

The risk of a nuclear accident :
How estimating its economic value ?
Some methodological reflections

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Preliminary remarks

The economic value of a nuclear accident

- has a wider scope than the monetary cost to the nuclear operator and to the local and national governments : these are private or public expenditures induced by nuclear liability law and partially covered by insurance mechanisms.
- includes all costs, including post-accident management and indirect costs to the economy, be they monetary or non-monetary, in the short run and in the long run.

- The economic value of uncertain consequences of any productive economic activity is part of its cost and should be an ingredient of rational choices.
- For most activity, this cost is (or, at least, could be) provided by insurance pricing.
- This is not the case for nuclear risk because of the limited liability of nuclear operators. Nuclear operators benefit from a hidden subsidy (but they are not the only ones...).
- Even if the liability of nuclear operator were unlimited, it is unlikely that insurance mechanisms could provide an estimate of the economic value of nuclear risk. Why ? How could we proceed ?

Specificities of nuclear risk

Nuclear risk differs from standard insurance risks, because it is

- **imperfectly mutualisable** : accidents are rare events (black swans) , compensation of losers would be difficult, sometimes impossible,
- **imperfectly diversifiable** : a nuclear accident could entail macroeconomic consequences : it is a systemic risk,
- **imperfectly known** : it is difficult to know the probability, it is an « ambiguous risk »),

- with potentially very large consequences : it is a catastrophe risk),
- with losses in the very long term : what will be the ultimate consequences, what is the right discount rate ?

- Insurance markets provide cost estimates for risks with some of these features : e.g., reinsurance, cat-bonds and other forms of catastrophe risk securitization for natural disaster risks (e.g., estimating the economic value of earthquake risk in California).
- However, nuclear risk accumulates difficulties (from conceptual and practical standpoints).
- The question is : how computing the « risk premium » of nuclear risk, and then how should we use this risk premium in nuclear power management ?

- Answering this question would require thorough research. Economic theory provides a striking characterization of the risk premium for a perfectly diversifiable, fully mutualisable risk induced by government decision-making (the so-called [Arrow-Lind theorem](#)) : it should be zero !
- Intuitively, governments can spread their risks over a large number of individuals, which makes the aggregate negligible. Consequently, governments should not include any risk premium in their discount rates.
- [The Arrow-Lind theorem does not apply for nuclear risks](#) because all its assumptions are invalid. Economic rationality requires to know more about the risk premium, for instance when risks are ambiguous and systemic.

Monitoring systemic risks

- The **financial crisis** that started in 2007 with the subprime crisis and went on with the sovereign debt crisis has a strong systemic component.
- The **Basel Committee** on Banking Supervision has decided to strengthen the capital base of large banks (raising the quality, consistency and transparency of capital) and to monitor the liquidity of banks.
- This is analogous to constrain banks to provision systemic risk.

Nuclear risk as a systemic risk

- A severe nuclear accident would have large-scale macroeconomic effect. This should lead governments to consider the systemic component of nuclear risk.
- The analogy between banking supervision and nuclear risk management is enlightening. Making banking systems more resilient in case of a systemic financial crisis is conceptually similar to improving the resilience of an economy in the case of a nuclear accident.
- Provisioning nuclear risks (e.g., by increasing the capital of nuclear operators) would be costly, in the same way as the Basel III regulation will be costly to banks. This is a way toward an economic value of nuclear risk