

## Insurance Markets: Lecture 9

### Catastrophes and Insurance

1. What is a catastrophe? Answer: a single event involving large scale destruction of property and/or life. Examples: hurricanes, floods, earthquakes, droughts, famines, Sept 11. (Note: acts of terrorism don't usually cause enough damage to be classed as catastrophes. Wars are in a general sense catastrophic but are not relevant for insurance purposes).

2. Catastrophes seem to be becoming increasingly important for insurers, because:

(i) increasing **frequency** of weather related catastrophes - global warming, deforestation;

(ii) increased **vulnerability** due to population growth, settlement patterns;

(iii) increased **wealth**.

See Tables.

3. What problems of **insurability** do catastrophes present?

(i) It can be difficult to assign probabilities to the events, or probability distributions to the possible scale of losses. This leads to what actuaries call "ambiguity", and results in higher premiums. However:

(a) insurability does not depend on objective probabilities, consider the standard risk exchange model. Insurers can be gamblers on basis of subjective probabilities.

(b) A lot of scientific research is being done on predicting weather-related catastrophes and earthquakes.

(ii) Insurance buyers tend to underestimate risks, so reduces willingness to pay. This strengthened if they have expectations of ex post compensation from the state (more on this below).

(iii) Contracts are incomplete, uncertainty about probabilities leads to withdrawal of cover and renegotiation of contracts following an event that causes updating of probabilities (e.g. Sept 11). This a form of market failure.

(iv) Problems with risk pooling and risk spreading. Law of large numbers does not apply to catastrophes. Losses are large relative to wealth of insurers,

may be positively correlated with other wealth/incomes of insurers, therefore insurers' risk premia may be large.

(v) Potential losses are large relative to ex ante reserve capacity of insurers. Costs of carrying large reserves.

(vi) Usual moral hazard problems - reduced incentives for prevention/mitigation of losses. This again strengthened if expect ex post state compensation. (Risk to life an effective form of coinsurance?)

4. How has the market responded to these problems? (Note: very low levels of insurance cover outside N America and Europe.)

(i) Development of reinsurance markets on a global scale - improving risk-pooling and risk-spreading.

(ii) Insurance pools - mutual insurance for specific types of risk, e.g. nuclear accidents in Germany.

(iii) Securitisation. Scale of catastrophe losses is very small in relation to the capacity of international capital markets. Therefore attempt to create financial instruments, e.g. cat(astrophe) bonds, to tap into this market. Type of Arrow-securities? But still quite limited in scale. Problem seems to be transactions costs (Muth).

(iv) Response by buyers, e.g. airlines, often takes form of calls for state intervention.

5. Role of the State:

(i) sellers of direct insurance

(ii) insurance guarantees, take over losses from private insurers above a certain level (e.g. France with airline insurance)

(iii) State-owned reinsurers?

(iv) Ex ante prevention-mitigation.

(v) Ex post relief, compensation, reconstruction.

6. Arguments for and against state role:

discussion of piece for ifo Schnelldienst.