HW1

Group Member : Yingshan He NetID: yh29
Shixue Feng shixuef2

1. $\frac{\partial \Delta}{\partial d_1} = e^{-\delta(T-t)} \frac{\partial N(d_1)}{\partial d_1} = e^{-\delta(T-t)} \cdot \frac{1}{\sqrt{2\pi}} e^{-d_1^2/2} = \frac{1}{\sqrt{2\pi}} e^{-\delta(T-t)-d_1^2/2}$

$\frac{\partial d_1}{\partial S} = \frac{1}{S\sigma\sqrt{T-t}}$

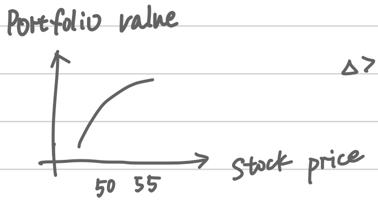
2. (a) change in value $= \Delta \times$ change in stock price $+ \frac{1}{2} \times \Gamma \times$ (change in stock price)^2

$= 8000 \times (50-55) + \frac{1}{2} \times (-4000) \times (50-55)^2$

$= -40000 - 2000 \times 25$

$= -90000$

(b)



$\Delta > 0$. $\Gamma < 0$.

3. (a) iii
(b) ii
(c) iii
(d) iii

4. (a) Fair value: amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.

(b) Give (1) the highest priority to unadjusted quoted prices in active markets for identical, unstricted assets or liabilities (Level 1 inputs),
(2) the next priority to inputs other than level 1 inputs that are observable, either directly or indirectly (level 2 inputs),
and (3) the lowest priority to inputs that cannot be observed in market activity (level 3 inputs)

(c) Liquidity risk: risk that company will be unable to fund themselves or meet their liquidity needs in the event of firm-specific, broader industry or market liquidity stress events.

(d)

	DBRS	Fitch	Moody's	R&I	S&P
credit ratings:	A(high)	A	A3	A	BBB+

5. (a) Primary risk measure: VaR

VaR is also used for shorter-term periods.

(b) Goldman employs a one-day time horizon with a 95% confidence level.

Inherent limitations:

(i) VaR does not estimate potential losses over longer time horizon where moves may be extreme

(ii) VaR does not take account of the relative liquidity of different risk positions

(iii) Previous moves in market risk factors may not produce accurate predictions of all future market moves.

(c) Methodology: historical simulations with full valuation of market factors at the position level by simultaneously shocking the relevant market factors for that position.

(d) Goldman used five years of historical data. And the historical data is weighted.

(e) Average daily VaR: $60 million

Total VaR: $57 million

(f) 2018: 2 days

2017: 0 day

Expected times: 1

(g) Zero failure: $P = 0.95^{252} = 2.43 \times 10^{-6}$

failure ≤ 2: $P = 0.95^{252} + C_{252}^{1} \times 0.95^{251} \times 0.05 + C_{252}^{2} \times 0.95^{250} \times 0.05^{2}$

$= 2.43 \times 10^{-6} + 3.23 \times 10^{-5} + 2.15 \times 10^{-4}$

$= 2.50 \times 10^{-4}$

(h) Biased. Because it seems that the probability of a day of exceeding VaR is quite small from the Bernoulli trials. But in reality, fatter tails often happen.