Different Types of Derivatives

In this note, I want to enumerate some different types of derivatives, specifying their names and their payoff schemes. Broadly speaking there are two classes of options: **European**, which can only be exercised at maturity, and **American**, which permit early exercise. The different payoff schemes could be applied to both classes.

Path Independent Options

European Call on Stock $\varphi(S, K) = \max\{S - K, 0\}$

European Put on Stock $\varphi(S, K) = \max\{K - S, 0\}$

Cash-or-Nothing (CON) Call   A so-called digital or binary option:

$$\varphi(S, K) = \begin{cases} \$1 & S > K \\ 0 & S \leq K \end{cases}.$$

All-or-Nothing (AON) Call   A so-called digital or binary option:

$$\varphi(S, K) = \begin{cases} \$S & S > K \\ 0 & S \leq K \end{cases}$$

Path Dependent Options

Lookback Floating Call $\varphi(S) = S(T) - \min_{s \in [t,T]} S(s)$.

Lookback Fixed Call $\varphi(S, K) = \max\left\{0, \max_{s \in [t,T]} S(s) - K\right\}$.

Asian Arithmetic Call $\varphi(S, K) = \max\{0, \frac{1}{T-t} \int_t^T S(t)\, dt\}$.

Asian Geometric Call $\varphi(S, K) = \max\left\{0, \exp\left(\frac{1}{T-t} \int_t^T \ln(S(t))\, dt\right)\right\}$.