Identifying and managing the nugget effect in your resource estimate

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Nuggets exist, they are a real, naturally occurring phenomenon that can be a blessing and a curse at the same time. The monetary worth of these nuggets can be disproportionate relative to other samples in the population and capturing their value without over-representing their effect on the results is one of the greatest challenges in resource estimation. When our end goal is a mining business with healthy quarterly and annual financial statements, the identification and management of these samples is critical.

The "nugget effect" is a term coined by the geostatistical community to describe the variability between samples at close spacing. A high nugget effect implies that, relative to nearby samples in a geological domain, values can differ significantly. The dilemma we face is that the resource estimation methods at our disposal rely on an assumption of similarity between nearby samples. This is further complicated by the fact that development decisions are being made when sample spacing is sparse.

There are many tools and methods used for identifying these erratic samples, including statistical analysis, spatial analysis, and 3D visualization, coupled with experience and an understanding of the geological mechanisms at play responsible for their occurrence. In order to understand the variability characterizing these populations, additional resolution is usually required and accomplished through tighter spaced drilling, bulk sampling, and where possible, test mining. Advanced operations may also benefit from benchmarking / analysis approaches and robust reconciliation procedures.

The resource estimation approaches most widely used in the industry are not well suited as stand alone estimators for high nugget deposits and modifications are almost always required. Popular tools used by the industry, designed to mediate the influence of nuggets during estimation, include grade capping/cutting, outlier restriction, non-linear estimation, and high grade domaining.

This talk presents and discusses tools for identifying and managing the nugget effect in resource estimation.

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