Cutting or Capping of High Assay Values

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Overview

- Why cut or cap high assay values?
- Emphasis on gold
- Cutting curve for producing mines
- Methods for non-producing projects
- What not to do
- Conclusions
Grade Cutting

Why cut or cap high assay values?

- Assay grade distributions tend to be strongly skewed
- Dominated by low values with lesser high values
- Range can be several orders of magnitude
- For gold, distribution can have an erratic tail
- For coarse gold, erratic high values can be caused by presence of a gold particle
- High assay values can have a disproportionately large influence on the average grade
- High values must be treated to reduce their influence
- Most common treatment is cutting or capping
Producing Mines

• Cutting curve – a graphical approach
• Plot average cut grade vs cutting level
• Use samples that represent material mined and processed from a specific volume or volumes
• Use calculated head grade for the same volume or volumes of material mined and processed
• Determine cutting level from head grade plotted on cutting curve
• Use a minimum of 500 or 1,000 samples
Grade Cutting – Cutting Curve

![Graph showing Grade Cutting and Cutting Curve with points and trend line indicating the relationship between cutting level and average cut grade per tonne of Au.]
Grade Cutting

Non-Producing Projects

- Zoom in to high end of simple histogram to identify erratic tail
- Cumulative probability plot to identify erratic tail
- Decile plot to assess effect of capping on highest percentile of data set
- Cutting curve to assess effect of capping on average grade
Univariate Statistics of Gold Assay Data Set

- All sample lengths 1 m
- \( N = 404 \)
- Mean 1.57 g/t
- Median 0.30 g/t
- Maximum 99 g/t
- Variance 44.74
- Standard Deviation 6.69
- Coefficient of Variation 4.26
# Gold Assay Data Set – Highest 15 Values in g/t

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<thead>
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<th>Value</th>
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<tbody>
<tr>
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<tr>
<td>8.13</td>
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<tr>
<td>7.80</td>
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</table>
Grade Cutting

Au Histogram

Frequency

Upper Limit of Bin in g/t Au

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

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Grade Cutting

Au Log Histogram

Frequency

Upper Limit of Bin in g/t Au
Grade Cutting – Zoom on Histogram Tail

Au Histogram

Cut?
Grade Cutting – Log Probability Plot
Grade Cutting – Decile Analysis

Au Percentile Analysis

Top 10 Percentile Au (g/t)
Grade Cutting

Total Contained Metal Removed at Various Cutting Levels

Gold Metal Removed

Cutting Level

Cut to 10  Cut to 20  Cut to 30  Cut to 40  Cut to 50  Uncut
Au Mean Cut Grade at Various Cutting Levels

Cutting Level

Mean Cut Grade (g/t)

Cut to 10
Cut to 20
Cut to 30
Cut to 40
Cut to 50
Uncut

Mean Cut Grade (g/t)
Grade Cutting

- Histogram suggests 25 g/t cutting level
- Log probability plot suggests 10 g/t Au cutting level
- Decile analysis suggests 15 g/t cutting level
- Recommend 20 g/t cutting level
Grade Cutting

DO NOT:

• Use a certain percentile of the data set such as 95%
• Use the log histogram – no detail on erratic tail
• Use too many bins in the histogram – too much detail
• Cut or cap composites instead of assays
  • High assay values can get smeared out in the composites
Grade Cutting

Conclusions

• Choose a cutting or capping level with care
• Use more than one method if possible
• For producing mines, make sure the sample data represent the mined volume
• Review the effect of cutting on the average grade and contained metal
• Consider alternate methods of reducing the influence of erratic high assays on the mean resource grade
  • Be aware that these may not have the same effect as capping
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