

Title: What Is a Good External Risk Measure: Bridging the Gaps between Robustness, Subadditivity, and Insurance Risk Measures

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Abstract:

Choosing a proper risk measure is of great regulatory importance and is relevant to the interfaces of operations and finance, as exemplified in Basel Accord which uses VaR (or quantiles) in combination with scenario analysis as a preferred risk measure for banking and operational risk. Two main families of axiomatically based risk measures are the coherent risk measures, which assume subadditivity for random variables, and the insurance risk measures, which assume additivity for comonotonic random variables. We propose new, data-based, risk measures, called *natural risk statistics*, that are characterized by a new set of axioms. The new axioms only require subadditivity for comonotonic random variables, consistent with the prospect theory. We point out while many risk measures may be suitable for internal risk management, robustness is an important consideration for external risk measures. Comparing to the previous measures, the natural risk statistics include the tail conditional median which is more robust than the tail conditional expectation suggested by coherent risk measures; and, unlike insurance risk measures, the natural risk statistics can also incorporate scenario analysis. The natural risk statistics includes VaR as a special case and therefore shows that VaR, though simple, is not irrational.