ISMA CENTRE - THE BUSINESS SCHOOL
OF THE FINANCIAL MARKETS

UNIVERSITY OF READING
ENGLAND

IFID Certificate Programme

Portfolio and Risk Management

Answers to Exercises

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1. Portfolio Management

Question 1

Compare the two measures of portfolio return studies in this section:

- Money weighted return
- Internal rate of return

a) Which of the following is (or are) a feature of the money-weighted return calculation?

- ☐ Has to be estimated by a process of iteration
- ☑ The result tends to be reasonably close to the fund's true IRR
- ☐ None of these
- ☑ Requires the fund to be revalued each time there is a new cash flow going in or out of the fund

Explanation

- The result tends to be reasonably close to the fund's true IRR
- Requires the fund to be revalued each time there is a new cash flow going in or out of the fund (because the calculation is money-weighted)

Question 2

Consider the following two assets:

Asset	**A**	**B**	**Correlations**	
Mean return	10%	12%	1.0	+0.5
Standard deviation	7%	8%	+0.5	1.0

a) What is the expected percentage return and standard deviation of a portfolio consisting of 40% of asset A and 60% of asset B? Express both figures in percentages to 1 decimal place. Type your answer in each box below and validate.

Expected return (%) 11.2

Standard deviation (%) 6.7

Explanation

Expected return:
= (0.4 x 0.1) + (0.6 x 0.12)
= 0.112 or **11.2**%

Standard deviation:
= $\sqrt{}$ [$(0.4 \times 0.07)^2$ + $(0.6 \times 0.08)^2$ + $(2 \times 0.4 \times 0.6 \times 0.07 \times 0.08 \times 0.5)$]
= 0.0666 or **6.7**%

b) What would be the effect on the risk of the portfolio if the returns on the stocks were negatively correlated?

- [x] It would be lower
- [ ] It would be higher

Explanation
Risk would be lower.

c) What would be the risk of the portfolio if the stocks were not correlated at all?

- [ ] 8%
- [ ] 6.7%
- [ ] 7.5%
- [x] 5.6%

Explanation
Portfolio risk:

$= \sqrt{[\ (0.4 \times 0.07)^2 \ + \ (0.6 \times 0.08)^2\ ]}$
= 0.0556 or **5.6**%, rounded.

Question 3

Assuming you are a rational[1] risk-averse investor, which portfolio out of each of the following pairs would you prefer?

a)

	Return	Risk
Portfolio A	20%	5%
Portfolio B	25%	5%

- [ ] Portfolio A
- [x] Portfolio B

Explanation
B (higher return for same risk)

b)

	Return	Risk
Portfolio A	17.5%	7%
Portfolio B	17.5%	2%

- [ ] Portfolio A
- [x] Portfolio B

Explanation
B (lower risk for the same return)

[1] This just means that for the same risk you prefer more rather than less.

c)

	Return	Risk
Portfolio A	10%	6%
Portfolio B	12%	8%

- [x] Depends on your risk/return preferences
- [ ] Neither

Explanation
It depends on your risk/return preferences.

2. Risk Management

Question 1

In the language of risk management, we have approximately EUR 4.5 million of value at risk at the 95% confidence level.

a) Which of the following is the correct interpretation of VAR in this case?

- ☐ We will lose more than EUR 4.5m on 5 days out of every 100
- ☐ We will lose less than EUR 4.5m on 95 days out of every 100
- ☐ We will never lose more than EUR 4.5m on any day
- ☉ We can be 95% confident that the trading loss in one day will not exceed EUR 4.5m

Explanation
We can be 95% confident that the trading loss in one day will not exceed EUR 4.5m.

Question 2

The implied volatility of the options on the FTSE-100 index of UK equities is currently 18.0% per annum.

a) Based on this information, calculate the daily VAR on a GBP 55 million portfolio of UK equities:

- At the 99% confidence level (i.e. 2.33 standard deviations)
- Assuming the year has 262 working days

Enter your answer in the box below, in sterling to the nearest pound, and validate.

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Question 3

A US investor has a portfolio of French bonds and equities worth EUR 500 million, whose currency risk has not been hedged. The investor's position and the characteristics of each market are summarised below (in all cases we assume the daily mean return on these markets is zero):

		A 10-year Bond	B CAC-40 Equities	C EUR/USD FX
Position		Long	Long	Long
Market value (EUR millions)		300	200	500
Daily % price volatility (σ)		0.55	1.12	0.65
Correlation Matrix	**A**	1.00	+0.74	-0.49
	B	+0.74	1.00	-0.52
	C	-0.49	-0.52	1.00

Note: The correlation matrix shows the correlation coefficients between all pairs of asset classes. For example:

- Correlation of returns between bonds and equities is +0.74: there is quite a tendency for both markets to rally simultaneously
- Correlation of returns between bonds and FX is -0.49: there is a tendency for a rallying bond market (lower interest rates) to be associated with a weakening EUR (stronger USD), but the association is weak
- Correlation of returns between equities and FX is -0.52: there is a stronger tendency for a rally in French equities to be associated with a weaker EUR

If the EUR/USD spot rate is 1.0490, what is the daily VAR on this portfolio, in USD, at the 95% confidence level (i.e. 1.65 standard deviations)?

a) First, calculate the risk on the portfolio using the formula developed in Portfolio Construction - Portfolio Risk & Return.

Portfolio risk $= \{ \Sigma (w_i \times \sigma_i)^2 + \Sigma\Sigma (2 \times w_i \times w_j \times \sigma_i \times \sigma_j \times \rho_{ij}) \}$

for $i = 1 \ldots 3, j = 1 \ldots 3, i \neq j$

Where:
w_i = Proportion of the asset portfolio value committed to instrument i
σ_i = Standard deviation of return on asset i (in percent)
ρij = Correlation coefficient of returns between assets i and j

Note that here the portfolio weights are, respectively, 3/5, 2/5 and 5/5, as the FX exposure is on 100% of the underlying bonds and equities.

Enter you answer in percent to 2 decimal places.

0.66

b) Next, apply this portfolio volatility to the VAR formula developed in section *Simple VAR* (assuming a mean daily return of 0).

VAR = Portfolio value x Z x σ_P

Where:
σ_P = Portfolio risk (standard deviation of portfolio return, in decimal)
Z = The number of standard deviations corresponding to the required confidence level (e.g 1.65 for 95% confidence)

Calculate the VAR on this portfolio in EUR, to the nearest Euro.

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c) Finally, express the VAR on this portfolio in USD equivalent to the nearest dollar, at EUR/USD 1.0490.

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