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PROBLEMS 4a. 17.10.2018

Q1. *Vega for European options.*

The partial derivative of an option price w.r.t. the volatility σ is called its *vega*, v.

For calls and puts in the Black-Scholes model, show that vega is positive. Interpretation: *options like volatility*. This makes good intuitive sense: an option is an insurance policy against adverse price movements. The worse these might be, the more we will be prepared to pay for it.

Q2. *Delta.*

The partial derivative of an option price w.r.t. the stock price S is called its *Delta*.

(i) For (European) calls, show that $\Delta \in (0, 1)$.

(ii) For (European) puts, show that $\Delta \in (-1, 0)$.

Q3. *Vega for American options.*

By using Q1 and the Snell envelope, or otherwise, show that vega is also positive for American options.

NHB