CHARACTERISING THE SHORT-SCALE VARIOGRAM

The behaviour of the variogram near the origin reflects the local controls on the mineralisation. Very important calculations are made using the variogram near the origin or short-scale variogram. If poorly defined, it may be a significant risk.

For instance, misinterpreting the nugget variance may lead to sub-optimal grade-control kriging and metal loss through inadequate ore-waste block allocation. Likewise, incorrectly calculating a block dispersion variance may result in a biased grade-tonnage estimate above cut-off, poor mine design and lower return.

Exploration commonly uses twinning, fencing (Figure 1) or scissor drilling (Figure 4) to investigate the short-scale variogram. Figures 2 and 3 show some of the challenges often associated with modelling such data. Trenching, winzing, pitting and aditing are further options that usually provide a larger amount of geological and grade data. All these techniques have their pros and cons, which have to be carefully considered at the time of planning such programs. Cost and time are a further consideration and often a constraint.

At operations (Figures 4 and 5), grade control data is abundant and, subject to sampling quality, can contribute very valuable short-scale variogram knowledge. This may provide a real opportunity to revisit and improve the resource modelling methodology (including the variogram of the deposit), understand better an actual vs. predicted gap and enhance strategic mine planning. In some circumstances, this knowledge may also assist in modelling a near-by deposit that is at an early stage of resource definition and has no close-spaced data available.

The variogram is a key tool. We use it to perform kriging, compute geostatistical variances, and develop conditional simulation models to cite some of the main geostatistical applications.

It is essential to characterise it properly at all scales.

Further discussion on this topic can be found elsewhere on this web site.