



## Risk Modelling - Extreme Value Theory

Extreme Value Theory (EVT) is particularly useful for analysing events that have a low probability of occurrence but can have significant impacts, such as severe floods, large earthquakes, extreme weather events, and financial market crashes.

In this article Tawanda Mushore - Seed Head of Research, gives us insight into **Risk Modelling - Extreme Value Theory**.

### Unveiling the Unpredictable

Imagine a severe flood that occurs every 100 years. To build an effective bridge or dam, the effects of the severe flood must be considered. While the last 99 years provide reliable long-term data on what happens on average, if the flood has not occurred yet the impact is underestimated. Hence, a structure built on these statistics alone will likely not survive the flood.

Where a lot of variability and extreme values exist, risk tends to be underestimated by focusing on a normalised environment. Using the mean (average) and deviations around this mean undervalues the impact of extremes. With a 100-year flood, it takes one event for immense destruction, hence it is essential to properly account for extremes.

Extreme Value Theory (EVT) is a branch of statistics dealing with extreme values, assessing the probability of events more extreme than previous observations. The riskiest events tend to happen with lower probability, hence less frequency for analysis. EVT allows for such analysis.

EVT is more appropriate for modelling climate change extremes or tail risks of pandemics, rather than naively interpolating from expected averages. Other practical uses include predicting the probability distributions of:

- Extreme floods
- Size of freak waves
- Road safety
- Mutational events during evolution
- Magnitude of large insurance losses
- Equity (stock) market risk

Day-to-day stock market returns are generally modelled using normal distributions using the mean and deviation from the mean (standard deviation). By not considering extreme deviations like market crashes, the risk is underestimated by focusing on averages. Since capital can be wiped out by a single or series of unexpected negative returns, it is important to model extremes appropriately.

A useful technique to model the behaviour of extreme values is the Peak-Over-Threshold (POT) method which builds a probability distribution using only the values below or above a threshold. This provides a better understanding of extreme market events including likelihood and intensity, with which risk can be better managed. POT is used in many fields to identify extremal events such as wave heights, floods, insurance claims, etc.

Risk management is a key component of Seed's investment process. As a progressive manager, we constantly search for techniques to improve risk management to ensure that clients' capital is protected. While we use conventional industry methods, we continue to investigate techniques that give us an edge in delivering the best possible outcomes for clients.



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The Seed team looks forward to assisting you on your investment journey. Do not hesitate to take full advantage of our expertise by emailing any questions to [investmentteam@seedinvestments.co.za](mailto:investmentteam@seedinvestments.co.za).

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