

Name:
Enrolment No:



UNIVERSITY OF PETROLEUM & ENERGY STUDIES
Online End Semester Examination, December 2021

Course: Energy Derivatives and Risk Management
Program: MBA (Oil and Gas)
Course Code: OGET 8010P

Semester: III
Time: 3 Hours
Max. Marks

SECTION A		10Qx2M=20Marks	COs
Write either True or False for each question			
Q1	Plain Vanilla swaps can exchange fixed or floating rates in order to reduce or increase exposure to fluctuations in interest rates.		CO 2
Q2	Vega is defined as the amount an option value will change in theory based on a one percentage-point change in interest rates.		CO 1
Q3	The purpose of Stress testing is to identify hidden vulnerabilities, especially those based off of methodological assumptions		CO 1
Q4	Rho is the amount call and put prices will change, in theory, for a corresponding one-point change in implied volatility.		CO 2
Q5	OTC derivative positions by terminating offsetting trades or replacing them with a smaller set of netted trades through trade compression.		CO 2
Q6	In trading and investing, certain securities, such as futures and mutual funds, are also marked to market to show the current market value of these investments.		CO 2
Q7	European Options can be exercised at any time between the date of purchase and the expiration date.		CO 1
Q8	Counterparty risk is the probability that the other party in an investment, credit, or trading transaction may not fulfill its part of the deal and may default on the contractual obligations.		CO 2
Q9	The process by which a client agrees to transfer its future obligations to a third party is known as trade novation		CO 2
Q 10	Speculation is a trading strategy, which is designed to reduce or mitigate risk where a second transaction is made to offset the risk of the first.		CO 2
Section B		4Qx5M= 20 Marks	
Q11	Illustrate the concept of currency swaps with the help of an example.		CO 4
Q12	For a \$6,000,000 portfolio, the expected one-week portfolio return and standard deviation is .19% and .16% respectively. Calculate VAR at 10% in percentage and dollar basis.		CO 3
Q13	Define the characteristics of option valuation		CO 1
Q14	Differentiate between the Black Scholes and Binomial model of Option valuation.		CO 3

Section C		3Qx10M=30Marks	
Q15	Discuss the features of Delta and Gamma and cite an example of each.		CO 5
Q16	Analyze a strategy with the help of an example in which the investor is expecting big price movements in underlying asset price but the expectation of decrease in price is more than an increase. OR Analyze a neutral strategy with the help of an example in which the profit as well as loss potential, both are minimum.		CO 4
Q17	Consider a case of Interest rate swaps involving two companies Company A and Company B that requires 10 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 visit Bank A, which is ready to provide loan at LIBOR and a fixed rate of 8%. Co. B visits Bank B, which is ready to provide loan at LIBOR+2% 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 9% fixed rate of interest from the swap bank. Similarly Swap bank entered into a swap contract with Co. B. Here, Co. B has to pay \$10 million at 9.5% fixed rate of interest to the swap bank, and in return, it would receive the amount at LIBOR +1 % 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?		CO 4
Section D		2Qx15M=30Marks	

Calculate weekly and monthly historical volatility of the gas futures prices over a 20-day period. Given the following details:

Trading Day	Closing price	Price ratio	Log of ratio
1	24.82		
2	24.43	0.98429	-0.01584
3	23.27	0.95252	-0.04865
4	22.13	0.95101	-0.05023
5	22.36	1.01039	0.01034
6	21.04	0.94097	-0.06085
7	19.51	0.92728	-0.07550
8	20.66	1.05894	0.05727
9	20.23	0.97919	-0.02103
10	20.59	1.01780	0.01764
11	21.71	1.05440	0.05297
12	21.71	1.00000	0.00000
13	21.71	1.00000	0.00000
14	22.55	1.03869	0.03796
15	23.83	1.05676	0.05521
16	24.31	1.02014	0.01994
17	24.62	1.01275	0.01267
18	25.73	1.04509	0.04410
19	26.19	1.01788	0.01772
20	26.48	1.01107	0.01101

Q18

CO 5

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.) Risk free rate of Interest= 4%
- d.) Time to expiration= 40 days
- e.) Volatility = 32%

Refer the standard normal distribution table in Annexure I.

OR

Calculate the value of a European call option by illustrating stock and options lattice for a period of 3 years with the following details.

Q19

Lattice Parameters	
Initial Price	100
Strike Price	110
R	1.06
U	1.09
D	0.91
Q	82.62 %
1-q	17.38 %

STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.9	.00005	.00005	.00004	.00004	.00004	.00004	.00004	.00004	.00003	.00003
-3.8	.00007	.00007	.00007	.00006	.00006	.00006	.00006	.00005	.00005	.00005
-3.7	.00011	.00010	.00010	.00010	.00009	.00009	.00008	.00008	.00008	.00008
-3.6	.00016	.00015	.00015	.00014	.00014	.00013	.00013	.00012	.00012	.00011
-3.5	.00023	.00022	.00022	.00021	.00020	.00019	.00019	.00018	.00017	.00017
-3.4	.00034	.00032	.00031	.00030	.00029	.00028	.00027	.00026	.00025	.00024
-3.3	.00048	.00047	.00045	.00043	.00042	.00040	.00039	.00038	.00036	.00035
-3.2	.00069	.00066	.00064	.00062	.00060	.00058	.00056	.00054	.00052	.00050
-3.1	.00097	.00094	.00090	.00087	.00084	.00082	.00079	.00076	.00074	.00071
-3.0	.00135	.00131	.00126	.00122	.00118	.00114	.00111	.00107	.00104	.00100
-2.9	.00187	.00181	.00175	.00169	.00164	.00159	.00154	.00149	.00144	.00139
-2.8	.00256	.00248	.00240	.00233	.00226	.00219	.00212	.00205	.00199	.00193
-2.7	.00347	.00336	.00326	.00317	.00307	.00298	.00289	.00280	.00272	.00264
-2.6	.00466	.00453	.00440	.00427	.00415	.00402	.00391	.00379	.00368	.00357
-2.5	.00621	.00604	.00587	.00570	.00554	.00539	.00523	.00508	.00494	.00480
-2.4	.00820	.00798	.00776	.00755	.00734	.00714	.00695	.00676	.00657	.00639
-2.3	.01072	.01044	.01017	.00990	.00964	.00939	.00914	.00889	.00866	.00842
-2.2	.01390	.01355	.01321	.01287	.01255	.01222	.01191	.01160	.01130	.01101
-2.1	.01786	.01743	.01700	.01659	.01618	.01578	.01539	.01500	.01463	.01426
-2.0	.02275	.02222	.02169	.02118	.02068	.02018	.01970	.01923	.01876	.01831
-1.9	.02872	.02807	.02743	.02680	.02619	.02559	.02500	.02442	.02385	.02330
-1.8	.03593	.03515	.03438	.03362	.03288	.03216	.03144	.03074	.03005	.02938
-1.7	.04457	.04363	.04272	.04182	.04093	.04006	.03920	.03836	.03754	.03673
-1.6	.05480	.05370	.05262	.05155	.05050	.04947	.04846	.04746	.04648	.04551
-1.5	.06681	.06552	.06426	.06301	.06178	.06057	.05938	.05821	.05705	.05592
-1.4	.08076	.07927	.07780	.07636	.07493	.07353	.07215	.07078	.06944	.06811
-1.3	.09680	.09510	.09342	.09176	.09012	.08851	.08691	.08534	.08379	.08226
-1.2	.11507	.11314	.11123	.10935	.10749	.10565	.10383	.10204	.10027	.09853
-1.1	.13567	.13350	.13136	.12924	.12714	.12507	.12302	.12100	.11900	.11702
-1.0	.15866	.15625	.15386	.15151	.14917	.14686	.14457	.14231	.14007	.13786
-0.9	.18406	.18141	.17879	.17619	.17361	.17106	.16853	.16602	.16354	.16109
-0.8	.21186	.20897	.20611	.20327	.20045	.19766	.19489	.19215	.18943	.18673
-0.7	.24196	.23885	.23576	.23270	.22965	.22663	.22363	.22065	.21770	.21476
-0.6	.27425	.27093	.26763	.26435	.26109	.25785	.25463	.25143	.24825	.24510
-0.5	.30854	.30503	.30153	.29806	.29460	.29116	.28774	.28434	.28096	.27760
-0.4	.34458	.34090	.33724	.33360	.32997	.32636	.32276	.31918	.31561	.31207
-0.3	.38209	.37828	.37448	.37070	.36693	.36317	.35942	.35569	.35197	.34827
-0.2	.42074	.41683	.41294	.40905	.40517	.40129	.39743	.39358	.38974	.38591
-0.1	.46017	.45620	.45224	.44828	.44433	.44038	.43644	.43251	.42858	.42465
-0.0	.50000	.49601	.49202	.48803	.48405	.48006	.47608	.47210	.46812	.46414

STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
0.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
0.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
0.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
0.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
0.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
0.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
0.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
0.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
0.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
2.0	.97725	.97778	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574
2.2	.98610	.98645	.98679	.98713	.98745	.98778	.98809	.98840	.98870	.98899
2.3	.98928	.98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.99158
2.4	.99180	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
2.5	.99379	.99396	.99413	.99430	.99446	.99461	.99477	.99492	.99506	.99520
2.6	.99534	.99547	.99560	.99573	.99585	.99598	.99609	.99621	.99632	.99643
2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.99720	.99728	.99736
2.8	.99744	.99752	.99760	.99767	.99774	.99781	.99788	.99795	.99801	.99807
2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.99861
3.0	.99865	.99869	.99874	.99878	.99882	.99886	.99889	.99893	.99896	.99900
3.1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.99929
3.2	.99931	.99934	.99936	.99938	.99940	.99942	.99944	.99946	.99948	.99950
3.3	.99952	.99953	.99955	.99957	.99958	.99960	.99961	.99962	.99964	.99965
3.4	.99966	.99968	.99969	.99970	.99971	.99972	.99973	.99974	.99975	.99976
3.5	.99977	.99978	.99978	.99979	.99980	.99981	.99981	.99982	.99983	.99983
3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.99992
3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.99995
3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.99997