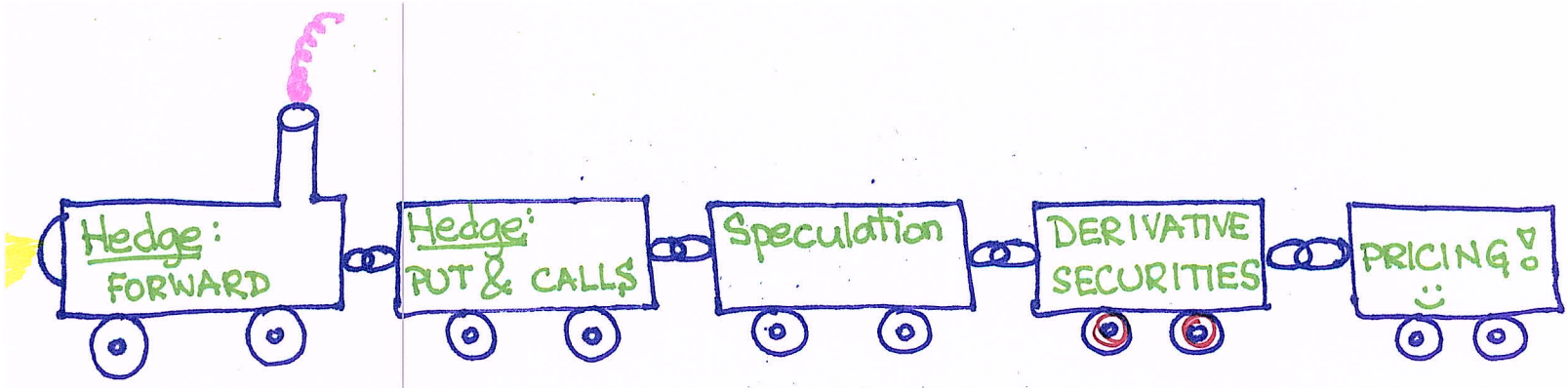
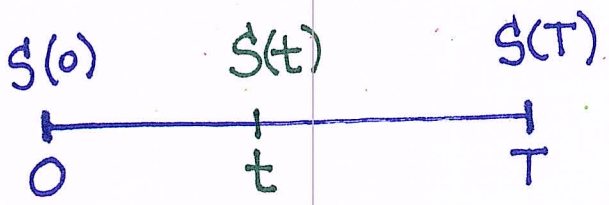
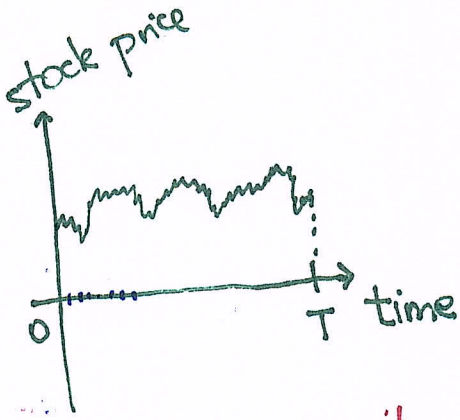


stock prices



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



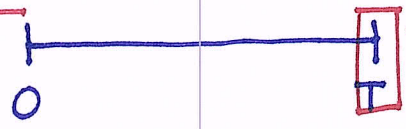
v... payoff function of the derivative security

PAYOFF

E.G. v_c ... excess above the strike price (if any) on the exercise date

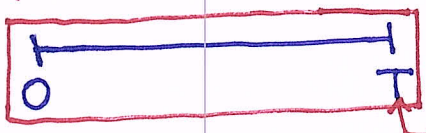
EARLY EXERCISE

Case #1.



the Only admissible exercise date is T. => EUROPEAN

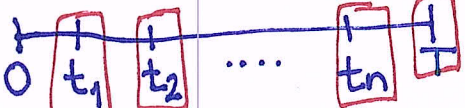
Case #2.



Any time prior to T is admissible exercise date. => AMERICAN

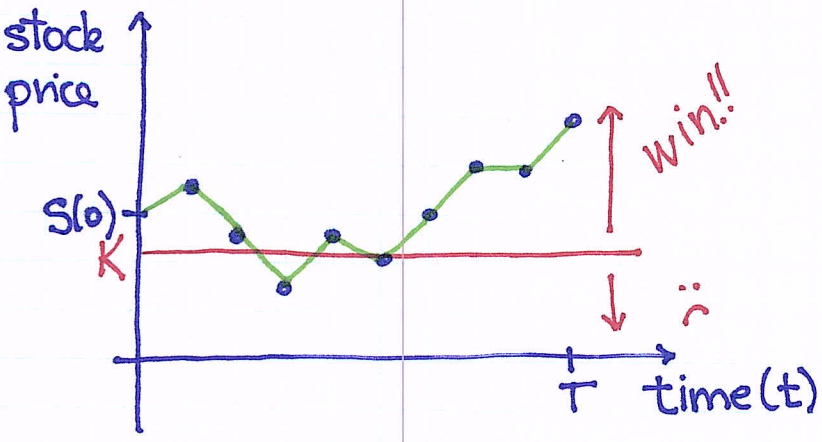
EXPIRATION DATE

Case #3.



A subset of dates prior to T contains all admissible exercise dates => BERMUDAN

The simplest bet $\boxed{\text{COIN TOSSES}}$



One trajectory of the stock price.

$\boxed{\text{DIGITAL OPTIONS}}$

K ... fixed strike/trigger price

"reward" \ "win"	$S(T) \geq K$	$S(T) < K$	
cash ($1)	CASH CALL	CASH PUT	→ cash-or-nothing
asset (1 unit)	ASSET CALL	ASSET PUT	→ asset-or-nothing

Option PRICING needs the payoff structure !!!

CASH CALL

- Payoff

$$V_{CC}(T) = \mathbb{I}_{\{S(T) \geq K\}}$$

Indicator random variable:

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

event

$$\mathbb{I}_A(\omega) = \begin{cases} 1 & \text{if } \omega \in A \\ 0 & \text{if } \omega \notin A \end{cases}$$

- The payoff function

$$v_{CC}(s) = \mathbb{I}_{[K,\infty)}(s)$$

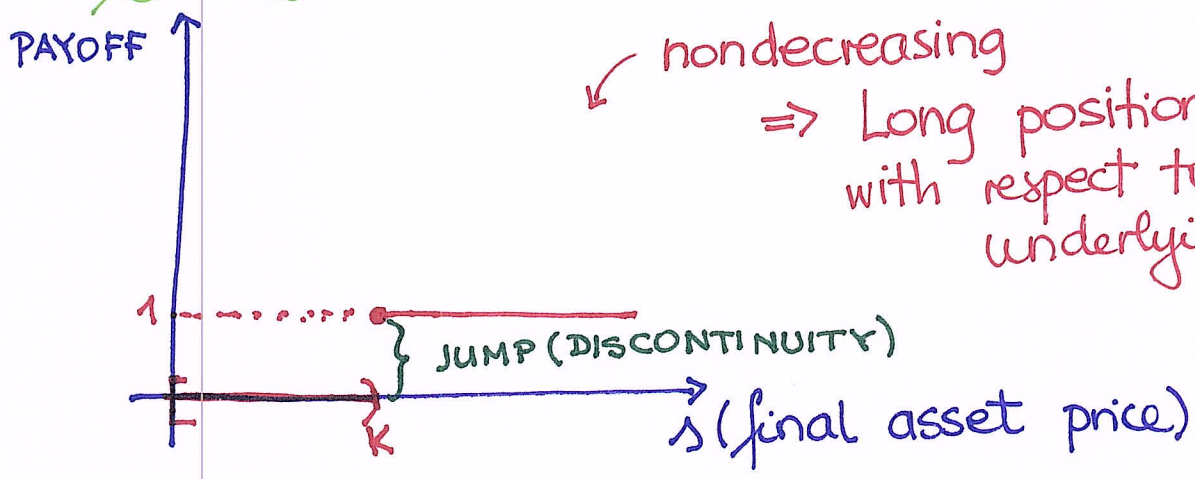
the final stock price

Indicator function:

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

B a set in the reals

- The Payoff curve



nondecreasing

$\Rightarrow$ Long position with respect to the underlying.