1.1 Options

European call option: A contract between two parties, the writer, who issues the option, and the holder, who buys the option from the writer. The holder ~~pays~~ buys the option from the writer by paying the premium to the writer. This contract gives the right to the holder to buy a particular asset from the writer at an agreed price K at a specified time in the future T. This asset is called the underlying. Frequently, but not always, the ~~asset~~ underlying is a stock. K is called the strike or exercise price. T is called the expiry or expiration date or maturity date.

European put option: the holder has now the right to sell the underlying at the exercise price K at at expiration date T.

American options: Like European but the right to sell or buy can be exercise at any ~~ti~~ time $t \leq T$, i.e. at expiry or any time before.

Value of call option at expiration date T (European)

S = market price of the underlying
spot contract, spot price (agreement on price assuming delivery on the same date)

If $S > K$, ~~the~~ at expiry T, the holder can buy the underlying for K per share by exercising the option and imme_ diately sell in the market for S per share to make a profit of $S-K$ per share.

If $K > S$, it is best for the holder not to exercise the option. ~~thus,~~

V = value of the option

$V = V(S,t)$ $\quad$ $S = S(t)$ = market price of the underlying at time t.

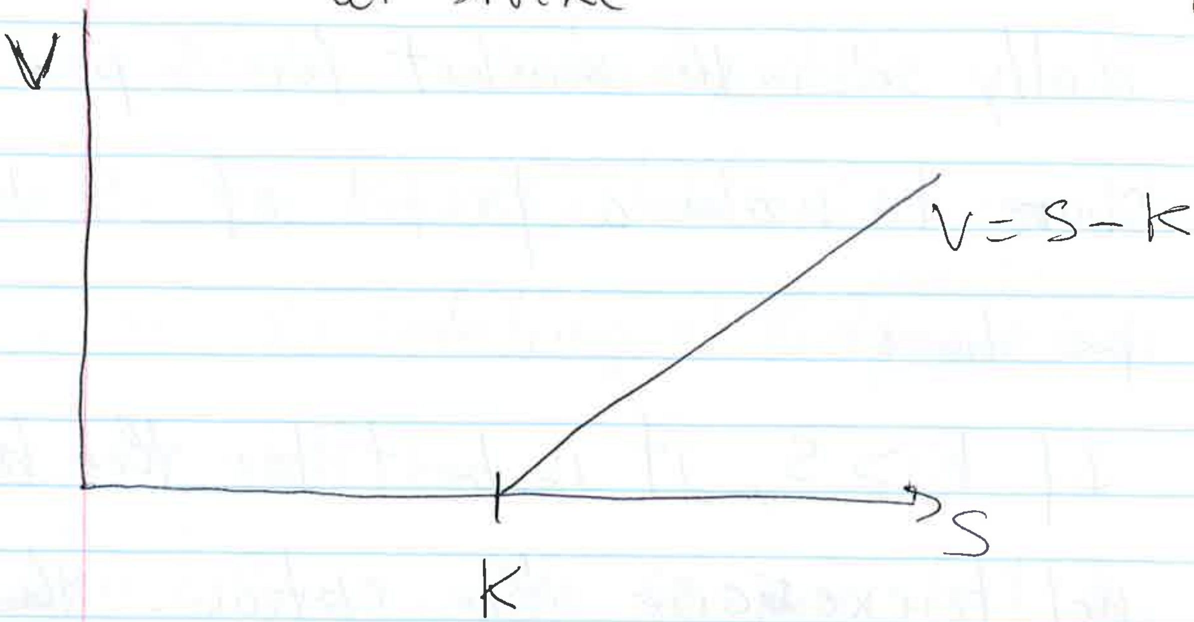
From above arguments

$$V(S,T) = \begin{cases} 0 & \text{if } S \le K \\ S-K & \text{if } S \ge K \end{cases}$$

$$V(S,T) = \max\{S-K, 0\},$$

(where $S = S(T)$). this is called the payoff function.

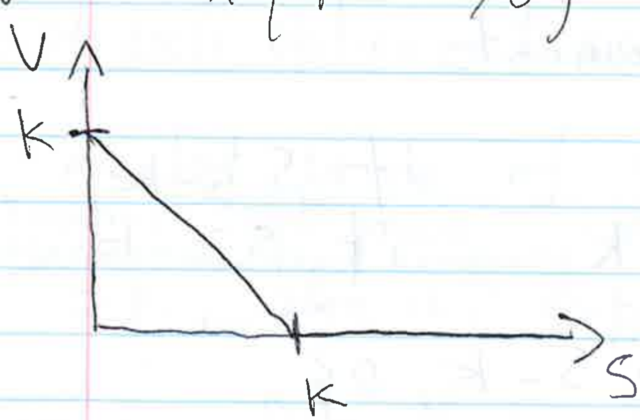
Value of the call option at strike



Value of a put option at expiry (European)

$$V(S,T) = \begin{cases} K - S & \text{if } S < K \\ 0 & \text{if } S > K \end{cases}$$

$$V = \max\{K - S, 0\}$$



Long position: the buying of ~~option~~ a call option or writing of a put, expecting the value of the underlying will go up

3

Short position: When we expect the value of the asset to go down. thus writing calls or buying puts