

Nuclear Deterrence Can Benefit from Using Actuarial Science

By

Joe Buff

With the strategic environment getting more precarious every day, incorporating new methods of thinking about risk mitigation can aid the United States in better addressing the threat posed by Russia, China, and North Korea. Incorporating actuarial methods into American approaches to strategic risk assessment is one way to do that.

Actuaries are risk-mitigation specialists. Most work in the financial services industry and employ rigorous mathematics plus curbside human psychology. They help engineer the ongoing solidity of insurance companies and pension plans.

Life Insurance and Nuclear Deterrence

Much as America's nuclear triad of submarine-launched ballistic missiles (SSBN), bombers, and intercontinental ballistic missiles (ICBM) take over a decade to design and field, the multi-trillion-dollar financial security business issues legally binding long-term contracts. Neither military force structure nor insurance and pensions are changed quickly.

The failure of nuclear deterrence failure has the potential to end the lives of millions of people. Insurance and pension failures can impair the livelihoods and financial security of millions as well.

In nuclear deterrence, there is a fundamental question that is always present: how much is enough? Too few nuclear weapons can lead to deterrence failure. Too many is unaffordable and increases the risks of counterproductive arms racing and crisis instability.

In actuarial science, the fundamental question is the same: how much is enough? Of course, it is insurance premiums that are the concern, but the methods for getting to the right answer are similar. Charge too much and a policy will not sell. Charge too little and the policies will sell like hotcakes, but there will be too little money to cover claims.

Prospective customers will "anti-select" against the financial-services vendor, doing whatever is in their own best interests and harming the corporation financially. Similarly, America's adversaries act in their own best interests, using tactics harmful to the United States.

Actuaries advise corporate boards of directors on sound balance sheet structure and comptroller practices—so that cash inflows exceed cash outflows. Nuclear deterrence experts advise national leaders and military commanders on sound force structure and posture, so that American capability exceeds that of adversaries.

How Actuaries Work

Actuaries run stochastic computer models of company financial results over a multi-decadal future horizon to help select desirable business strategies. The process works in the following way.

First, they "sensitivity test." Then they calibrate the key actuarial assumptions required by the modeling, such as policyholder lapse rates, claim rates, and operating expenses.

Second, they create a large set of scenarios to encompass what the volatile external environment may look like over time. This includes returns on different investments, competitor behaviors, and consumer demand.

Third, for each business strategy under consideration, they study the range of outcomes each yields across the scenario set. They then help pick the option that best “immunizes” against downside outcomes while providing the most favorable and achievable upside.

Throughout, actuaries help elicit every assumption that influences company success or failure—including hidden ones. They then red-team appropriate values for each. Actuaries monitor unfolding conditions to see if any assumptions need to be adjusted and the company strategy rethought.

Four Nuclear-Deterrence Theory Applications of Actuarial Science

Applying an actuarial perspective to nuclear deterrence theory supports modernization of the nuclear triad. It also suggests that the arsenal’s size should not be whipsawed by short-term fluctuations in real or perceived probability of enemy nuclear attack. Given the obscurity of true enemy intentions and the protracted recovery time from big arms cuts, a larger arsenal is advisable. Events show that (1) modernized triad platforms, (2) sufficient warhead counts, (3) a responsive science and industrial base, and (4) resilient manpower need to be committed to and sustained for the long term.

Nuclear arsenal rightsizing should provide for multiple nuclear wars over an extended time frame. American nuclear forces and infrastructure are certain to be high priority targets in any large-scale nuclear attack or during escalation from a limited attack. One serious failure of deterrence, in which the United States expends or loses a significant fraction of the triad, might facilitate additional nuclear attacks before there is an opportunity to rebuild an adequate force.

Nuclear dangers should be compared using event-loss expectations, not just event probabilities. To prioritize preventing events with a relatively high probability, but survivable cost, while discounting the necessity of preventing different events with low probability, but catastrophic cost, would fail actuarial tests. In nuclear strategy, it is neither valid logic nor wise statecraft.

Actuarial risk theory calculations also show the importance of nonproliferation in controlling nuclear dangers. As each new nuclear power joins the club, the number of sequences in which countries could start a nuclear conflict grows significantly. This means it is incumbent on the United States to be prepared for such scenarios.

Where insurance rates and nuclear arsenal size differ is in their financial impact on the insurance provider and the United States. For the insurer, survival has a large financial component where margins are tight. For the United States, the cost of the nuclear arsenal is less than 0.1 percent of the federal budget and less than 0.01 percent of gross domestic product. This means the nation has ample resources to buy down risk without threatening financial stability.

Conclusion

Actuarial science analytics can be applied to help develop, communicate, and teach nuclear strategy. Such an approach might aid in eliminating pop-culture misunderstandings, myths, and misinformation. It might also encourage congressional appropriators to better support the nuclear enterprise. Given the multi-decadal time horizon needed to significantly augment US Strategic



Global Security Review

Command's existing strength, such actuarial applications are worth further explication and evaluation, and sooner rather than later.

Joe Buff is a Fellow of the Society of Actuaries (1980), with twenty years' experience in pensions, insurance, management consulting, and on Wall Street. Views expressed in this article are the author's own.