$S(0)$, $S(t)$, $S(T)$

$0 \quad t \quad T$

$\{S(t), 0 \leq t \leq T\}$

Payoff function of the derivative security

Payoff

E.G. $\nu$ ... excess above the strike price (if any) on the exercise date

**EARLY EXERCISE**

**Case #1:**

The only admissible exercise date is $T$. $\Rightarrow$ EUROPEAN

**Case #2:**

Any time prior to $T$ is admissible exercise date. $\Rightarrow$ AMERICAN

Expiration date

**Case #3:**

A subset of dates prior to $T$ contains all admissible exercise dates $\Rightarrow$ BERMUDAN
The simplest bet: COIN TOSSES

One trajectory of the stock price.

DIGITAL OPTIONS

K...fixed strike/trigger price

<table>
<thead>
<tr>
<th>&quot;reward&quot;</th>
<th>&quot;win&quot;</th>
<th>S(T)≥K</th>
<th>S(T)&lt;K</th>
</tr>
</thead>
<tbody>
<tr>
<td>cash ($1)</td>
<td>CASH CALL</td>
<td>CASH PUT</td>
<td></td>
</tr>
<tr>
<td>asset (1 unit)</td>
<td>ASSET CALL</td>
<td>ASSET PUT</td>
<td></td>
</tr>
</tbody>
</table>

→ cash-or-nothing

→ asset-or-nothing

Option PRICING needs the payoff structure?!

CASH CALL

- Payoff

V_{CC}(T) = \mathbb{I}_{\{S(T)≥K\}}

Indicator random variable:

\[ \mathbb{I}_A = \begin{cases} 1 & \text{A happened} \\ 0 & \text{A did not happen} \end{cases} \]

\[ \mathbb{I}_A(\omega) = \begin{cases} 1 & \text{if } \omega \in A \\ 0 & \text{if } \omega \notin A \end{cases} \]
The payoff function

\[ \psi_C (S) = \mathbb{I}_{[K,\infty)} (S) \]

the final stock price

The Payoff curve

Indicator function:

\[ \mathbb{I}_B (x) = \begin{cases} 1 & x \in B \\ 0 & x \notin B \end{cases} \]

B a set in the reals

\[ \text{nondecreasing} \Rightarrow \text{Long position with respect to the underlying.} \]

\( S \) (final asset price)