Goldsmith Functions

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3.1 Inputs

The formulas have several inputs. While some are used as placeholders in definitions, others have actual meaning in the context of the application of the functions.

3.1.1 Definition of Variables (by function)

• $\Xi(v; w; x; y; z)$: All inputs to this function are placeholders. $v, w, x, y, z \in \mathbb{R}$
• $Rd_n(x)$; $Ex_n(x)$: All inputs to this function are placeholders. $x \in [0; 100]$; $n \in \mathbb{N}_0$
$\Theta(r)$; $\beta(r)$: r is a variable which controlls the sensitivety of the Φ_e, Φ_0 and Φ_n functions. $r \in \mathbb{Z}$
• $\Phi_e(c; r)$; $\Phi_0(c; r)$; $\Phi_n(c; r)$: c is the main input variable of the Φ_e, Φ_0 and Φ_n functions. It can be thought of as ,,purity“ or other qualities. (see Examples section for more details.)$c \in [0; 1]$ (for $\Phi_e \quad c \in [\Theta(r); 1]$); r is a variable which controlls the sensitivety of the Φ_e, Φ_0 and Φ_n functions. $r \in \mathbb{Z}$
• $\Lambda_0(s; r)$; $\Lambda_n(s; r)$: s is the score calculated from c using Φ_0 or Φ_n. $s \in]-\infty; 100]$; r is a variable which controlls the sensitivety of the Λ_0 and Λ_n functions. $r \in \mathbb{Z}$
• $\delta(x)$; $\delta_s(x)$: All inputs to this function are placeholders. $x \in [0; 1[$
• $\chi(x)$: All inputs to this function are placeholders. $x \in [0; \infty[$

3.2 Formulas

$$\Xi(v;w;x;y;z) = \begin{cases} v & \text{for} \quad y > z \\ w & \text{for} \quad y = z \\ x & \text{for} \quad y < z \end{cases} \tag{1}$$

$$Rd_n(x) = x \cdot 10^n + 100 \cdot (1 - 10^n) \tag{2}$$

$$Ex_n(x) = Rd_{-n}(x) \tag{3}$$

$$\Theta(r) = (1 + 10^{-r})^{-9} \tag{4}$$

$$\beta(r) = 9 \cdot \log_{10}(1 + 10^{-r}) \tag{5}$$

$$\Phi_e(c;r) = 100 \cdot \sqrt{1 + \frac{\log_{10}(c)}{\beta(r)}} \tag{6}$$

$$\Phi_0(c;r) = \Xi(\Phi_e(c;r); \Phi_e(c;r); 0; c; \Theta(r)) \tag{7}$$

$$\Phi_n(c;r) = Rd_n(\Phi_0(c;r)) \tag{8}$$

$$\Lambda_0(s;r) = 10^{\beta(r) \cdot \left(\left(\frac{s}{100}\right)^2 - 1\right)} \tag{9}$$

$$\Lambda_n(s;r) = \Lambda_0(Ex_n(s);r) \tag{10}$$

$$\delta(x) = -\log_{10}(1 - x) \tag{11}$$

$$\delta_s(x) = -\lfloor \log_{10}(1 - x) \rfloor \tag{12}$$

$$\chi(x) = \sum_{k=1}^{x} \left(\frac{9}{10^k}\right) = 1 - 10^{-x} \tag{13}$$

3.3 Explanation

3.3.1 Explanation of Functions

- $\Xi(v;w;x;y;z)$:
- $Rd_n(x)$:
- $Ex_n(x)$:
- $\Theta(r)$:
- $\beta(r)$:
- $\Phi_e(c;r)$:
- $\Phi_0(c;r)$:
- $\Phi_n(c;r)$:
- $\Lambda_0(s;r)$:
- $\Lambda_n(s;r)$:
- $\delta(x)$:
- $\delta_s(x)$:
- $\chi(x)$:

3.4 Outputs

3.5 Interpretation of outputs

3.6 Examples

There are several possible areas of application for the goldsmith functions. Some of these applications include the purity of precious metals, reliability, accuracy of AI algorithms, data fidelity, purity of silicon in the semiconductor industry and many more.
Below there are some example values.

- $99.999998\%\ gold \triangleq 88.19r8 - 0\ gold$
- $99.99999999954\%\ silicon \triangleq 69.92r12 - 0\ silicon$
- $10.0\%\ gold\ content\ in\ ore \triangleq 79.43r0 - 0\ gold\ content\ in\ ore$
- $58.3\%\ gold\ content\ in\ 14k\ gold \triangleq 60.91r1 - 0\ gold\ content\ in\ 14k\ gold$
- $93.0\%\ forgor \triangleq 43.55r2 - 0\ forgor$
- $0.6\%\ copper\ content\ in\ ore \triangleq 42.42r0 - 0\ copper\ content\ in\ ore$
- $99.5\%\ uptime \triangleq 66.54r4 - 0\ uptime$

The general notation is given by the following standart.

- $[100 \cdot c]\%\ [quantity] \triangleq [\Phi_n(c; r)]r[r] - [n]\ [quantity]$

The notation standart is intended for the use in various industries and is deliberatly kept concise.

4 Conclusions

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5 Refrences

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6 Appendices

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