Strathmore
UNIVERSITY

STRATHMORE INSTITUTE OF MATHEMATICAL SCIENCES
BACHELOR OF BUSINESS SCIENCE IN FINANCIAL ENGINEERING
END OF SEMESTER EXAMINATION
BSF 4238: FINANCIAL INNOVATION AND STRUCTURED FINANCE

DATE:14th January,2022. Time: 2 Hours

Instructions

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.

QUESTION ONE (30 MARKS)

1. Majority of financial innovations involve different ways of bundling or unbundling more basic instruments such as bonds, equities, commodities and currencies. Discuss 2 possible source drivers of financial innovation and a type of product that resulted from such innovation (6 marks).
2. Differentiate between cash-flow based securitization and synthetic securitization (2 marks).
3. Outline the differences between the following swap contracts a) Credit Default Swap b) Interest rate Swap c) Variance Swap (6 Marks).
4. An analyst evaluates two European call options with different strike prices and time-to-maturity and summarizes their details as follows:

Pricing Date	05/01/2022			10/01/2022		
Underlying	S&P 500			DJIA		
Direction	Long	**Delta**	0.9918	Long	**Delta**	0.9912
Option Type	Call	**Gamma**	0.0022	Call	**Gamma**	0.0013
Contract Size	100	**Vega**	1.1296	150	**Vega**	1.4339
Spot	100	**Theta**	-4.3554	120	**Theta**	-5.023
Volatility (%)	20.0	**Rho**	19.697	31.0	**Rho**	20.8761
Interest Rate (%)	5.0	**Vanna**	-0.2585	5.0	**Vanna**	-0.1704
Dividend Yield (%)	0.0	**Charm**	0.0913	0.0	**Charm**	0.0971

i) Determine the prices of the European Call options on S&P 500 Index and DJIA Index at pricing dates 05/01/2022 and 10/01/2022 respectively (6 Marks)

ii) At the pricing dates 05/01/2022 and 10/01/2022 the market prices of the two respective European Options were 25.45 USD and 42.36 USD. Determine their respective implied volatility σ_{imp} (4 marks)

iii) The analyst considers a Call Spread option strategies for the two options. Illustrate the payoff structure of the considered strategy (2 marks)

5. Structured products can be used not only for investments but also to hedge positions against market risks. Explain other 2 benefits of issuance of structured products other than for hedging purposes. (4 marks)

QUESTION TWO (20 Marks)

1. Describe the following exotic options and their respective payoff conditions as applied in energy and electricity markets (8 Marks)
    a) Asian Option
    b) Spread Option
    c) Barrier Option
    d) Bivariate Digital Option
2. Explain the securitization process of a non-performing loan portfolio, clearly describing the roles of the SPV, Originator, Servicers, Credit Enhancer, Trustee, Underwriters with relevant processes diagrams (12 Marks)

QUESTION THREE(20 Marks)

1. Explain the following approaches in deploying hedging strategies (4 Marks)
    a) Model-dependent Hedging
    b) Margin Hedging
2. Describe the following terms as understood in the context of commodities futures markets (4 marks)
    a) Contango
    b) Backwardation
3. Discuss 3 benefits of holding and development of investment funds (6 marks)
4. Unit Investment Trust has 70% of its holdings in fixed income instruments and 20% in equities. Its holds the following treasury bonds:

    5-Year zero coupon bond of par 1000USD and YTM of 12%

    10-year zero coupon bond of par 12000 USD with YTM of 14%

    20-year semi-annual 9% coupon bond of par 7000 USD with YTM 10%

The trust had expenses amounting to 3% of the value of its equities holdings. And outstanding liabilities of 3,500 USD, with 5,500 shares outstanding.
Calculate it net asset value (6 Marks)

QUESTION FOUR (20 Marks)

1. Differentiate between the following types of arbitrage (6 marks)
   a) Spatial Arbitrage
   b) Statistical arbitrage
   c) Strategical arbitrage
2. A parity condition is a no-arbitrage condition representing an equilibrium state under which investors cannot obtain a risk-less profit. Show the parity conditions present in forward contracts and option contracts (4 Marks)
3. A structured product is a pre-packaged financial product for facilitating customized risk-return objectives based on the returns from certain investable assets. It is used as an alternative to direct investment. Explain the following structured products (10 marks)
   a) Wedding Cake
   b) Himalaya
   c) Phoenix
   d) Twin-win
   e) Shark Fin

QUESTION FIVE (20 Marks)

1. Modelling of derivatives and structured products payoffs and price trajectories is an involving processes in which the analysts can apply a variety of mathematical and computation techniques and financial models with a variety of assumptions and trade-offs. Discuss the 5 main purposes of structure products modelling. (8 Marks)
2. Covid-19 outbreak has resulted in unprecedented disruptions in operations, supply and demand shocks. Many businesses across sectors in Kenya have been disrupted and affected particularly in Hospitality, Tourism, Education, Sporting etc.
   Such a “black swan and its contagion” in the economy can bring about challenges in designing, pricing and writing of structured products. Discuss any 4 of such challenges (12 Marks)