UNIVERSITY OF LONDON

CENTRE FOR FINANCIAL AND MANAGEMENT STUDIES

MSc Examination
Postgraduate Diploma Examination
Postgraduate Certificate Examination
for External Students

91DFMM482

FINANCE (ECONOMIC POLICY)
FINANCE (FINANCIAL SECTOR MANAGEMENT)
FINANCE (QUANTITATIVE FINANCE)

Financial Engineering

Specimen Examination

This is a specimen examination paper designed to show you the type of examination you will have at the end of this module. The number of questions and the structure of the examination will be the same, but the wording and requirements of each question will be different.

The examination must be completed in THREE hours.

Answer any **THREE** questions.

The examiners give equal weight to each question; therefore, you are advised to distribute your time approximately equally between three questions.

Statistical tables are provided at the end of this examination paper.

Candidates may use their own electronic calculators in this examination provided they cannot store text. The make and type of calculator MUST BE STATED CLEARLY on the front of the answer book.

PLEASE TURN OVER

*Answer any **THREE** questions. Answer **ALL** parts of multi-part questions.*

1.   *Answer **BOTH** parts of this question.*

    a)   Describe in detail what is meant by a futures contract. Explain the relationship between futures price and spot price, and give reasons to justify the requirement that margin accounts are held.

    b)   Explain what position can be regarded as equivalent to a long forward contract to buy an asset at a price K on a given future date and a short position in a call option with a strike price K on the same date.

2.   Explain the upper and lower bounds that must be satisfied by option prices. Illustrate the put-call parity formula and discuss its applications.

3.   *Answer **ALL** parts of this question.*

    Suppose that a stock price S follows a geometric Brownian motion:
$$dS = \mu S dt + \sigma S dz$$
where dz is a standard Wiener increment and where μ and σ are constant parameters.

    a)   Provide a motivation for the above stochastic process for dS.

    b)   Using Itô's Lemma, find the distribution for x in the following cases:
        i) $x = \alpha S$, where α is a constant;
        ii) $x = S^{\gamma}$, where γ is a constant;
        iii) $x = e^{\beta S}$, where β is a constant.

4.   Define the delta, theta, and gamma of an option portfolio. Explain under what conditions theta can be regarded as a proxy for gamma in a portfolio.

5.   Answer BOTH parts of this question.

    a)   Explain what is meant by a 'volatility smile'.

    b)   What information does the volatility smile provide concerning the probability distribution of asset prices used by market participants?

6.   What is meant by the Gaussian copula model for time of default? Carefully explain this model and discuss the assumptions upon which it is based.

7.   Explain in detail two alternatives to the Black–Scholes–Merton model. Discuss under what conditions they can be appropriate for the modelling of asset prices.

8.   Explain what is meant by barrier, binary and lookback options. Describe their properties and discuss under what conditions they can be used for the hedging of risks and for speculation. How do these options compare with the corresponding regular options?

Normal Curves Area
Standard normal probability
in right-hand tail

Area

0   z
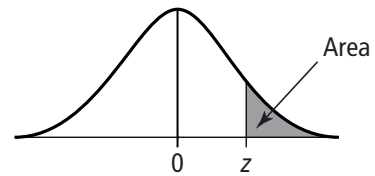
z	Second decimal place of z									
	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641
0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014

[END OF EXAMINATION]