Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Energy Derivatives and Risk Management II **Semester: III**
Programme: MBA (Energy Trading) **S.Code:OGET8003**
Time: 03 hrs. **Max. Marks: 100**
Instructions: The students can ask for graph sheets

SECTION A

S. No.		Marks	CO
Q 1	**Explain the following in not more than 2 lines** 1.) Implied Volatility 2.) Delta 3.) Theta 4.) Stress Testing 5.) Vega 6.) In the money option 7.) Black Scholes Model 8.) Historical Simulation 9.) Vanilla Swap 10.) Beta 1 value of GARCH model	**20**	**CO 1,2,3,4**

SECTION B

Q 1.	Explain the working of currency swap with the help of an example?	**5**	**CO 3**
Q 2.	Let us say, you have a portfolio of 17 million USD with expected daily return as .17% and daily SD as .13%. Calculate 5% and 10% daily VAR for the given portfolio.	**5**	**CO 4**
Q 3.	Explain the factors affecting the option prices?	**5**	**CO 1**
Q 4.	Calculate the value of a call option using Black Scholes Model if the following values are given: a.) Stock price= $62 b.) Strike price= $60 c.) N(d1)=.66 d.) N(d2)=.62 e.) Risk free rate of Interest= 4% f.) Time to expiration= 40 days	**5**	**CO 2**

SECTION-C

Q 1.	1.) Using Binomial model, prepare stock and options lattice for a period of 3 years with the following details. Lattice Parameters Initial Price 100	**15**	**CO 2**

		Strike Price: 100 R: 1.01 U: 1.07 D: 0.93 Q: 55.70 % 1-q: 44.30 %		
Q 2.	Consider a case of Interest rate swaps involving two companies Company A and Company B which requires 5 million dollars to expand its operations. Co. A's main aim is to take loan at variable rate of interest and Co. B wants loan at fixed rate of interest. Co. A visits Bank A which is ready to provide loan at LIBOR and a fixed rate of 7%. Co. B visits Bank B which is ready to provide loan at LIBOR+1% and at a fixed rate of 10%. Now a swap bank approaches the two companies asking Co. A & B to take loan from Bank A & Bank B at a fixed and variable rate of interest respectively. Swap Bank entered into a swap contract with Co. A wherein Co. A has to pay \$5 million at LIBOR to the swap bank and in return would receive the amount at 8% fixed rate of interest from the swap bank. Similarly Swap bank entered into a swap contract with Co. B wherein Co. B has to pay \$5 million at 8.5% fixed rate of interest to the swap bank and in return would receive the amount at LIBOR from the swap bank. Analyze the situation above and answer the following questions: 1.) How is the swap contract beneficial to Company A? 2.) How is the swap contract beneficial to Company B? 3.) Explain the role of swap bank in the whole transaction and the profit earned by it	**15**	**CO 3**
SECTION-D				
Q1.	**Read the case study "Increasing the Effectiveness of Hedging Interest Rate and Foreign Exchange Risks" and answer the following questions:** **Increasing the Effectiveness of Hedging Interest Rate and Foreign Exchange Risks**	**3 X 10 = 30**	**CO 2,3,4**

Company Overview

McDonald's Corporation (McDonald's) is the world's leading and best known global food-service retailer, with nearly 29,000 restaurants in more than 120 countries. In 1967, McDonald's opened its first foreign country franchise in Canada. Today, more than 65% of total revenue is derived internationally, as more and more restaurants are opened in countries outside the United States, increasing McDonald's foreign exchange and interest rate risks. McDonald's Treasury is challenged with managing these risks. This is no small task, as hedging the interest rate and foreign exchange risks for operations based in foreign countries is complex.

McDonald's Treasury is divided into four areas – Cash Management, Financial Markets, Domestic Finance, and International Finance. The Cash Management team takes care of the administration and back office duties of the treasury, while the Domestic Finance and International Finance areas manage the banking relationships for McDonald's Corporation, franchisees, and suppliers.

The Financial Markets group is responsible for hedging the balance sheet and income statement against foreign exchange and interest rate risks, while funding the growth of global operations. They often fund assets locally, but in many markets this is challenging. The assets are funded by more than $8 billion in debt, with over 50% of the debt denominated in a foreign currency. McDonald's uses swaps and options in managing their financial risks.

The Need

Brian Moore, Manager of Financial Markets at McDonald's, identified a need to further increase the effectiveness of the interest rate and foreign exchange hedging programs. He and his team wanted to implement a leading-edge solution that would help achieve this goal while containing costs. They also needed to maintain consistency with the long-standing risk management policy requiring Treasury to be able to price and manage every derivative they transact. To maximize the hedge coverage while minimizing the hedge cost, Brian Moore and Darin Aprati, Foreign Exchange Manager at McDonald's, used basket option strategies to hedge their interest rate and foreign exchange risks. A basket option is an option whose payoff depends on the value of a portfolio (or basket) of assets.

McDonald's was looking for an upgrade in technology to help the Treasury build the currency basket option, so the search began.

The Solution

McDonald's hedges their interest rate and foreign exchange exposures, which are made up of foreign income and assets and their domestic and foreign debt portfolio, by using the following approaches:

- Qualitative Analysis – uses the underlying economic fundamentals for each country, and the currency is analyzed to determine when it is necessary to hedge.
- Quantitative Analysis – relies on mathematical models to analyze assets vs. liabilities implies using different weightings of different baskets. Much of this is done using random scenario simulations, however, McDonald's needed tools to measure hedge effectiveness.

McDonald's evaluated several system-based software solutions to evaluate hedge effectiveness, but they lacked the flexibility and the analytical coverage needed to price many of the complex derivatives. "Big systems lack flexibility and functionality, plus they are harder to link to market data," stated Aprati. "The technology just didn't exist to do what we needed," he added.

In 1996, Moore and Aprati chose FINCAD's Microsoft® Excel based financial engineering software as a pricing tool. FINCAD Analytics Suite for Excel allows McDonald's to price their derivatives portfolio, enabling them to work more efficiently with instruments such as basket, average rate and double average rate options. These exotic currency options allow them to hedge their exposures in a more cost-effective manner.

McDonald's can now run simulations in Microsoft Excel to test the effectiveness of their hedges. When they are dealing with exotic option models, they can easily confirm that they match the risks that are being hedged.

McDonald's also uses FINCAD Analytics to analyze their portfolio of interest rate swaps, currency swaps, and swaptions. "Being able to work with both foreign exchange and interest rates in the same software environment has reduced the learning curve it takes to value instruments," Moore states. "FINCAD Analytics works with just about everything we do," Moore added.

Moore and Aprati built spreadsheet templates for these instruments and linked them to live market data from Reuters® and Bloomberg®. This enables them to calculate mark-to-market values in real time.

"In implementing the solution, the FINCAD support staff was very responsive in meeting McDonald's needs for financial instrument valuation," stated Aprati. "FINCAD proactively incorporated an option function into their software before we even requested it, which saved us a lot of time," Aprati adds. FINCAD listens to its customers and continues to improve its product based on user feedback and industry trends.

Technology

As part of their hedging technology solution, the Financial Markets Group uses Reuters and Bloomberg live data feeds to retrieve current & historical interest rates and foreign exchange data. They use the curve building, swap, and option pricing tools in FINCAD Analytics. The team uses PC based solutions generally, though they also have a deal capture system to handle the fixed income portfolio. At trade time they use FINCAD to confirm pricing using real-time data.

Questions:

Q1. What are the major areas in which company's business was involved and justify the reasons for its involvement in such kind of business? 10 Marks

Q2. What was the need of the company to increase the effectiveness of the interest rate and foreign exchange hedging programs? 10 Marks

Q3. What is the solution to the problems faced by McDonalds? 10 Marks