

MACHAKOS UNIVERSITY

SAC 404

INVESTMENT AND ASSET MANAGEMENT II

Supplementary

4TH YEAR 2ND SEMESTER 2022

Question 1

- a) Evaluate the discounted mean term of a bond redeemable at par in 10 year's time with annual coupons of 8% at interest rates of 5%, 10% and 15%. Hence sketch a graph of the discounted mean term as a function of the interest rate over the range 5% to 15%. What is the relationship between the three forms of market efficiency (6mks
- b) Consider a market in which the Capital Asset Pricing Model (CAPM) holds
- i) Write down the equation of the Security Market Line, defining all the notation you use (2mks
- ii) In this market, the risk-free rate of interest is 9.44% per annum. There are only two risky assets in the market with the following attributes.

Rate of return (per annum)				Variance/Covariance Matrix			
State	Probability	Asset 1	Asset 2			Asset 1	Asset 2
1	0.2	10.00%	11.00%		Asset 1	0.00142	0.00379
2	0.3	15.00%	30.00%		Asset 2	0.00379	0.01146
3	0.1	18.00%	25.00%				
4	0.4	20.00%	40.00%				

- iii) Determine the weight of each asset in the market portfolio to be consistent with $\beta_1 = 0.46$, $\beta_2 = 1.36$. (2mks
- iv) Calculate the Market Price of Risk. (2mks

- c) In a market where the assumptions of the Capital Asset Pricing Model hold, there are two risky assets with the following attributes:

<i>Security</i>	<i>A</i>	<i>B</i>
Expected return (p.a.)	20%	16%

- Determine the composition of the market portfolio with expected return 18% per annum. (3mks)
- Calculate the beta of each security under the assumption that the risk-free rate of interest is 10% per annum. (3mks)

e).

In a market in which the Arbitrage Pricing Theory (APT) model holds, the expected return is given by:

$$E[R_i] = I_0 + I_1 b_{i,1} + I_2 b_{i,2} + \dots$$

- Define all the terms in the equation. (3mks)
Assume the risk-free rate $r_f = 0.04$. Consider two well diversified portfolios P_i with the following features in a two factor model:

	<i>P1</i>	<i>P2</i>
$E R_i$	15.50%	11.95%
$b_{i,1}$	(a)	(b)
$b_{i,2}$	1.5	0.7

- Determine the values (a) and (b) for $I_1 = 0.05$ and $I_2 = 0.06$. (3mks)

Question 2

An investor has £100 and is considering investing in two different stocks. The prices of both stocks are assumed to follow the lognormal model with the parameters below.

<i>Stock</i>	<i>Current price</i>	<i>Drift μ</i>	<i>Volatility σ</i>
A	£5	5%	20%
B	£5	8%	30%

- Calculate the expected value at time 3 of £100 invested in:

- a) Stock A (2mks
 - b) Stock B (2mks
- ii) Calculate the standard deviation at time 3 of £100 invested in:
 - a) Stock A (3mks
 - b) Stock B (3mks

The investor decides to invest £50 in each stock.

- iii) Calculate the expected value of the investor's portfolio at time 3. (2mks
- The correlation of the two stocks is 0.3
- iv) Calculate the standard deviation of the value of the investor's portfolio at time 3. (3mks
 - v) Comment on the expected return and standard deviation of the portfolio compared to investing the whole £100 in one stock. (5mks

Question 3

- i) State the main assumptions of mean-variance portfolio theory (5mks

Consider a mean-variance portfolio model with two securities, with respective returns S_A and S_B , where the expected return $E[S_B] = 0.25E[S_A]$ and the variance of return $V[S_B] = 0.25V[S_A]$.

Let the correlation between the returns on the two securities be ρ .

- ii) Determine, in terms of $E[S_A]$, the expected return on the minimum variance portfolio if: (6mks
 - a) $\rho = 0$
 - b) $\rho = 1$
- iii)
 - a) Calculate the variance of the return on the minimum variance portfolio for part (ii)(b). (5mks
 - b) Comment on the risk in this portfolio. (3mks

Question 4

A fund must make payments of £50,000 at the end of the sixth and eighth years. Show that, if interest rates are currently 7% pa at all durations, immunisation to small changes in interest rates can be

achieved by holding an appropriately chosen combination of a 5- year zero-coupon bond and a 10-year zero-coupon bond. (20mks

Question 5

- a) What are the betas of the market portfolio and the risk-free asset? Use these beta values to complete the derivation of the security market line equation (10kmks
- b) Suppose there are only two portfolios A and B available to invest in. A is a portfolio of risky assets and B is a portfolio consisting of just one risk-free asset. Show that the efficient frontier must be a straight line. (10mks