion required
- Protocol not yet in force, ratification by EU upcoming – for several years
- Protection still a magnitude lower in many countries

# Adequacy of guarantees

- Loss potential in populated areas: controversial, say € 500-5'000 (!?) billion
- Operators won't be *able* to pay that, governments possibly won't be *willing*
- Consumers can't protect themselves by insurance

Bottom line: The risk is spread on many shoulders in an undesirable way

# Insurance options?

In principle (probably) yes, but:

- would require open debate on loss potential
- would involve the whole financial market:

In (re)insurance about €10 billion per event seems to be the maximum amount that can be placed in one program, across programs maybe \$100’’’’

- Many (re)insurers are not keen on business in “political” areas

# Pandemics insurance

**No surprise:** a deadly viral pandemic after 100 benign years with some near-misses  
(yet, one expected rather influenza than corona)

**Surprise:** most affected insurance not life/health/WC, but NDBI (*non-damage business interruption*) due to preventive measures; correlation with investment

Although everyone now wants it, **industry** apparently **not keen** on offering pandemic insurance

**Issues:** severity, lack of diversification, frequency (?)



# Severity

Worldwide figures in '''' \$ (trillion), rough estimates

- 100 bond market, stock market (each)
- 80 GDP
- 2-10.5 Global Financial Crisis economic losses
- 12 Covid-19 economic losses, SR estimate
- 0.1 Covid-19 insured P&C losses, early est.
- 0.8 future econ. losses from pandemics p.a.
- 0.2 market insurance cost p.a., AAE est.

# Severity

US figures in '''' \$, estimates

- 100 P&C aggregate sum insured
- 0.8 P&C insurers' capital resources
- 0.1 Nat Cat event loss potential
- 0.07 Property premium p.a. (not only NDBI)
- 0.14 monthly insured BI (<100 employees)
- 1 monthly BI insurance potential
- 2 public aids to citizens, small businesses

# Return period

- Some think that any Property policy can be sold at premium rate **1 per mil** of sum insured.
- Some in London Market: Covid-19 is **500y** event
- Wimbledon Tennis Tournament had pandemic insurance, premium \$2'' p.a., 2020 Covid loss \$142'' ( $\approx$ SI), Rate on Line 1.4%;  $\approx$ **100y** event
- World Bank PEF Cat Bond Class A (covering flu and coronaviruses): risk RoL 3.57%; **28y** event
- Spill-over of coronavirus from animal: **12y** event?

# Insurability of pandemics

BI insurance: no small partial losses as even regional epidemics take 6+ months; product can't be cheap

Overall picture:

- If loss potential has magnitude of world GDP, **diversification** can only work **over time**
- If return period is 100+ years, **no vehicle** in the financial market can smooth that over time
- If return period is 10-20 years, **saving** might work better than insurance, e.g. equalization reserve

# The WTC loss

- Terrorist attack, 11 September 2011
- Tragic, but very instructive, example for successful risk management “after the event”

# Key facts

- Four airliners hijacked, used as missiles
- WTC's Twin Towers destroyed, Pentagon damaged
- About 3'000 people killed, 250 seriously insured
- Many victims highly paid and married (matters for compensation)
- Insured loss about \$40 billion
- Economic damage \$1'000 (?) billion

# Potentially responsible (i.e. suable)

- Airlines (UA, AA)
- Airports, security firms
- The authorities, the City of New York
- Police, fire brigade
- Motorola
- Terrorist groups
- Members of the Saudi-Arabian government
- ...

# Sources of compensation

Not mutually exclusive:

- Own insurance covers
- Tort system (by suing someone)
- Government programs
- Charity



# Measures taken by government

- Quick
- Unorthodox
- 3 steps

# 1. Ensuring survival of institutions

## *Air Transportation Safety and Stabilization Act* (ATSSA):

- In force 11 (!) days after the attack
- Exclusive jurisdiction: Southern New York
- Retroactive (!) liability cap for U.S. institutions:  
according to existing TPL covers
- Tax breaks for victims
- *Victims Compensation Fund (VCF)*

## 2. Channelling of benefits through VCF

Not compulsory, but with incentives and conditions:

- Claims regulation within 3 years
- Compensation of loss of income, lax onus of proof
- Stricter rules for very high incomes
- Awards for noneconomic loss capped
- No punitive damages
- Own insurance (Life, Workers' Comp) deducted (*contradicts* legal practice)
- Waiver of legal actions for damage

### 3. Creation of an atmosphere of solidarity and patriotism

The (re)insurance industry feared *adverse selection*, with well-off victims preferring to go to court.

Plausible scenario: years of legal proceedings, constant negative press, ..., social self-destruction with huge economic consequences

Instead:

- Mayor Rudy Giuliani: *We're going to rebuild. ... Do things. Go to restaurants.*
- Strong spirit of national solidarity – rather than revenge, opportunism

# Compensated amounts

<b>in ’’’ \$</b>	<b>Source</b>
1.0	Life insurance
1.0	Workers’ Compensation
5.6	VCF
0.4	Other public
0.7	Charity
<b>8.7</b>	<b>Total</b>

# Key figures

- 97% of affected families opted for the VCF, average compensation \$3 million
- VCF saved \$2 billion (>20%) by deducting insurance benefits
- Only 70 families went to court, received \$7 million on average (i.e. not much more – after deduction of legal fees)
- On top: \$1.9''' for police and rescue workers

# Bottom line

- In administrative and economic terms, the U.S. coped well with the 9/11 attack.
- Measures taken were unorthodox, partly *unfair* – but very *effective*.
- Impressive, though perhaps singular, example of a society's ability to take action post crisis – by *briefly breaking* its own rules.

# Thanks

For details see paper on SSRN:

*Mitigation and transfer of risks: prevention,  
insurance, and limited liability*

Additional literature (on insurability of pandemics)  
on next slide.

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# Literature

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