INTRODUCTION TO GLOBAL Q(T) CURVES

Let us consider a hypothetical deposit drilled on 50m centers. Closely spaced data have indicated a short range of 12m. A Selective Mining Unit (SMU) of 5m x 5m x 5m is being considered. Figure 1 exhibits three interesting global Q(T) curves\(^1\) for this deposit.

Let us read how much metal is contained in 25% of the tonnage (T=25%).

The green Q(T) curve refers to the distribution of composites and indicates that the 25% highest grades carry 80% of the metal.

The red Q(T) curve refers to the distribution of the real SMU grades, let us call it the direct Q(T) curve. For T=25%, we read Q=62%.

Q=18% represents the loss of metal associated with the composite-to-SMU change of support or "support effect". Figure 1 shows that, logically, the extent of loss varies with T.

At the time of mining, the SMU grades will not be perfectly known but only estimated (grade control). Inevitably, some degree of ore-waste misallocation will take place, which entails, in this hypothetical example, a further 8% metal loss (Q(T)= 54%). The black (dotted) Q(T) curve is referred to as the indirect Q(T) curve.

Q=8% represents the loss of metal due to the "information effect".

How can direct and indirect global Q(T) be estimated with the data at hand?

Direct Q(T) curves can be calculated using the histogram of the composites, the variogram and a change-of-support model such as for instance the Discrete Gaussian (DG) model. This model is easy to use, has worked well across a wide range of deposits and proved robust in highly skewed grade environments.

Within the DG-model framework, computing indirect global Q(T) curves is easy. Note that only the characteristics of the future grade control are required: geometry of the blast-hole pattern, sampling variance for instance. No grade-control assays are needed.

The sensitivity of direct and indirect global Q(T) curves to changes made to the variogram, SMU size or grade-control characteristics can be readily assessed. This provides opportunities to:

- Identify which parameter has the greatest impact on the resource-to-reserve conversion (feasibility, due diligence);
- Check the validity of a resource estimate (due diligence, project audit); and,
- Interpret reconciliations at an operation.

Direct and indirect global Q(T) curves are a great tool that can assist in resource risk identification and management, and in optimising the orebody. Further discussion on change of support and information effect can be found elsewhere on this web site.

(1) Free selection: a cut-off grade is applied to the grade distribution (composite, SMU).