

EXAMINERS' REPORT

May 2015 examinations

Subject F105 — *Finance and Investment Principles* Fellowship Principles

INTRODUCTION

The attached report has been prepared by the subject's examiners. General comments are provided on the performance of candidates on each question. The solutions provided are an indication of the points sought by the examiners, and should not be taken as model solutions.

QUESTION 1

Examiner's comments

This question was straightforward bookwork and most candidates accordingly scored well, with only a handful of poorly-prepared candidates failing to pick up most of the marks on offer.

1. Market risk is the risk relating to changes in the value of the portfolio due to movements in the market value of the assets held.
2. Credit risk is the risk that a counterparty to an agreement will be unable or unwilling to fulfil their obligations.
3. Operational risk is the risk of loss due to fraud or mismanagement within the organisation itself.
4. Liquidity risk is the risk of not having sufficient cash to meet operational needs at all times. It is related to market risk in as much as the liquidity of the overall portfolio is need to be taken into account in portfolio selection.
5. Relative performance risk is the risk of under-performing comparable institutional investors.

QUESTION 2

Examiner's comments

This question was very poorly answered, given the relative difficulty level of the question. Very few candidates attempted to ‘contrast’ the advantages and disadvantages of the indices, even though it was the key word in the question itself. Furthermore, most candidates displayed poor knowledge regarding listed property companies, as covered in detail in subject A301.

Advantages Barometer	Disadvantages Equity Index
+ Pools fixed properties	- Pools listed companies which manage fixed properties
+ Indicates the current level of rentals	- Underpinning values distorted by broad equity market movements - Underpinning values distorted by management charges - Underpinning values distorted by discount to NAV
+ Can incorporate sufficient fixed properties to be credible	- Listed property sector may be too tiny to be representative
+ Can choose appropriate representation from underlying property sectors, e.g. retail, commercial, industrial	- Property sector splits depend upon property managers’ focus in respective portfolios
Advantages Equity Index	Disadvantages Barometer
+ Equity valuation primarily based on valuation of fixed property portfolios	- Hypothetical rack-rented properties cannot be physically held
+ Respected and understood calculation methodology	- Calculation methodology may be questionable
+ Total return index (TRI) available [1/2]	- TRI may not be calculated
+ Stock indices usually very frequently updated	- Updated less frequently due to more complex data requirements

QUESTION 3

Examiner’s comments

Part (i) was an application which candidates were unlikely to have seen before, but the solution should have been clear-cut from the definition of LRE; unfortunately many candidates were unable to translate their textbook understanding of the concept into a numerical solution. Most candidates picked up some marks for part (ii) but few obtained close to full marks.

i. The value of equity is the PV of assets less the PV of liabilities:

$$A = 125 e^{-2(0.025)} + 225 e^{-7(0.035)} = 295.012$$

$$L = 100 e^{-0.02} + 200 e^{-4(0.03)} = 275.404$$

$$E = 19.608$$

LRE is the change in market value of equity from the given change in the cost of funds.

$$A' = 125 e^{-2(0.0275)} + 225 e^{-7(0.0375)} = 291.364$$

$$L' = 100 e^{-0.0225} + 200 e^{-4(0.0325)} = 273.394$$

$$E' = 17.970$$

$$LRE = 17.970 - 19.608 = -1.638$$

ii. Clearly, the primary issue is that there will be insufficient cash on hand when the liabilities fall due, as liabilities fall due in advance of sufficient asset proceeds. It will be necessary for the institution either to liquidate its position in the bond(s) when liability payments fall due, exposing it to the risk of adverse movements in the yield curve (and hence price of the bonds), or it could consider switching into bonds of the same duration as the liabilities, if these are available on the market, or shorter maturity, at the expense of reinvestment risk. Derivative strategies (e.g. total return swaps) could also achieve the desired outcome.

QUESTION 4

Examiner's comments

Overall this was reasonably answered, however the dispersion of marks was rather wide.

Part (i) was bookwork, and many students got this right, but those that did not know their bookwork were not able to make the required points.

Part (ii) was done reasonably well by most students. Only a few got the final answer correct, but many students got the methodology correct or almost correct.

(i)

Fixed income derivative payoffs will be dependent in some way on the level of interest rates. They are therefore more difficult to value than equity derivatives, since:

- The behaviour of an individual interest rate is more complicated than that of a stock price.
- For the valuation of many products, it is necessary to develop a model describing the behaviour of the entire yield curve.
- The volatilities of different points on the yield curve are different.
- Interest rates are used for discounting as well as for determining payoffs from the derivative.

(ii)

$$C = P(0,T) [F_0 \Phi(d_1) - X \Phi(d_2)]$$

$$F_0 = \text{forward bond price} = (B_0 - I) / P(0,T)$$

where

B_0 is the bond price at time zero and

I is the present value of the coupons that would be paid during the life of the option.

$$\text{In this case, } I = 25 e^{-0.25 \times 0.03} = \text{R}24.8132$$

$$\text{Thus } F_0 = (980 - 24.8132) / e^{-5/12 \times 0.035} = \text{R}969.219$$

$$d_1 = [\ln(F_0/X) + \frac{1}{2} T \sigma^2] / \sigma \sqrt{T} = (\ln(969.219 / 1050) + \frac{1}{2} 0.12^2 \cdot 5/12) / (0.12 \sqrt{5/12})$$

$$\begin{aligned}
&= -0.9948 \\
d_2 &= d_1 - \sigma \sqrt{T} = -1.0722 \\
\Phi(d_1) &= 0.15992 & \Phi(d_2) &= 0.14181 \\
\text{Hence, } C &= e^{-5/12 \times 0.035} [(969.219 \Phi(-0.9948) - 1050 \Phi(-1.0722))] \\
&= R6.01418
\end{aligned}$$

QUESTION 5

Examiner's comments

This question proved to be difficult with the majority of candidates not being able to score more than a third of the marks available.

i.

This part was poorly answered given that this is a bookwork question and the expectation is that a well prepared candidate should score full marks. Few, if any, candidates were able to link the concept of intrinsic value with their solution.

ii.

Generally this part was poorly attempted and most candidates were able to pick on the points relating to costs and regulatory restrictions.

iii.

In the evaluation of the proposal, most candidates were able to draw a sensible conclusion. However, the solutions lacked the level of detail required, given the marks available for this part.

i.

- This intrinsic value of a call option equals the greater of zero and the amount by which the market price of the underlying asset exceeds the exercise price, i.e. $\max[ST - K, 0]$
- 'in-the-money' refers to the intrinsic value being positive, i.e. where an immediate exercise of the option would yield an immediate pay-off.
- As it increases the certainty as to whether or not the call would be exercised, the premium for the transaction would increase.

ii. Considerations of using a derivative strategy:

Positive factors

- The client could immediately establish a position in the equity and bond markets using financial derivatives and benefit in any subsequent increases in the market values of the equity index and treasury bonds during the period of the derivative strategy. In effect, the client would have a synthetic position in those markets with immediate effect.
- The cost of establishing the synthetic position could be relatively low, depending on the type of derivative strategy used, e.g. if calls are used, the cost is limited to the premiums paid, and depending on the underlying volatility of the equity and bond markets.
- Derivative markets (for the type of contract under consideration) are liquid.

Negative factors

- The payout from the derivative strategy needs to cover the financing costs.

- The expectation that the markets will rise during the strategy period might be incorrect and if the prices decline on equities and bonds, the client would lose part or all of the premium on the calls.
- There is a limited choice of financial derivative contracts compared to the investable universe, therefore creating a potential mismatch between the specific equities and bonds that the client wants to invest in and the contracts available. Unless the strategy period exactly matches the expiration dates on the derivative contracts, there may be a timing mismatch. This should be less of an issue in developed markets, however.
- The cost of the derivatives may be potentially high, e.g. if the market has already factored in an optimistic outlook, the premiums paid on the calls would be expensive. Markets, if efficient, would have already factored in the outlook. Therefore, the cost of the option will be driven mostly by the volatility of the underlying market. The opportunity cost on all the derivative strategies would be large if the client is wrong on the outlook for one or both markets.
- There may exist regulatory restrictions on the use of derivatives by the client.
- The proposed derivative strategy must be paid at the outset and financed. Possibly consider a futures / forward contract instead of a call option, as requires no up-front premia.

iii. Evaluation of the proposal

- The proposed strategy will achieve the clients' aim and allow him the ability to act on his conviction. The cost may be substantial and other derivative strategies (e.g. futures / forwards) may be more optimal.
- There could also be some basis risk between the underlying asset used in the derivative and the actual investment he wishes to participate in.
- If the outlook for the market is neutral, it appears as if the negative factors outweigh the positive factors, particularly the potentially sizable premia.
- Hence, the clients' decision on the use of financial derivatives in this instance must be related to the strength of its conviction that the markets will rise during the strategy period.
- The financing cost is also a factor.
- There is a cost to establish the derivative positions, especially if its expectations do not materialise.
- The client might want to consider a partial synthetic position.

QUESTION 6

Examiner's comments

Part (i) was a simple application of bookwork to the specific scenario outlined in the question. Responses to part (ii) were disappointing, with many candidates making vague statements (unrewarded by marks) about using the results to determine the level of economic capital without addressing specifically how this could be done, as the question asks. In part (iii), surprisingly few candidates were able to link the VaR measure to the simulated results, and an alarmingly high proportion dismissed VaR as an appropriate criterion on the basis that it assumes normally distributed returns (there is of course nothing to prevent simulations based on non-normal distributions of the underlying variables).

i. The stages are as follows:

1. The key objectives that investment and economic capital requirement policy should aim to achieve need to be clarified. These involve objectives such as future solvency levels and the level of tolerable risk (mismatch between assets and liabilities). This will require an understanding of the risk tolerance of the key stakeholders, especially shareholders.
2. Suitable assumptions to use in the study need to be agreed. It will need to be decided which variables will be modelled stochastically (e.g. inflation and investment returns) and which deterministically (e.g. mortality and expenses).
3. Data on the liabilities needs to be collected to carry out the projections. For detailed liability analysis, data on individual policyholders is required to build up an accurate assessment of the future cashflow projections.
4. The overall nature of the liabilities is considered — an analysis of current solvency position and cash flow projections under different scenarios is considered.
5. An analysis would be carried out to identify how the life office's solvency position might progress in the future if different investment strategies were adopted. This will require assumptions of the joint distributions of returns on the asset classes.
6. Different asset mixes would then be analysed in more detail to assess the risks (relative to the liabilities) and the rewards of each alternative under consideration. A natural starting point would be a position matched as closely as possible with inflation-linked bonds, while alternative strategies could pursue greater returns through some exposure to equities.
7. The results would be summarised and presented – often in graphic format, so as to make them easier to understand for those such as directors with ultimate responsibility for the investment decision.

Compared to a traditional actuarial valuation, ALM provides much more information in three (or more) extra dimensions:

1. providing projections into the future (*time* dimension)
2. providing some estimate of the range of likely outcomes (*probabilistic* dimension)
3. indicating the effect of changing investment strategy (*asset mix* dimension).

ii. Economic capital requirements are often set in Value at Risk terms, e.g. holding sufficient capital for a 1-in-200 event is equivalent to holding economic capital consistent with a 99.5% VaR.

The outcome of the ALM would give a distribution for the solvency level at different time horizons. If the above example were consistent with the desired level of economic capital, for example, sufficient economic capital would be held to ensure, under the chosen investment strategy, that solvency was ensured under 99.5% of the simulations.

iii. As a criterion for setting economic capital requirements, VaR seems an appropriate measure, consistent with common regulatory approaches to the determination of economic capital. However, the choice of confidence level seems inappropriate- few regulators, shareholders or policyholders are likely to be satisfied with a 5% probability of insolvency (or of a requirement to raise new capital)- and a one-year

horizon is surely too short for a long-term institution such as a life office writing annuity business. It would be preferable to require a higher annual confidence level (annual measurement frequency) measured over a longer time horizon (multi-year measurement period).

As a criterion for setting investment strategy, VaR offers a mechanism to incorporate risk aversion into the decision. However, the choice of a single point ignores both the extent of the potential downside in the lower 4% tail and stakeholder preferences over the potential upside. An alternative approach would be to specify a utility function appropriate for the key stakeholders and choose an asset allocation that maximises expected utility (credit for any reasonable alternative)

QUESTION 7

Examiner's comments

The question was generally well-attempted and most candidates managed to obtain a reasonable mark.

i.

This part of the question was generally well answered by most candidates, which is to be expected from a bookwork question.

ii.

As an application question, this part was poorly attempted. Most candidates were able to score a few marks relating to the points made about comparability and fairness.

iii.

For a bookwork question, this part was generally well answered with the biggest challenge being the ability to summarise the comparison of the different methods in short paragraphs. Some candidates provided formulae, which were not requested.

iv.

This part of the question was poorly attempted by all candidates, with very few even being able to score a third of the marks available, probably as a result of a lack of understanding of convertible securities. Despite the solution being rather straightforward, most candidates complicated their solutions with suggestions that sometimes bordered on the ridiculous!

i. Self-regulation

- A self-regulatory system is organised and operated by the participants in a particular market without direct government intervention.

Advantages of self-regulation:

- The system is implemented by the people with greatest market knowledge.
- System is implemented by people who are incentivised to maximise cost benefit ratio of regulation and ensure system is non-bureaucratic.
- Should be more flexible than the alternatives and be able to respond rapidly to changes in market needs.
- Cooperation with a self-regulatory organisation may be more forthcoming than with a government agency (but not necessarily).

Disadvantages of self-regulation:

- Regulator will be perceived to be closer to industry than customers.
- This can lead to a lack of confidence from consumers and purchasers...
- ...particularly when criticism of industry is high in the wider economy

- Self-regulatory organisation likely to have fewer powers to fine and punish industry members than a government agency established under statute.
- Barriers to entry

ii. Potential goals of PPS:

- Achieve greater uniformity ...
- ... and comparability between performance calculations.
- Improve service offered to investment management clients.
- Enhance professionalism of the industry.
- Bolster the notion of self-regulation.
- Provide the industry with a yardstick to evaluate fairness ...
- ... and accuracy in investment performance evaluations

iii.

- Time-weighted rate of return is unaffected by cash-flows, so it is good as the basis for comparisons between funds and over time. It does not give the rate actually achieved, and it is potentially impractical if cash-flows are frequent or if valuation is difficult.
- Money-weighted rate of return gives the rate of return actually achieved by an investment or portfolio. It is not good as a basis for comparing portfolios because the rate can be distorted by the size and timing of cash-flows.
- Linked-internal rate of return is a practical approximation for the time-weighted rate of return. The main downside is that assumptions have to be made about the timing of cashflows in each period.

iv.

- A convertible security represents a hybrid investment involving elements of both the debt and equity markets
- For reporting purposes, convertible securities should be consistently assigned to either equities or fixed-interest.
- Should any shift occur, notice should be given to the client concurrent or prior to such shift.

QUESTION 8

Examiner's comments

Overall this was reasonably answered.

Part (i) was basic bookwork, and most students did well in this section.

Part (ii) illustrated that there are still some students that have little regard for the details in the question. Students reproduced the standard list of factors, ignoring the fact that this is a venture capital company (so there is unlikely to be any useful history or earnings or dividend payments). A number of students ignored the instruction word "outline" and simply produced a brief list (the word "competition" on its

own got no credit). Students who discussed issues relating to the discount rate to be used were also not answering the question asked.

Part (iii) was surprisingly poorly answered. Few students could think of more than two or three points. A few students thought that relative valuation methods were the same as technical analysis and a few thought it referred to Black Scholes (and then went on to acknowledge that this method would be more complex than DCF, hence this should have been a clue to them that this is not what the manager had in mind). There are still a number of students that use the word “inaccurate” inaccurately. For example, a few students made the comment that relative valuation methods may be “less accurate” and are therefore less useful than DCF. This comment is non-sensical – what does “less accurate” mean in this context? Students need to choose their words much more carefully.

(i)

Venture capital investing is the provision of capital for businesses in the conceptual stage or where products are not developed and revenues and/or profits may not have been achieved.

The other main forms are:

Leveraged buy-outs – equity capital for acquisition or refinancing of a larger company.

This differs from an ordinary acquisition because the shares of the acquired company no longer trade on the open market; instead, they are held by the private equity investors.

Management buy-outs are a form of leveraged buy-out in which the existing management buy-out the existing owners of the company. A management buy-in occurs when the buyer is an external management team.

Development capital – growth or expansion working capital for mature businesses in need of product extension and/or market expansion.

Restructuring capital – new equity for financially or operationally distressed companies.

(ii)

While many factors are similar to analysing an existing company, the information available will be much less as there is no company history or track record.

- Management ability: Management have a key influence over the success or otherwise of a company. While there is no track record for the venture company, management might have an established track record elsewhere. The ability to manage rapid growth and change is key, and this is a different skill to managing a more mature and stable company. Does the management have the experience and skill to incorporate appropriate controls as the company grows?
- Key-man risk: Is the management team reliant on the business skills of a key individual? Is the competitive advantage as a result of intellectual capital of a few key employees?
- Quality of products: This is an unknown, although market testing results and quality testing by specialised firms should be done to give some assurance.
- Prospects for market growth: This depends on how well accepted the new product is by the target market, and then the prospect to expand the target market itself e.g. by expanding in other countries.

- Competition: This depends on whether other firms are developing a similar product, and how quickly can other firms copy and/or develop a competitive product. High demand for the product will inevitably lead to an influx of competitor products.
- Input costs: Initial development costs will be high, but should reduce. Initial production costs will be high until the firm reaches economies of scale.
- Profit variability and growth: Unlikely to be profitable for some years, and it will be even longer before the firm will pay out dividends.
- Level of borrowing: This will depend on cashflow needs and the financing policy (between equity and debt).
- Level of liquidity: There are unlikely to be revenues for some time, so need to liquidity will be high initially.

Overall there will be a high level of uncertainty in the assumptions. Frequent re-assessment and production of revised financials as new information becomes available is key.

(iii)

The main advantages of a discounted cashflow model (DCF) over relative valuation methods:

- The DCF provides an absolute number that can be compared to the share price;
- The DCF can also be used for stochastic modelling and deterministic sensitivity and scenario analyses;
- DCF can be used for companies that do not generate profits and/or dividends, so ideal for start-up companies;
- DCF can explicitly incorporate specific information received e.g. from management on cost reductions ;
- Relative valuation can be invalid due to fundamental changes e.g. P/E changes due to a secular change in risk perceptions, rather than short-term anomalies.
- Relative valuation may not be feasible if suitable comparable companies do not exist, or where they exist (e.g. similar venture capital companies) if no/little public information is available.

The main disadvantages of a DCF method over relative valuation methods:

- The models require subjective assumptions, and the results can be very sensitive to some assumptions (e.g. the discount rate used), while no assumptions are necessary for relative valuation methods (although the decision on 'how cheap/expensive' an asset is relative to another or the past can be subjective);
- DCF models can become very complex, cumbersome and time-consuming, while relative valuation methods are much simpler;
- DCF is subject to spurious accuracy and the risk of modelling errors.
- DCF will be much more difficult to explain to others than relative valuation methods.

QUESTION 9

Examiner's comments

Candidates' performances were spread over the entire question, with very few showing consistent knowledge and application.

Part (i) was pure bookwork.

Part (ii) required recognition of appropriate bookwork.

Part (iii) resulted in a wide spread of marks. Those candidates who approached the problem as directed by the question were able to achieve reasonable credit, even without specific taxation knowledge. Those candidates who ignored the question directive and discussed complexities around taxation policies garnered few marks.

Part (iv) was a natural follow-on from part (iii). Again, candidates who approached the problem as directed by the question achieved credit.

Part (v) was predominantly bookwork, but candidates displayed a poor knowledge of syllabus objective (c).

- i. Platco = Basic Materials
Mainly produce intermediate goods
Finit = Financials
Financial capital intensive
Highly geared
Volatile profits
Labour costs are important
Domestic market is important, but increased internationalisation
- ii. The merger involves firms in unrelated industries: Platco = Basic Materials and Finit = Financials. Therefore the merger is conglomerate.

The companies are likely to be uncorrelated due to different:
 - Resources
 - Markets
 - Structures
- iii. Company profits are taxed twice: once in the hands of the company and once in the hands of the investor.

The revenue of Platco is crudely:
Platinum price * Quantity produced

Platco is also likely to have large reserves of platinum.

As such, the depressed platinum price will directly reduce the revenue.
Labour unrest will reduce the quantity produced and therefore reduce the revenue as well.

Management may have limited ability to curb expenses, particularly fixed expenses.
Fewer hours worked means a lower wage bill, but this may be partially offset by the higher wages being negotiated.

There are high costs associated with closing underperforming mines, which encourages management to run them on skeleton staff until the sector rebounds.

Platco will also have to pay interest costs associated with financial gearing. Again, management is likely to have limited ability in renegotiating financing terms.

The net result of the above is recurring losses over the past five years. A deferred tax asset is likely to be created equal to:

Income statement loss * Company taxation rate

The deferred tax asset is likely to accumulate over year on year losses.

This deferred tax asset would ultimately be used to offset future taxation from future positive profits.

- iv. Platco's deferred tax asset improves the Net Asset Value of the company, or company book value. The value of this asset depends upon utilisation through future profits. Moreover, the value of this asset reduces the longer it takes to be used due to time value of money.

The merged company will merge balance sheets and income statements. The expected extreme profitability provided by Finit should hopefully cover any further losses from Platco's business resulting in net profits. This will utilise the deferred tax asset quicker making the asset more valuable. Once Platco becomes profit-making, the utilisation should be accelerated.

Therefore the primary motive is the utilisation of unused taxation benefits.

- v. The central bank will want to be comforted that:
- Finit's ability to adhere to banking regulation is not affected by the merger
 - The merger will not weaken the financial markets
 - Utilisation of the taxation benefits is appropriate and within the spirit and ambit of taxation laws
 - If there are cross-border capital moves, that the exchange rate would not be unduly placed under pressure.

Furthermore, due to the merger, the central bank may need to consider imposing on Finit different:

- Minimum liquid reserve ratios
- Interest rate ceilings for bank deposits
- Lending allowances

The above impositions should only be temporary, however, as differentiation creates distortions in the banking market.