

Black-Scholes (from foundation to code)

· Financial options: "Book it at current price", may or may not act on it later. terms:-

Lycall option: right to BUY Lyput option: right to SELL

· Strike Price (K): - booking print

· Empiration date

· Premium: - cost of booking

European options: can only enexcise on

· Underlying Asset

expiration date

· Exercise: actually executing in

American options: can everaise anytime till
expiration date

we deal BUY or SELL action

with this in Black-Scholes

· Key assumptions:

i. Stock prices follow a random geometric Brownian Motion - ofc

ii. Constant volatility - true in short period or stable markets

iii. No transaction costs - scale

iv. Continuous Trading - A bit of a stretch, but it's akay

vi. Constant risk free rate, i.e. Interest rates don't change - no worness vii. Markets are frictionless & liquid: - larger market => better liquidity

viii. No Arbitrage opportunities (doubt)

Mo Tu We Th Fr Sa Su	Date / /
let's define	telsond soll .
> So = current stock price	
-> K = Strike price (price at which I book the option)	
> T = time to expiration (in years)	
> v = visk-free interest rate (known value)	
→ 6 = volatility (standard deviation	of returns)
	definition:
· di = [ln(5/k) + (x+6/2)xT]	Volatility (6)
6 x JT	how much price of slock
· d2 = d, - 6xst	fluctuates over a period
. N(n) = cumulative standard normal dist f"	1 (allock in details)
	2. Compute log returns
· European Call Option of EPut Option:	To In (Po)
- TAT N(d)	(R-1)
* C = S.x N(d1) - Kxe x N(d2)	3. Find mean of(x;)
P= K × C × N(-d2) - 5.× N(-d1)	1 at at I don't found
The Kit King and Sand addang	
Here Cf P are basically the	
premium which should be charged for the resp option-	
Andrews worthway to adversion a	
	J. C. Land



. The "Greeks"

- they help us understand how option price charges when market conditions change.

1 Delta (1) - Price sensitivity

D = change in option's price for every 1\$ shange in underly stock price Call options: 0= 0=1

Put options: -1 ≤ △ ≤ o

2) Gamma (T) - Rate of change of delta

[= change in delta value for every 11 change in underlying stock price

- always positive

- highest at the money i.e. when So= K

- Approaches zero for deep in money out of money options

> High [=) & 4 risk change rapidly. Il imp for risk management

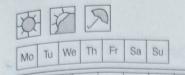
3 Theta (O) - Time Decay

(= how much an option loses value each day, due to passage of time

- usually -ve

- accelerates as expiration approaches

- Highest for at-the-money options



- @ Vega (v) Volatility Sensitivity
 - V = how much an option's price changes when volatility changes by 1%
 - always + ve
 - higher for longer term options
 - highest for at the money options.

issue: Volatility is an input which cannot be observed directly, it must be estimated or implied from market prices.

- (5) Rho (1) Interest Rate Sensitivity
 - P = how much an option's price changes when interest rate changes by 1%
 - +ve for CALLS & -ve for PUTS
 - more significant for longer term options.