University of Texas at Austin

Quiz # 14

Option gamma. The delta-gamma-theta approximation.

Please, provide your **complete solution** to the following problem. Final answers without shown reasoning will get zero points.

Problem 14.1. (5 points) Assume the Black-Scholes model. Let the current price of a non-dividend-paying stock be equal to \$80 per share. Its volatility is 0.20.

The continuously compounded risk-free interest rate is 0.04.

Consider a one-year, at-the-money European call option on the above stock. The current delta of the call option is 0.6179. What is the current gamma of the call option?

Problem 14.2. (5 points) Assume the Black-Scholes model. Let the current stock price be \$100. Consider an option on this stock such that its current price is \$3.65, its delta is -0.4182, and its gamma is 0.016. What will the approximate price of this option be should the stock price rise to \$104 in a small time interval?

Problem 14.3. (5 points) Assume the Black-Scholes model. Bertie Wooster was looking at stock-price and option data from yesterday. He decides to pose his friend Tuppy Glossop a riddle. Bertie tells Tuppy the following about yesterday's price of a stock and information on an option on this stock:

- the stock price yesterday was greater than \$77;
- the option's price was \$2.45;
- the option's delta was -0.1814;
- the option's gamma was 0.04;
- the option's theta was 0.01 **per day**.

Tuppy is allowed to see today's stock price and today's option price. They turn out to be \$80 and \$2.20, respectively. What is Tuppy going to guess to be yesterday's stock price?