

EXAMINATION

31 October 2018 (am)

Subject F105 — Finance and Investment Fellowship Principles

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Follow log in and saving instructions issued to you at the exam venue.*
2. *Save your work throughout the exam.*
3. *You are required to submit your answers in Word format only using the template provided. You MAY NOT use any other computer program (e.g. Excel) during the examination.*
4. *You have 15 minutes at the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*
5. *You must not start typing your answers until instructed to do so by the supervisor.*
6. *Mark allocations are shown in brackets.*
7. *Attempt all nine (9) questions, beginning your answer to each question on a new page.*
8. *Show calculations where this is appropriate.*
9. *If answer booklets are used for any question(s) start each question IN A SEPARATE ANSWER BOOKLET, entering all candidate and examination details on EACH.*

Note: The Actuarial Society of South Africa will not be held responsible for loss of data where candidates have not followed instructions as set out above.

AT THE END OF THE EXAMINATION

**Check that you have saved your work as per instructions given to you.
Hand in your question paper with any answer booklets firmly attached.**

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

QUESTION 1

A defined contribution pension fund is in the process of revising each of its investment mandates.

- i. Outline the primary purpose of an investment mandate. [1]
- ii. List typical restrictions that might be included in an investment mandate relating to the foreign bond portfolio of the pension fund. [4]
- iii. Briefly outline the main aims of regulation and explain why a regulator of the pension fund would restrict the proportion of fund assets invested in foreign bonds. [4]

[Total 9]

QUESTION 2

An investor saving for his retirement has decided to invest in exchange-traded funds (ETFs). He is considering two options:

Option A: Invest in a regulated retirement savings vehicle (RSV) which offers ETFs as underlying investment options. Contributions to a RSV are deductible from earnings for tax purposes. The investor will not have access to these savings prior to retirement. No taxes are paid by the RSV on investment returns, however the investor will pay income tax on benefits received from these savings during retirement.

Option B: Invest in ETFs in his personal capacity using taxed earnings. The investor has access to these savings whenever needed, and returns on ETFs are taxed as they are realised or received.

- i. Discuss how the differences in tax treatment would affect the relative attractiveness of the two options to the investor. [3]

A relatively unknown financial services company markets a new ETF as providing an expected return of 12% p.a. and the company guarantees a return of the capital invested. The marketing material compares this product to money market investments which offer around 6% p.a. The investment has attracted much attention in the local media, including positive responses from savers and warnings about its sustainability from sceptics.

- ii. Discuss the behavioural biases that might be exhibited by the investor choosing to save for his retirement in 20 years' time through this ETF. [5]

[Total 8]

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QUESTION 3

Boring Bank has just issued a R100m 5-year floating rate note (FRN) that pays half-yearly coupons. Boring wants to protect itself against rising interest rates and requests a quote from Interesting Bank for a two-year European swaption under which Boring would pay 9% p.a. (compounded half-yearly) and receive floating rates over the last three years of the FRN it has issued.

Current forward rates are shown below as annual (compounded half-yearly) rates, applying over the half-year starting at time t .

Time in years (t)	Forward rates
0	6.0908%
0.5	6.0000%
1.0	6.8136%
1.5	7.3326%
2.0 and onwards	8.0000%

- i. Calculate the issue price of the swaption. You may assume that the swap rate at maturity of the option is lognormally distributed with a volatility of 0.2978. [6]

The swaption can be expressed as an option on a fixed rate bond that has a 3 year term from the option expiry date and with a strike price equal to the nominal value of the bond.

- ii. Explain whether this option is a put or a call, stating what the coupon rate on the fixed rate bond is. [2]
- iii. Boring feels the quoted price for the swaption is too high. State alternative ways that Boring can protect itself against interest rate rises. [2]

[Total 10]

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QUESTION 4

An investment bank has purchased the entire issue of a 5-year extreme mortality bond (EMB) from an AA-rated life insurance company. The EMB is structured to pay floating coupons after which the security will be redeemed. Coupons and the principal are paid in full to the investment bank unless an extreme mortality event occurs, in which case the redemption value is reduced, and the extent of reduction is dependent on the scale of event.

A worldwide mortality-index is used as a measure of mortality. An extreme mortality event is declared if this index rises above a threshold of 120% of its starting value at any point during the bond term, in which case the deduction from the redemption value is R25m for every 1% that the index has risen above the threshold. The deduction is capped at the full amount of the issue.

- i. Discuss the risks posed by the EMB to the investment bank. [5]
- ii. List restrictions that the investment bank can impose on the insurance company before purchasing the EMB to reduce the investment bank's risks. [4]

[Total 9]

QUESTION 5

- i. Explain the rationale for institutional investors including commodities in their multi-asset portfolios. [3]

Investors in a developing economy have been able to use derivatives on specific commodities to obtain exposure to this asset class. The local stock exchange wishes to develop a diversified commodity index to be used as a basis for launching new derivatives.

- ii. Discuss the issues that need to be addressed in developing such an index. [6]

[Total 9]

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QUESTION 6

Able Stores is a listed furniture retailer that wants to buy its main supplier, FurnFact, at a premium of R60m, for R300m at 31 December 2017. Able Stores plans to raise the funding required via a R150m rights issue and through issuing corporate bonds to the value of R150 million.

Projected financial information as at 31 December 2018 for Able Stores assuming that the acquisition does not take place, and a consolidated view assuming the acquisition does take place is shown below.

Balance sheets as at 31 December 2018		
	Able Stores (No acquisition)	Consolidated (Post- acquisition)
	R million	R million
Share capital	50	200
Debt	50	200
Current liabilities	70	20
Total Equity and Liabilities	170	420
Inventory	70	90
Debtors	80	140
Cash	20	30
Building		100
Goodwill		60
Total Assets	170	420

Income statements for the year ending 31 December 2018		
	Able Stores (No acquisition)	Consolidated (Post- acquisition)
	R million	R million
Sales	300	400
Variable costs	215	220
Fixed expenses	60	100
Interest payable	5	20
Net profit	20	60

- i. Define the type of acquisition this would be classified as and discuss the motivation for such an acquisition. [2]
- ii. By calculating appropriate ratios on the projected financial information, comment on the impact of the acquisition on the bondholders of Able Stores. [6]

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- iii. Discuss the impact that the beginning of a downturn in the economy is likely to have on Able Store's price-earnings ratio. [2]

[Total 10]

QUESTION 7

- i. Briefly outline the key characteristics of companies in the financials grouping under the FTSE industry classification system. [2]

An equity fund manager claims that an effective way to generate returns in excess of the overall equity market is to divide portfolios between "growth" and "value" specialist investment teams.

You have been asked by an investor utilising this fund manager (from 1 January 2015) to assess the manager's performance given the fund information below. The benchmark was based on published style indices, namely 50% Value Total Return Index (TRI) and 50% Growth TRI with no rebalancing after 1 January 2015. The manager did not rebalance his portfolio during the period under review. There was one cash outflow from the fund of R150 million on 1 January 2017 – half was taken from the value portfolio and half from the growth portfolio.

	Value Portfolio		Growth Portfolio	
	TRI	Market value (R millions)	TRI	Market value (R millions)
1 January 2015	120	200	170	400
31 December 2015	135	225	197	470
31 December 2016	155	265	235	565
31 December 2017	140	175	195	380

- ii. Calculate the annualised time-weighted rate of returns for:
- the value and growth portfolios and their benchmarks; and
 - the total portfolio and its benchmark. [4]
- iii. Show the split of the over/under-performance, in terms of time-weighted rate of returns for the total portfolio, between the following components:
- Stock selection decision
 - Style allocation decision [4]
- iv. Comment on the manager's performance. [4]

[Total 14]

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QUESTION 8

An institutional investor has a liability consisting of annual payments, increasing in line with inflation, over the next 5 years. The value of the liability is calculated by discounting the projected liability cashflows at the expected return on the asset backing the liability. The asset backing the liability is a 4-year fixed interest bond with annual coupons and is valued at R105.89 million.

- i. Outline four investment risks, other than liquidity and operational risk that the investor is exposed to. [4]
- ii. Define liability hedging. [1]

The investor wishes to hedge the liability by switching the asset backing the liability (valued at R110.05 million) to one of two inflation-linked bonds (ILB) with annual coupons, of which the real cash-flows are as follows:

Year	ILB A	ILB B
	R millions	R millions
1	3.75	2
2	3.75	2
3	3.75	2
4	3.75	102
5	103.75	-

- iii. Assuming a discount rate of 7.25% p.a. and an assumed inflation rate of 5% p.a., calculate the duration of ILB A and ILB B. [3]
- iv. Motivate which ILB would be more appropriate for the hedge, given that the liability duration is 4.47. [3]

[Total 11]

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QUESTION 9

- i. Define annualised historical tracking error. [1]

A trust that provides scholarships for tertiary education is in the process of reviewing its investment policy statement. The long-term targeted level of funding is set such that student scholarship liabilities are 70% of total assets of the trust. This liability reflects the present value of future payments to students, which are increased annually in line with inflation rates, funded by the trust. The remaining assets are set aside in a contingency reserve.

Inflation linked bonds are used to hedge some of the student scholarship liability. Two separate asset managers are appointed to manage the equity and bond portfolios of the fund.

	Strategic asset allocation	Benchmark	Risk measure
Cash	5%	Short term fixed interest composite index (STeFI)	-
Listed equity	40%	JSE All Share index (ALSI)	Active money positions of 1% per share
Inflation linked bonds	55%	Government issued inflation linked bonds index (IGOV)	Tracking error of 5% p.a.

The trustees have decided to reduce the fund's risk tolerance level.

- ii. Define each of the following risks and provide an example of the fund's current exposure to it.
- a. Strategic risk
 - b. Active risk
 - c. Structural risk
- [5]
- iii. Discuss the difficulties the trust faces in reducing its strategic risk and how futures contracts can be used to address these difficulties. [7]
- iv. Discuss the appropriateness of a suggestion by one trustee that using straddles would be helpful in reducing the active risk taken in the equity portfolio. [3]

The trustees decide to control the active risk budget by reducing its active money positions for all stocks in its equity portfolio to zero.

- v. Discuss the implications of this decision to the management style followed by the asset manager for the equity portfolio. [4]

[Total 20]

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END OF PAPER