Cost of errors of omission and errors of commission in risk management

By
Zur Shapira
New York University

Two major problems in risk management are uncertainty and the large scale of potential damage. The two aspects are usually described by the expected damage. This averaging figure may not describe well the perspective of the person in charge of risk management of a specific potential disaster. This note describes the dilemma of such a person.

Sophisticated instruments have improved the estimates of the occurrence of natural hazards in cases such as hurricanes and floods. While the increase in precision of estimates helps to prepare for dealing with potential natural disasters, the issue of risk management is very complex and involves many additional aspects. Among these are the public awareness of the potential damage and their readiness to behave according to rules issued by the local officials, such as in cases of evacuation due to rising river waters that may end in a flood. When natural disasters threaten communities rather than just individuals, the beliefs of local residents, and their risk perceptions are important. In addition, the role local government plays is crucial. An important aspect that needs to be examined is the behavior of local officials. They are likely to act in line with the forecasted estimate of the likelihood of occurrence of say a flood, the potential estimate of the damage, and their own incentives and penalties from making a correct or a faulty decision.

Consider the case of hurricane Floyd. In September 1999, this hurricane was approaching the southeastern coast of Florida. The mayor of Miami who is the highest elected official of Dade County, was notified by the National Hurricane Center (NHC) that even though the hurricane was approaching Miami it was destined to turn north and not land near Miami. By the time Floyd reached 100 miles off the coast of Miami the mayor who was in telephone contact with the head of the NHC decided to call a partial evacuation. Floyd moved further to the coast, turned north and landed in North Carolina causing a lot of damage. The mayor's decision was eventually a false alarm. The evacuation was costly (obviously less costly what could have happened if Floyd reached land n Miami). While most rational people would have made the same decision, there are people amongst those who bear the cost of a false alarm that become very critical after he fact and may even demand compensation as has been the case in some evacuations that turned out to be false alarms in Western Florida. The role of the county manager in charge of evacuation decisions is very complex and is becoming more complicated every year with the continued growth in the residential population of southern Florida.

In many cases elected officials do not have the jurisdiction to force residents to evacuate. Furthermore, public reaction to warnings about hurricanes often reveals misalignment between the forecasts and actual behavior. For example, warning about Hurricane Andrew, (that so far has been the most costly hurricane in the U.S. in recent history $35 billion), were met with disbelief form some of the southern Florida population, especially those who moved there in the years preceding Andrew where no strong hurricane hit that area. Consequently, their willingness to evacuate was not high.

Modeling the decision maker dilemma

Over the last few years I have been using signal detection theory (SDT) to analyze the decision maker's problem in terms of the costs of type I and type II errors. For example, I used it to illustrate the problem of strategic surprise in commercial relations between buyers and sellers (Lampel & Shapira, 2001). The model could be used to analyze strategic surprises in military contexts such as in the cases of Pearl Harbor and the Yom Kippur war. In those and similar situations, the decision maker is faced with the possibility of committing one of the above errors, both of them are costly.

SDT can be also be applied to dealing with terrorism, the two errors are very much on the mind of security officials who screen people at locations such as airports. The post September 11 public reaction has been supportive of government actions but it is unclear how long will the public tolerate the inconvenience if no more signs of urgency will surface.

Potential issues for discussion

- Are there better ways to educate people living in disaster prone areas about the major parameters involved in disasters?
- How to make government officials cognizant about the role of psychological, sociological and managerial aspects of the problem. For instance, the US invests many millions of dollars in weather forecasting instrumentation but very little in understanding judgmental problems of forecasting and social/psychological problems associated with evacuation.
- The public-private issue is important vis a vis the incentives and penalties of elected officials. Would a professional private organization do a better job in

managing evacuations in the case of hurricanes? The evidence form airport security in the pre September 11 period is not necessarily supportive of such a proposition.

References

Lampel, J. & Shapira, Z.. 2001. "Judgmental errors, interactive norms and the difficulty of detecting strategic surprises". *Organization Science* ,12, 599-601.