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MATHEMATICS AND STATISTICS
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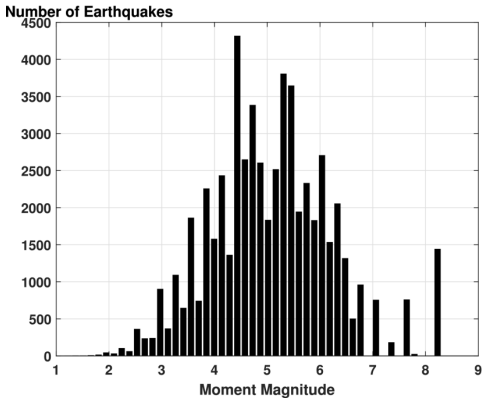

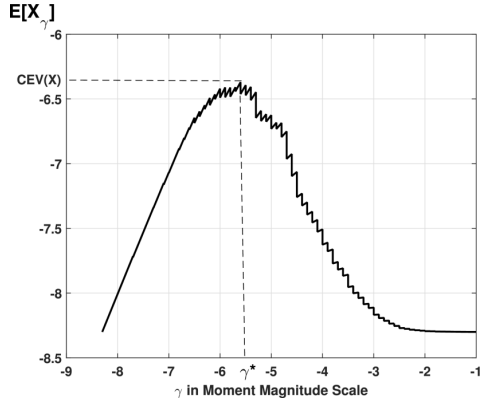

WHEN THE EXPECTED VALUE IS NOT EXPECTED

Abstract. Our motivation for the research to be described is derived from the following fact: The expected value of a random variable X, denoted $\mathbb{E}(X)$, is often inconsistent with what human beings may actually expect based on psychological considerations. This is particularly important when predictions involving life-threatening situations arise. To bring this issue into sharp focus, this seminar begins with a set of questions related to the recent rampage of Hurricane Irma in the State of Florida. When the use of empirical data leads to an expected value forecast of storm surge wave height which is unduly pessimistic, will the "boy who cried wolf" effect be in play the next time a hurricane approaches the mainland? On the other hand, if the formally calculated expected wave height is too optimistic, might it be the case that many will take inadequate protective measures? Based on such considerations, we define a new alternative to $\mathbb{E}(X)$ which we believe is quite useful for "mission critical" situations with downside risk being of paramount concern. We call this new metric the *Conservative Expected Value* and denote it by $\mathbb{CEV}(X)$. In this talk, we provide the technical definition of the $\mathbb{CEV}$, compare it with the classical expected value and describe some aspects of the rich mathematical theory which accompanies it. We also include a description of some of the studies we have conducted using the $\mathbb{CEV}$ to evaluate historical data.

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B. Ross Barmish received his Ph.D. degree in electrical engineering from Cornell University in 1975. From 1975 to 1978, he was an Assistant Professor of Engineering and Applied Science at Yale University. From 1978 to 1984, he was as an Associate Professor of Electrical Engineering at the University of Rochester. He joined the University of Wisconsin–Madison in 1984, where he is currently a Professor of electrical and computer engineering. His research interests include robustness of dynamical systems, building a bridge between feedback control theory, and trading in complex financial markets. Prof. Barmish was a recipient of the Best Paper Award (1986-1989 and 1990-1992) from the International Federation of Automatic Control, and the 2013 Bode Prize by the IEEE Control Systems Society.

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