**Utility Functions Guide**

1. **Linear Utility Function:** u(w) = w
   * Risk-neutral attitude.
2. **Exponential Utility Function:** u(w) = -e-αw

* **Constant:** α
* **Interpretation:** α is the rate of utility decay as wealth increases. It reflects the degree of the user’s risk aversion. A *higher* α indicates *greater* risk aversion.
* **Suggested Range:** α is typically a small positive number. Common values range from 0.01 to 0.1, with values close to 0 indicating near *risk-neutral* behavior and values higher than 0.1 indicating extremely high risk aversion.

1. **Constant Relative Risk Aversion (CRRA) Utility Function:** u(w) =

* **Constant:** γ
* **Interpretation:** γ is the coefficient of relative risk aversion. It measures how risk aversion changes in response to changes in wealth. A higher γ indicates greater risk aversion.
* **Suggested Range:** γ typically ranges from 1 to 3. γ = 1 results in a *logarithmic utility function*.

1. **Square Root Utility Function:** u(w) = √w
   * Risk-averse attitude where utility increases with the square root of wealth.
2. **Logarithmic Utility Function:** u(w) = ln(w)
   * Risk-averse attitude where utility increases logarithmically with wealth.
   * Note: This is used in the Kelly Criterion.
3. **Quadratic Utility Function:** u(w) = w – βw2
   * **Constant:** β
     + **Interpretation:** β determines how quickly utility turns negative as wealth increases (“diminishing returns”).
     + **Suggested Range:** β should be a small positive number, typically between 0.0001 and 0.01. Higher values will quickly turn utility negative for larger wealth levels.
4. **Hyperbolic Absolute Risk Aversion (HARA) Utility Function:** u(w) = (α + βw)y
   * **Constants:** α, β, y
   * **Interpretations:**
     + α: Affects the base level of utility as wealth approaches zero.
     + β: Indicates how wealth influences utility (higher β means that changes in wealth have a larger effect on utility).
     + y: Indicates the degree of risk aversion.
   * **Suggested Ranges:**
     + α: Typically a small positive number that ensures α + βw > 0.
     + β: Typically a small positive number between 0.0001 and 0.01 (see β in Quadratic Utility Function).
     + y: A value greater than zero that’s typically between 0.5 and 5. Values closer to 0.5 represent moderate risk aversion, values around 2 to 3 reflect substantial risk aversion, and values closer to 5 indicate very high risk-aversion.
5. **Power Utility Function:** u(w) = for k < 1
   * **Constant:** k
   * **Interpretation:** k influences the concavity of the utility function. Smaller k values indicate higher risk aversion.
   * **Suggested Range:** k ranges from -∞ to 1, excluding 0. k = 1 gives a linear utility function.
     + **For 0 < k < 1:** Individuals become *less* risk-averse with increasing wealth.
     + **For k < 0:** individuals become *more* risk-averse with increasing wealth.