Strathmore
UNIVERSITY

STRATHMORE INSTITUTE OF MATHEMATICAL SCIENCES
BACHELOR OF BUSINESS SCIENCE IN FINANCIAL ENGINEERING, FINANCIAL ECONOMICS AND ACTUARIAL SCIENCE
END OF SEMESTER EXAMINATION
BSF 4234 ADVANCED PORTFOLIO MANAGEMENT

DATE: 14th DECEMBER 2022 Time: 2 Hours

QUESTION 1 (30 MARKS)

1. Louise and Christopher Maclin live in Nairobi, and currently rent an apartment in the metropolitan area. Christopher Maclin, aged 40, is a supervisor at Barnett Co. and earns an annual salary of Ksh. 8,000,000 before taxes. Louise, aged 38, stays home to care for their newborn twins. She recently inherited Ksh. 90,000,000 (after wealth-transfer taxes) in cash from her father's estate. In addition, the Maclins have accumulated the following assets (current market value):
   • Ksh. 500,000 in cash
   • Ksh. 16,000,000 in stocks and bonds
   • Ksh. 22, 000,000 in Barnett common stock
   The value of their holdings in Barnett stock has appreciated substantially as a result of the company's growth in sales and profits during the past 10 years. Christopher Maclin is confident that the company and its stock will continue to perform well.
   The Maclins need Ksh. 3,000,000 for a down payment on the purchase of a house and plan to make a Ksh. 2,000,000 non-tax-deductible donation to a local charity in memory of Louise Maclin's father. The Maclins' annual living expenses are Ksh. 7,400,000. After-tax salary increases will offset any future increases in their living expenses.
   During discussions with their financial adviser, Grant Webb, the Maclins express concern

about achieving their educational goals for their children and their own retirement goals. The Maclins tell Webb:

• They want to have sufficient funds to retire in 18 years when their children begin their four years of university education.

• They have been unhappy with the portfolio volatility they have experienced in recent years. They state that they do not want to experience a loss in portfolio value greater than 12 percent in any one year. They do not want to invest in alcohol and tobacco stocks.

• They will not have any more children.

After their discussions, Webb calculates that in 18 years the Maclins will need Ksh. 200 million to meet their educational and retirement goals. Webb suggests that their portfolio be structured to limit shortfall risk (defined as expected total return minus two standard deviations) to no lower than a negative 12 percent return in any one year. Maclin's salary and all capital gains and investment income are taxed at 40 percent and no tax-sheltering strategies are available. Webb's next step is to formulate an investment policy statement for the Maclins.

Required:

i. Formulate the risk objective of an investment policy statement for the Maclins. (2 Marks)

ii. Formulate the return objective of an investment policy statement for the Maclins. (2 Marks)

iii. Formulate the constraints portion of an investment policy statement for the Maclins, addressing *each* of the following (8 Marks)

a. Time horizon
b. Liquidity requirements
c. Tax concerns
d. Unique circumstances

2. Explain the following challenges in formation of micro and macro expectations process (6 Marks)

a) Anchoring Trap
b) Recallability Trap
c) Model and Input uncertainty
d) Survivorship Bias
e) Data Mining Bias
f) Confirming Evidence Bias

3. For the purposes of asset allocation, it is necessary to define asset classes. With this information, investors and managers can better distinguish among asset classes when developing an investment strategy. Explain 2 criteria that can be used to specify asset classes (4 Marks)
4. Clients' needs and circumstances change, and portfolio managers must respond to these changes to ensure that the portfolio reflects those changes. Discuss 2 other benefits that are realized by portfolio rebalancing. (4 Marks)
5. Differentiate between the following styles of investment
    a. Social Responsible investing
    b. Contrarian Investing. (4 marks)

QUESTION 2 (20 MARKS)

1. The portfolio management process is an integrated set of steps undertaken in a consistent manner to create and maintain an appropriate portfolio (combination of assets) to meet clients' stated goals. Evaluate the portfolio management process (10 Marks)

2. An analyst estimates that the expected return on the stock in the following table is 11 percent. Using a two-factor model, calculate the stock's return if the company-specific surprise for the year is 3 percent. (5 marks)

Variable	Expected Value	Actual Value	Sensitivity
Interest rates	0.0%	2.0%	-1.5
GDP	1.0%	4.0%	2.0

3. An analyst considers three widely diversified portfolios shown in the following table below:

	Expected Return	1st Factor Sensitivity	2nd Factor Sensitivity
Portfolio A	17%	1.3	0.8
Portfolio B	15%	0.8	1.4
Portfolio C	10%	0.3	0.3

Suppose that another portfolio, portfolio *D,* is well diversified with a betas of 0.7 and 1.1 and expected return of 13%. Would an arbitrage opportunity exist? If so, what would be the arbitrage strategy? Verify that the portfolio is priced correctly. (5 marks)

QUESTION 3 (20 MARKS)

1. Active managers attempt to "beat the market" by forming portfolios capable of producing actual returns that exceed risk-adjusted expected returns. The difference between the actual and expected return is often called the portfolio's alpha, and it represents the amount of value that the active manager has added. Examine 2 major reasons why a fund sponsor would prefer an active management approach over a passive one. (4 marks)
2. An investment firm holds KSh. 10,000,000 investment in an S&P 500 index fund. They then replace 10 percent of their investment in the index fund with an investment in a stock having a beta of 2 with respect to the index. Show mathematically, that is it impossible for the new portfolio, consisting of the index fund and the stock, to have a lower standard deviation of return than the original portfolio? (6 marks)
3. Macro performance attribution is done at the fund sponsor level and begins with the funds beginning market value and ends with its ending market value. Under each decision making variable, the question under consideration is: How much did each of the decision making levels contribute, in either a return or a value metric, to the Fund's change in value over an evaluation period. Explain the following levels of analysis for macro attribution (6 Marks)

    a) Asset Categories (Pure Indexing)
    b) Benchmarks
    c) Asset Allocation

4. The common types of benchmarks in common use are: absolute return, manager universes, broad market indexes, style indexes, factor-model-based, returns-based, and custom security-based. A custom security-based benchmark should meet all fundamental and quality-based benchmark criteria. Explain 2 characteristics of a good benchmark. (4 Marks)

QUESTION 4 (20 MARKS)

1. Discuss any 3 factors that each influence international market integration and market segmentation (6 Marks)
2. In the formations of capital markets expectations, a multifactor model can be used. A multifactor model is a model that explains the returns to an asset in terms of the values of

a set of return drivers or risk factors. Given the returns of two well-diversified portfolios, portfolio L and Portfolio K in two markets L and market K is:

$$R_l = \alpha_l + b_{1l}F_{GDP} + b_{2l}F_{INT} + \varepsilon_l$$

$$R_k = \alpha_k + b_{1k}F_{GDP} + b_{2k}F_{INT} + \varepsilon_k$$

a) Determine the expression for Covariance and the value of Covariance between the two portfolios (6 marks)

b) Given that portfolio K is a new portfolio that contains an additional asset class. Determine whether the incorporation of this new asset class into portfolio K is an optimal choice over holding portfolio L under Safety First Criterion and Utility Framework given the benchmark return of 3% and tolerance of 0.01. (8 Marks)

Assuming that the two factors, GDP and INT have a covariance matrix of the form below.

	GDP Factor	**INT Factor**
GDP Factor	0.0196	0.0017
INT Factor	0.0017	0.0016

And that the factor loading for the portfolios and the expected returns are obtained as:

	GDP	**INT**	**Residual Risk**	**E(R)**	**Risk free**
Portfolio K	1.10	0.6	10.0%	13%	5%
Portfolio L	1.05	0.8	8.0%	9%	5%

QUESTION 5 (20 MARKS)

1. An institution holds Portfolio K. The institution wants to use Portfolio L and Portfolio J to hedge its exposure to inflation. Specifically, it wants to combine K, L and J to reduce its inflation exposure to 0. Portfolios K, L and J are well diversified, so the manager can ignore the risk of individual assets and assume that the only source of uncertainty in the portfolio is the surprises in the two factors. The returns to the three portfolios are

$$R_K = 0.12 + 0.5\ F_{inf} + 1.0\ F_{gdp}$$

$$R_L = 0.11 + 1.5\ F_{inf} + 2.5\ F_{gdp}$$

$$R_J = 0.19 + 0.3\,F_{inf} + 1.5\,F_{gdp}$$

Calculate the weights and consequent strategy that a manager should have on K and L to achieve this goal given the analyst would like to hold 0.3 of portfolio J. What is the novel return equation given this adopted strategy. (6 marks)

2. You are an African Markets Equity Analyst and have been asked to prepare a fundamental analysis of one of the companies you will cover. Explain any 3 of the quantitative factors that you would investigate. (6 marks)
3. Explain the main behaviour bias being exhibited in each of the following scenarios (8 marks)

   (a) A pension scheme has been advised by the same investment consultancy over a five-year period. The trustees are now carrying out a review to decide whether they would like to continue working with this investment consultancy or appoint a new investment consultancy. During the selection process the trustees decide to re-appoint the current consultancy, even though other firms had clearly given better presentations.

   (b) A group of pension scheme trustees has seen high returns in their equity portfolio over the last five years and views among market commentators suggest this performance will continue. The trustees decide to increase their allocation to equities in order to generate further returns for the scheme.

   (c) Market commentators have been suggesting for several months that equity valuations are not justified and they expect a market correction. However, an equity trader who is investing their own portfolio has allocated a large proportion to equities.

   (d) An investment consultant comments on the poor performance of a hedge fund's strategy. The consultant believes that the hedge fund should have been able to foresee market events based on historic market data, although the consultant did not provide any views on hedge funds prior to this.

----------All the Best ----------