Test 2 Spring 2025

- Due Mar 27 at 6pm
- Points 90
- Questions 9
- Available Mar 27 at 3:30pm - Mar 27 at 6pm 2 hours and 30 minutes
- Time Limit 100 Minutes

This quiz is no longer available as the course has been concluded.

Attempt History

	Attempt	Time	Score	Regraded
LATEST	**Attempt 1**	100 minutes	40 out of 90	60 out of 90

Score for this quiz: 60 out of 90
Submitted Mar 27 at 5:14pm
This attempt took 100 minutes.

⋮⋮

Question 1   10 / 10 pts

A stock is at $100. Simulate its future dynamics using geometric brownian motion with a rate of 3% and a volatility of 0.40.

Run 20,000 daily simulations for a 1-year period. Assume 30 days in each month.

Estimate the probability that the stock drops below $90 and then rises above $110 in the 1 year period.

Upload code!

⤓ **Exam2Q1.py** (https://gatech.instructure.com/files/61039137/download)
Correct answer

⋮⋮

Question 2   10 / 10 pts

A stock is at $100 and moving with a volatility of 0.35. The interest rate is 4% per year. Price a derivative that pays S_{max} - S_{min} during the period of 1 year. Here S_{max} and S_{min} denote the maximum and the minimum of the stock along the path it takes over the year, respectively.

Use a geometric brownian motion dynamics for the stock. Run 20,000 daily simulations for the 1-year period and find the price of the derivative.

The price is approximately

○ $53

○ $33

○ $60

○ $42

Wrong answer

⋮

Question 3

0 / 10 pts

Consider a stock that is trading at $100. The interest rate is 0%. In 1 month the stock could be either $150 with probability 40% or $50 with a 60% probability.

A "refund call option" pays the amount paid by a regular call option with strike $100 in 1 month if the regular call option is in the money. If the regular call option is not in the money half your money is refunded back.

What is the price of the refund call option?

○ $53

○ $27

○ $33.33

○ $20

Wrong answer

⋮⋮

Question 4

0 / 10 pts

S&P 500 index is at 4,000. You want to create and ultrashort S&P 500 ETF. The ETF price moves at 2 times the change of the S&P 500 index in the reverse direction. The price of the ETF should be $40. The volatility of S&P 500 is 0.50. What will be the time decay in such an ETF? Assume an interest rate of 5%.

○ -402

○ -310

○ 450

○ 402

◉ -450

Correct answer

⋮⋮

Question 5

10 / 10 pts

A stock is at $450 with a volatility of 0.35. The interest rate is 6%. Create a 4-step tree with a time step of 1-year using the CRR procedure.

Using the tree price a 4-year rebate option. The rebate option pays $Max(S_t-410,0)$ as soon as the stock crosses $640. Note that t is therefore a random stopping time, and not necessarily the time to expiration.

○ $200.55

○ $139.83

○ $179.24

Question 6

Original Score: 0 / 10 pts Regraded Score: 10 / 10 pts

⚠ **This question has been regraded.**

A financial institution has the following portfolio of options on a stock:

Type	Position	delta	gamma	vega
call	-100	0.5	0.02	1
call	-300	0.8	0.6	0.2
put	-400	-0.6	0.02	0.7

A traded option (option 1) is available with a delta of 0.6, a gamma of 0.5 and a vega of 0.8.

Another traded option (option 2) is available with a delta of 0.7, gamma of 0.4 and vega of 0.7.

What position in the traded options and the underlying would make the combined portfolio delta, gamma and vega neutral?

a. option 1 long 350 positions, option 2 long 1846 positions

b. option 1 long 886 positions, option 2 long 440 positions

c. option 1 long 440 positions, option 2 short 1846 positions

d. option 1 long 886 positions, option 2 long 200 positions

e. option 1 long 886 positions, option 2 short 200 positions

f. option 1 short 886 positions, option 2 long 440 positions

○ c

○ a

○ b

○ d

○ e

○ f

◉ None of these
Correct answer

⠿

Question 7
10 / 10 pts

A portfolio of European style derivatives on a stock has the property that it is delta and gamma neutral. Which of the following statements is necessarily true of the portfolio?

a. The portfolio has negative value

b. The portfolio realizes the risk free rate of return over time

c. The portfolio has severe time decay

d. All derivatives in the portfolio have the same expiration time.

○ d

○ c

◉ b

○ a
Wrong answer

⠿

Question 8
Original Score: 0 / 10 pts Regraded Score: 10 / 10 pts

⚠ **This question has been regraded.**

You have some positions in binary options as described below.

Long binary call with strike price of $50: pays $100 if stock is above $50 and nothing otherwise.

Short binary put with strike price of $60: pays $100 if stock is below $60 and nothing otherwise.

Suppose the stock is at $55 now.

Which is true?

a. Your position has severe time decay (large negative theta)

b. Your position has positive theta (theta>0)

c. Your position has negative gamma and negligible delta

d. None of these

○ b and c

○ a only

◉ d only

○ b only

○ c only

Wrong answer

⋮⋮

Question 9

0 / 10 pts

◉ b

○ c

○ a

○ d

Quiz Score: 60 out of 90