Strathmore
UNIVERSITY

STRATHMORE INSTITUTE OF MATHEMATICAL SCIENCES

BACHELOR OF BUSINESS SCIENCE IN FINANCIAL ENGINEERING, FINANCIAL ECONOMICS AND ACTUARIAL SCIENCE

SPECIAL EXAM

BSF 4230 ADVANCED PORTFOLIO MANAGEMENT

DATE: 28th April 2022 Time: 2 Hours

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**Instructions**

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

**Question one**

Roberto and Mariana Kibet live in a large city in Kenya with their two children, ages four and two. Roberto is 30 years old and Mariana will be 30 years old later this month. Roberto is a manager in a manufacturing facility and Mariana is a musician in the local symphony orchestra.

Roberto and Mariana's annual salaries total Kshs120,000 after tax. Their salaries just cover their living expenses. The average annual inflation rate is four percent and their salaries and expenses are expected to increase at this rate. They are healthy and believe their jobs and earning potential are secure. The Kibet's salaries, dividends, and interest are taxed at 20 percent, and capital gains at 15 percent.

Mariana's parents have significant wealth and funded an irrevocable personal trust for her. Kenya has a wealth transfer tax that applies to transfers into trusts and to inheritances. Kenya has adopted the Prudent Investor Rule for the administration of trusts. The current value of the trust is Kshs 1,500,000. The terms of the trust state that when Mariana reaches the age of 30, she will

receive a tax-free distribution of half the value of the trust. The balance of the trust will remain invested and will distribute in total to her when she reaches age 40. Since she does not have access to the remaining balance for ten years, this balance is not considered a part of the

Kibet's investable assets, but is part of their total net worth. In addition, Mariana expects to inherit a substantial sum of money upon the death of both parents.

The Kibets have Kshs 500,000 in investable assets, currently all in short-term bank deposits. It is their intention to maintain at least this amount in investable assets, on an inflation-adjusted basis, in the future.

The Kibets currently live with Mariana's parents, but are now purchasing a home. The purchase price of the home is Kshs 850,000. The down payment is 30 percent of the cost of the home and will be funded from the trust distribution. The Kibets will take out a fixed rate mortgage for the balance of the purchase price. The after-tax mortgage cost will be fixed at Kshs 55,000 (principal and interest) annually for 30 years, with the first annual payment due one year from now.

The Kibet's immediate investment goal is to have their investment portfolio cover the cost of the mortgage, while maintaining the portfolio's inflation-adjusted value. They plan to retire at the age of 60 and their long-term goal is to have an investment portfolio that will provide an annual income comparable to their current salaries adjusted by inflation. Their family health insurance is provided by Roberto's employer, both now and in retirement. They are hopeful their two children will attend the local university at no cost. The university does not charge tuition fees for qualified students who pass its entrance exam. Those who do not pass the exam are required to pay full tuition, which is high relative to the Kibet's living expenses.

In order to meet their investment goals, the Kibets realize they need to consider investments other than short-term bank deposits. The Kibets hire Luiz Oliveira, CFA, to manage an investment portfolio that they will fund with their Kshs 500,000 in bank deposits and the net proceeds of Mariana's trust distribution at age 30.

Required:

a)

i) Prepare the return objectives portion of the Kibet's investment policy statement (IPS). (2 marks)

ii) Calculate the after-tax nominal rate of return that is required for the next year. (9 marks)

b)

i) Identify *two* factors in the Kibet's situation that increase their ability to take risk. (2 marks)

ii) Identify *two* factors in the Kibet's situation that decrease their ability to take risk. (2 marks)

iii) Determine whether the Kibets have below-average, average, or above average ability to take risk. (1 mark)

c) Prepare the following constraints of the Kibet's IPS:

i) Liquidity. (2 marks)

ii) Time horizon. (3 marks)

Twenty-five years have passed. The Kibets are now 55 years old and their two children are grown and financially independent. Mariana's parents passed away earlier this year and left her an inheritance of Kshs 8,000,000 after-tax. The Kibets have five years remaining on their mortgage and the Kshs 55,000 annual mortgage payment will continue to be funded from their investment portfolio. They intend to work another five years and then retire at age 60. Their salaries are expected to continue to cover their living expenses until retirement. Their investment portfolio, including the inheritance, now totals Kshs 10,200,000.

The Kibets explain to Oliveira that in retirement, they would like to maintain their current standard of living and start a regular program of donating money to their favorite charities. They also hope to leave an inheritance of Kshs 5,000,000 to each of their two children at their death.

Oliveira calculates they will need a portfolio value of Kshs 15,000,000 when they retire in order to support these goals.

d)

i) Prepare the current return objectives portion of the Kibet's IPS.

(3 marks; each point is 1 mark)

ii) Calculate the after-tax nominal rate of return that is required for the portfolio.

(6 marks)

**Question Two**

a)

Ralph Employees Defined Benefit Plan has the following features:

| | *Kes '000'* |
|---|---|
| *Projected benefit obligation (PBO)* | 12,477 |
| *Pension assets* | 8,734 |
| *Average duration of pension liabilities* | 14 years |

The plans risk management committee has set a goal to maintain the market value of pension assets at or above 65 percent of PBO.

The nominal discount rate for calculating PBO in 2022 will be reduced to 6.5 percent from 7.0 percent in 2021.

Roger represents the management of a defined benefit pension plan's board of trustees and Tate represents employee plan participants. They make the following statements during a meeting between the plan participants and the employer:

Roger: "To increase the probability that pension plan assets will be sufficient to fund pension plan benefits, the plan should invest most of its assets with equity managers having the best track records as measured against market index benchmarks."

Tate: "To avoid the risk of market losses making the funding shortfall worse over the next year, we should limit TEPP's investments to short-term, risk-free securities."

Required:

i) Give reasons why each statement is incorrect, based on the pension plan liabilities. (7 marks).

ii) Evaluate the most likely effect of the change in the discount rate for 2008 on PBO, holding all else constant. (3 marks)

b) Discuss the psychological traps that an analyst need to consider when carrying out capital market expectations forecast. (10 marks)

**Question Three**

KCB Bank is a US-based commercial bank that began operations in 1896. In order to attract skilled labor, KCB Bank offers employees attractive benefits which include a defined benefit pension plan and annual wage increases above the rate of inflation. An asset only (AO) approach to strategic asset allocation is currently used for the investment management of the pension plan. Omondi is a consultant to the board of trustees of KCB Bank's pension plan. The board asks Omondi to recommend a strategic asset allocation for the pension plan given the following investment policy objectives:

Return requirement: Earn an average annual return of 8.7 percent plus management and administration fees of 0.7 percent.

Risk objective: A maximum standard deviation of portfolio returns of 10.0 percent.

For the strategic asset allocation analysis, Omondi has generated the corner portfolios shown in Exhibit 1. The KCB Bank pension plan investment policy statement (IPS) prohibits short positions and the use of leverage. The IPS allows investment in any single portfolio or combination of portfolios described in Exhibit 1.

**Exhibit 1**
**Corner Portfolios**
**(Risk-free Rate = 4.5%)**

| Corner Portfolio Number | Expected Return (%) | Expected Standard Deviation (%) | Sharpe Ratio | Asset Classes (Portfolio Weights, %) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | U.S. Equities | Non-U.S. Equities | Intermediate-term U.S. Bonds | Non-U.S. Bonds | U.S. Real Estate |
| 1 | 10.8 | 16.1 | 0.39 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 10.4 | 14.2 | 0.42 | 82.4 | 0.0 | 0.0 | 0.0 | 17.6 |
| 3 | 10.3 | 12.7 | 0.46 | 74.1 | 4.0 | 0.0 | 0.0 | 21.9 |
| 4 | 9.1 | 9.1 | 0.51 | 33.7 | 12.0 | 36.7 | 0.0 | 17.6 |
| 5 | 8.0 | 7.4 | 0.47 | 25.0 | 11.8 | 45.3 | 3.4 | 14.5 |
| 6 | 6.9 | 5.2 | 0.46 | 0.0 | 13.7 | 53.0 | 27.1 | 6.2 |
| 7 | 6.6 | 4.8 | 0.44 | 0.0 | 11.2 | 53.0 | 31.5 | 4.3 |

a) Using traditional mean-variance analysis:

i) **Select** the *most* appropriate portfolio or combination of portfolios for the strategic asset allocation of the KCB Bank pension plan. **Justify** your response with ***two*** reason other than meeting KCB Bank's return requirement. (3 marks)

ii) **Determine** the weight of total equities (U.S. and non-U.S. combined) in the *most* appropriate strategic asset allocation. (5 marks)

b) Omondi proposes that the IPS be changed to allow borrowing or lending at the risk-free rate, currently 4.5 percent. He suggests that this change would enable KCB Bank's pension plan to minimize its expected standard deviation of return while achieving the plan's required return.

i) Determine the most appropriate strategic asset allocation for the KCB Bank pension plan based on Omondi's proposal and the optimal asset allocation for the overall portfolio. (6.5 marks)

ii) Explain how this allocation improves the plan's risk-adjusted return. (4 marks)

iii) Determine the weight of total equities (U.S. and non-U.S. combined) in the most appropriate strategic asset allocation. (1.5 marks)

**Question Four**

a) An investment adviser is counselling Kerubo, a client who recently inherited Kes 1,200,000 and has above-average risk tolerance ($R_A = 2$). Because Kerubo is young and one of her purposes is to fund a comfortable retirement, she wants to earn returns that will outpace inflation in the long term. Goddard expects to liquidate Kes 60,000 of the portfolio in 12 months, however, to make the down payment on a house. If that need arises, she states that it is important for her to be able to take out the Kes 60,000 without invading the initial capital of Kes1,200,000. Below are the three alternative strategic asset allocations.

*Investor's Forecasts*

| *Asset Allocation* | Expected Return | Standard Deviation of Return |
|---|---|---|
| *A* | 10.00% | 20% |
| *B* | 7.00% | 10% |
| *C* | 5.25% | 5% |

Required:

i) Based only on Kerubo's risk-adjusted expected returns for the asset allocations, which asset allocation would she prefer? (3 marks)

ii) Given Kerubo's desire not to invade the Kes 1,200,000 principal, what is the shortfall level, $R_L$? (2 mark)

iii) According to Roy's safety-first criterion, which of the three allocations is the best? (3 marks)

iv) Recommend a strategic asset allocation for Goddard. (2 marks)

b) Discuss 4 more challenges in forecasting of assets yields. (6 Marks)

c) Differentiate between the following styles of investment

i) Social Responsible investing

ii) Contrarian Investing. (4 marks)

**Question Five**

a) Discuss 3 approaches to equity investment portfolio management. (6 marks)

b) When carrying out monitoring of the portfolio, the portfolio manager must review a number of areas in relation to client's portfolio. Discuss five areas covered under such reviews. (10 marks)

c)

Jose Moreno is an analyst for a fund sponsor in Latin America. The fund sponsor uses two equity managers (Manager A and Manager B) and each invests in developed and emerging markets.

Costa prepares a performance attribution analysis for the total fund. He identifies the fund's sources of return and develops the macro attribution table in Exhibit 1.

*Exhibit 1*

*Total Fund Level*

*Macro Attribution for 1 January – 31 March*

| *Decision-Making Level (Investment Alternative)* | Fund Value (in Kes) | Incremental Return Contribution (%) | Incremental Value Contribution/(Withdrawal) (in Kes) |
|---|---|---|---|
| *Beginning value* | 360,000,000 | 0 | 0 |
| *Risk-free asset* | 361,800,000 | 0.5 | 1,800,000 |

| | | | |
|---|---|---|---|
| *Asset category* | 388,872,000 | 7.52 | 27,072,000 |
| *Benchmarks* | 389,376,000 | 0.14 | 504,000 |
| *Investment managers* | 389,664,000 | 0.08 | 288,000 |
| *Allocation effects* | 389,304,000 | -0.10 | (360,000) |
| *Total fund* | 389,304,000 | 8.14 | 29,304,000 |

**Demonstrate** whether the total fund outperformed a pure indexing strategy. (4 marks)