

EXAMINERS' REPORT

June 2011 examinations

Subject F105 — *Finance and Investment* Fellowship Principles

INTRODUCTION

The attached report has been prepared by the subject's Principle Examiner. 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.

GENERAL COMMENTS

Students struggled in a number of areas in this exam, however what was surprising was the generally weak knowledge and application of bookwork in some areas. Specific areas of weakness demonstrated by students in this exam included:

- *Reproducing and applying bookwork formula for the valuation of swaptions (Q7ii);*
- *Understanding the concept of a guaranteed annuity option and how life assurers can use swaptions to manage the interest rate risk (this topic is introduced in the ST5 notes);*
- *Linking investment knowledge with basic insurance concepts; F105 assumes that students are familiar with concepts introduced in prior subjects including CA1/A301. Yet it was surprising to see how few candidates mentioned level of solvency / free assets in assessing the credit rating for a general insurer (Q2ii);*
- *Reproducing bookwork “disguised” as application (Q1i and Q4i).*

Overall student performance was very disappointing.

QUESTION 1

i. Advantages:

- Easy to collect data.
- Quick and easy to carry out.
- Can be helpful with investment timing decisions.
- If a successful TA method can be found, can generate short-term trading profits.

Disadvantages:

- May distract attention from FA which is the core investment philosophy.
- Some clients who invested on the basis of FA philosophy might not be happy with the change esp if they do not believe TA is a viable method of investing.
- Unsuccessful methods could generate losses.
- Might encourage a more active trading strategy, increasing expenses.
- In a competitive/efficient market, any anomalies susceptible to TA detection should be closed out quickly.
- If TA decisions require subjective judgement, then there will be a need for experienced and skilled expertise which the firm is unlikely to have and will add to costs to obtain.

ii. Primary causes:

- Hindsight bias – tendency to view events post-hoc as having been predictable a priori.
- Confirmation bias – tendency to rely on evidence which is consistent with prior hypotheses, and ignore evidence at odds with them.

One mark for each suitable example:

Example: Confirmation bias – an investor who purchases an individual stock on the basis of a strong belief in its value, investing more into the stock on the basis of an industry award to its CEO, and disregarding news of a significant labour dispute and pending strike.

iii. Possible motives for conglomerate merger:

- Utilisation of unused tax benefits e.g. if one company has an accumulated tax loss this can be used to offset taxable profits elsewhere.
- Utilisation of surplus funds e.g. if one of the companies has surplus capital but insufficient capital projects in which to invest it, which can be provided by the other company.
- Protection against threat of takeover, by increasing size of company.
- Diversification of business operations, making companies less susceptible to variations in their individual business environments.
- Enhancement of earnings per share.
- Exploitation of lower financing costs and other economies of scale.
- Possible synergies e.g. utilising advanced technology for the extraction and preservation of tobacco, removal of carcinogens, or creating smoke-free and environment-friendly alternatives for smokers.

Counter-arguments:

The arguments for diversification and utilisation of surplus funds could easily be argued to be without merit:

- The return of surplus funds to shareholders would allow them to invest the money directly into investments which meet their risk-return needs...
- ...and shareholders are able to diversify by investing in a variety of companies' shares, and do not need a merged corporate balance sheet to do so.

(Credit was given for any valid counter-arguments to any two of the possible motives)

iv. The separate entities provide investment opportunities for each of the three funds:

- The cyclical industries fund would consider investment in the electronic goods manufacturer.
- The defensive industries fund would consider the tobacco company.
- The SRI fund would probably consider the electronic goods manufacturer but may well be barred from investment in the tobacco company.

The merger creates a potential problem for each of the funds:

- It is not clear whether the merged entity would fall into the mandates of either the cyclical or defensive funds, and the SRI fund mandate may prohibit tobacco investment.

For part (i) a number of students made the comment that Technical Analysis (TA) can be used to confirm the Fundamental Analysis (FA) decision. These students did not read the question properly as it clearly stated that TA would only be used where FA is inconclusive.

For part (ii) most students got the biases correct, although some did not get the definitions correct. Many students did not give examples as required, or when they did, they were either not about sub-optimal investment decisions or were weak examples.

For part (iii) a number of candidates indicated use of “complementary resources and functions such as HR and IT” as a reason for merger, but HR and IT would be common functions not complementary. Almost no-one was able to think about possible synergies such production of electronic cigarettes. A number of students thought that “empire building” was a reason for mergers which is unlikely.

Part (iv) was generally well answered, although some students thought that tobacco is cyclical, which it is not.

i. Key issues:

- Fundamental risks of the company's industry including changes to regulatory environment.
- Competitive position (relative to peers).
- Downside risk vs. upside potential.
- Quality of profitability vs. EPS growth.
- Cash-flow generation vs. book profitability.
- Forward looking analysis.
- Strategy, management track record and risk appetite.
- Capital structure and financial flexibility.
- Financial strength (eg leverage, liquidity).
- Use and purpose of borrowings.

ii. Additional considerations:

- Size of total written premiums.
- Spread by type of business (short-tailed, long-tailed), and geographic spread, and currency spread.
- Size of free assets relative to policyholder liabilities and statutory minimum.
- Business plans for growth especially in new unfamiliar areas.
- Level of conservatism of management e.g. in premium rates, reserving, dividend policy, reinsurance.
- Adequate matching of liabilities by assets.
- Adequacy of reinsurance arrangements especially against catastrophes.
- ERM risk management processes in place to monitor and manage risks.
- Any backing / guarantees by parent company.

In part (i) a number of students simply wrote things like "Ability/Character of company to repay" without elaborating. Students were required to think about the factors that demonstrate ability / character to repay loans.

Part (ii) was very badly answered. Many students repeated many of the points in (i) despite the question asking for "additional" considerations. Many students did not even mention size of solvency / free assets as being an issue. Many mentioned looking at claims ratio without also mentioning that claim ratios are cyclical and allowance should be made for this (looking at claims ratios without considering cyclical nature of claims is virtually pointless). Many thought that general insurers are leveraged, however this is normally not the case due to the cyclical nature of their business.

QUESTION 3

i.

- Private equity is the provision of equity capital where there is no immediate exit route via the secondary market. It involves investment in unlisted entities.
- Venture capital – capital for businesses in the conceptual stage or where products are not developed and revenues and/or profits may not have been achieved.
- Leveraged buy-outs – equity capital for acquisitions or refinancing of a larger company. Leveraged management buy-outs (and buy-ins) occur where existing management (or an external management team) borrow funds to buy a controlling stake in the company from existing owners.
- 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.

- Heterogeneity of private equity funds: funds will differ depending on their strategy and fund managers' area of expertise. The expected risk-return profile will differ by type of private equity investment undertaken by the fund (e.g. investors should expect lower return and risk from development capital compared to venture capital).
- Heterogeneity of funds could be overcome by producing separate indices for different types of private equity funds, provided there are sufficient funds to be able to do this, however the nature of many funds might be difficult to categorise if they engage in different types of activities.
- The production of reliable indices usually requires knowledge of the market values of the constituents of the indices at frequent intervals, which probably don't exist for private equity vehicles.
- An alternative to utilising market values is to calculate a proxy based on net asset value information published by the funds themselves, however...
- ...funds might not produce regular valuations of their investments,
- ...and any valuation produced by the fund will be subjective and could be distorted,
- ...and such values might not be made publicly available.
- Investors in some private equity forms e.g. venture capital may receive several calls for capital, and the timing of capital injections may differ between investors in the same fund due to long fund-raising periods; this will be difficult to allow for in an index.

- A further complication for a weighted arithmetic index is deciding on the weights of the constituents of an index – these might be based on fund size, but the information may not be available.
- Geometric and un-weighted arithmetic indices only require price data, but are unsuitable as benchmarks for portfolio management.
- A desirable feature of an index is that it should be “investable” i.e. investors can replicate the performance; an index based on unlisted funds that might not be open to all investors or require very hefty minimum investments is then ‘un-investable’ and is less useful to the investment community.
- Ideally investors would want to see both returns before fees and net of fees. This data may not be available, and a net-of fees index return will encompass heterogeneity in fee structures.
- Heterogeneity over time: Private equity funds may evolve over time (e.g. from providing mainly venture capital funding to mainly development capital), it might be difficult to establish when to change the category of a fund for inclusion in an appropriate index.
- This heterogeneity is compounded by the relatively short-term nature of some private equity forms (e.g. leveraged buy-outs).
- Private equity funds often return capital to investors over a period of time – “chain-linking” is needed to allow for capital changes in constituents of an index.
- A number of private equity ventures (and funds) may not survive – if these funds are excluded from index calculation the index will overstate performance, hence index construction must reflect the impact of failed funds to avoid survivorship bias.
- Selection bias: only successful funds will select themselves for inclusion in the index.

iii.

Comment – useful suggestion:

- A suitable risk-adjusted return index would be very useful to investors, as private equity returns can be expected to be very volatile before adjusting for potentially high levels of risk.
- Unadjusted returns may be misleading to potential investors.
- The Sharpe measure shows the level of outperformance relative to a portfolio’s standard deviation:

$$S = \frac{R_p - r}{\sigma_p}$$

σ_p = standard deviation on the portfolio

R_p = return on the portfolio
 r = risk free rate of return over the period

However, the drawbacks would be:

- If no liquid secondary market exists for PE investments, market value data are not available, and infrequent, possibly subjective fund valuations will be used as proxies, but these will understate the level of risk as measured by standard deviation of return.
- Different PE strategies have different levels of volatility, which may require further subdivision of data, which may be impossible.
- PE fund returns will have a tendency to exhibit skewness and leptokurtosis which means that standard deviation is likely to be an insufficient measure of portfolio risk.
- Investors mainly interested in downside risk while variance considers both up/downside risk.
- Sharpe is relevant if PE represents all/most of an investors wealth, not part of it.

In general students were able to combine their knowledge of private equity and indices to generate reasonable answers.

Some students thought the index would be of PE investments themselves (and not PE funds that invest in PE projects).

For part (i) a number of students thought that leveraged buy-outs comprise only management buy-ins and buy-outs. However this is not always the case. Similarly, definitions that did not mention leveraged management buy-outs and buy-ins did not obtain full credit.

For part (ii) a number of students realised that price data or data for weights would unlikely be available but were not able to suggest how to overcome these difficulties.

Part (iii) was generally well answered.

QUESTION 4

i. The principal aims of the regulation of financial services are to:

- correct market inefficiencies and to promote efficient and orderly markets
- protect consumers of financial products
- maintain confidence in the financial system.

OTC markets:

- OTC markets are much less liquid (i.e. low marketability) and transparent than the markets in exchange-traded derivatives.
- Credit risk is a major factor as no clearing house and no margins deposited.
- Dealing costs are high.
- Market values are not quoted.

- A pension fund must remain financially sound in order to meet their financial obligations towards stakeholders.

ii. In response to the regulator's aims, pension funds should have regard for the following:

- Ensure that the fund's assets are appropriate for its liabilities.
- Ensure proper due diligence / risk assessment of the third parties who manages its assets.
- Understand the changing risk profile of its assets over time, by doing a comprehensive risk analysis; and
- Have regard for the sustainable long-term performance of assets it is invested in.

With specific reference to OTC derivatives:

- Prohibit: Speculation.
- Concentration of risk in OTC structures or with single OTC issuers.
- Income enhancement through uncovered positions.
- Leverage at fund level.
- Refrain from entering into OTC contracts, rather go for exchange-traded contracts.

iii. Rules-based approach:

A regulator prescribes detailed standards and procedures for market conduct, followed through by a "tick-box" supervisory approach.

Rules-based:

- + provide greater certainty in relation to requirements for compliance.
- + behaviour can be changed quickly.
- + compliance can easily be checked.
- stifle innovation.
- becomes quickly outdated.
- encourages regulatory arbitrage.
- more costly than PB approach.
- may undermine professional responsibility.

Principles-based approach:

A regulator defines a set of general principles aimed at achieving normative outcomes, allowing freedom for the regulated entities with regard to its implementation.

Principles-based:

- + transfers supervisory function to the regulated entity.
- + regulator role becomes more governance-based.
- regular dialogue with the regulator to measure standards of acceptability.
- non-compliance may be more difficult to monitor and address.

iv.

- Entities must have sufficient resources, and governance structures, and fit and proper persons to conduct their activities appropriately.
- Aids consumer protection.
- Prevents market abuse.

v. Entities must be suitably defined, but should include:

- All institutions issuing OTC derivatives business.
- Operators of trading platforms and other trade execution facilities for OTC derivatives.
- Operators of post-trade clearing and settlement services for OTC derivatives.
- OTC derivative brokers.
- Entities offering professional advice in respect of OTC derivatives.

Minimum requirements for licensed entities should include:

- Adequate capital and infrastructure to support their activities.
- Conformity with “fit and proper” requirements in respect of employees.
- Appropriate risk management and corporate governance policies, reflecting minimum standards of best practice.

Credit was given for any other valid requirement.

Given the spread of marks obtained in this question, it would appear as if most candidates struggled with it. It is not clear as to whether it is because the question was challenging or whether candidates who left it to last were unable to finish it in time. The question required higher-level thinking skills and the ability to integrate some of the core issues in the syllabus. Some general comments about each part of the question:

Part (i) was generally answered satisfactorily - even though the question distinguished between “general” and “specific” reasons, most candidates only covered one of these aspects, resulting in easy bookwork marks were lost out on.

Part (ii) was poorly answered – very few candidates were able to specifically address the regulator’s concerns with respect to pension funds. Only the better candidates were able to address the concerns relating to OTC derivatives.

Part (iii) was generally answered satisfactorily – an application question related to regulation, most candidates were able to distinguish between the two approaches. However, very few candidates were able to generate adequate advantages and disadvantages, in most cases just repeating the bookwork. Candidate often repeated the same point using different wording, e.g. “RB more costly than PB” and under the PB, repeating “PB less costly than RB”.

Part (iv) was poorly answered – very few candidates were able to explain the rationale behind the principle with the result that poor marks were scored in this question.

Part (v) was poorly answered – most candidates were not able to identify entities relating to OTC derivatives. Hence, minimum requirements were scant and very few candidates scored marks here, if any.

QUESTION 5

i.

- Hedging
- Speculation
- Arbitrage
- Portfolio (transition) management.

ii.

- At the same time as buying individual securities, sell equity index futures.
- Futures being sold will not exactly match the securities being bought.
- The result would be that any profit / loss on the individual securities due to overall market movement will be offset to an extent by a loss / profit on the futures contracts.
- The aim is not to hedge exactly, but to reduce or remove market risk.
- The strategy provides protection against broad equity market movements, while allowing scope for stock selection profits.

iii.

Return on Equity – not suitable:

- The portfolio will effectively consist of a long equity position which is significantly cancelled out by a short futures position.
- Volatility of equity returns.

Suitable measure:

- Money market return or inflation as defined in the marketing material (e.g. CPI, National Earnings Index etc.) plus a margin to ensure outperformance of inflation (as defined).

iv.

The fund's performance is not correlated to the equity market, making it effectively a relatively low-risk investment. It will appeal to investors looking for low risk or diversification, who have faith in the asset manager's stock-selection abilities.

Type of investor:

- Risk-averse investors.
- Retired investors.
- Hedge funds.
- Pension funds wanting to add an alternative product that complements their overall investment strategy.
- Investor with real liabilities.

Part (i) was well answered – bookwork.

Part (ii) was poorly answered – most candidates failed to frame their answers in relation to a futures strategy. In many instances, candidates wrote everything they knew about hedging with futures, clearly demonstrating their inability to focus on the most important risk, namely a

downturn in the equity market. Only the better candidates were able to pick up the marks relating to outperformance based on stock selection profits.

Part (iii) was poorly answered – candidates who were unable to satisfactorily answer part (ii) were unable to explain why returns of equity may not be appropriate. Most candidates were able to suggest an appropriate performance objective but note that marks were available for specifying what the inflation measure is of the ARF. Few candidates made this distinction.

Part (iv) was generally well answered – most candidates were able to come up with the obvious types of investor.

QUESTION 6

i. A fully matched strategy may:

- Not be possible because:
 - The necessary assets (e.g. index linked gilts) may not be available in all the countries the company operates in.
 - The DMT of liabilities exceeds the DMT of assets available.
 - Strictly speaking a full matched strategy, requires that all liability cashflows are known in advance (which is not the case here).
- Have a “cost” implication because:
 - Investment is likely to be in low risk-low return assets, like gilts.
 - May require rebalancing, with a concomitant cost implication.
 - Limited availability of assets, like gilts, may increase demand for these assets and therefore the price of these assets.

The Asset Liability model:

- The ALM model is increasingly used in the pension fund context of reviewing investment policy.
- Have the advantage of forcing the users (here the trustees) to specify their objectives, time horizons and confidence levels in advance.
- The model looks at the behaviour and interaction of both the projected assets and liabilities of the scheme.
- The output would be a probability distribution of outcomes for the different investment strategies.
- It will also be possible to quantify the level of risk of the various investment strategies, including:
 - Sovereignty risk.
 - Currency risk.
 - Tax risk (of the various jurisdictions the multi-national is operating in).
- The sensitivity of meeting the objectives to any of the financial risks (e.g. currency risk) can be identified and the investment strategy adjusted to mitigate the risks.
- The outcome of the exercise is usually to recommend a suitable investment strategy for the scheme.

However:

- the benefits outlined above should be weighed up against the costs (in terms of expertise and time) & complexity of ALM and
- trustees should also be aware of the model and parameter risk of ALM's.
- In the context of a pension scheme of a large multi-national company, these disadvantages may be relatively small.

ii.

- A lower confidence level means that the trustees are willing to accept a higher level of risk of not meeting their objective and vice versa.
- The more conservative the confidence level, the higher the value of the required reserve, hence the lower the likelihood that the sponsoring employer will have to make good a deficit lessened in the long-run (i.e. over the projected time horizon).
- The more conservative the confidence level, the more constraints will be placed on the investment strategy.
- However, in the short run, this may place strain on the employer to make good any immediate deficit that may result from implementing the strategy, and/or may increase the contribution rate going forward, that will place an additional cashflow constraint on the employer
- If an insurance company / bank runs into financial trouble, they may find it very difficult to raise additional capital in the market (or the additional capital is likely to be very expensive), whereas an employer has a vested interest in ensuring that a pensions scheme remains financially sound. This therefore means that a lower confidence level may be justified for schemes backed by an employer.
- The risks in the insurance and banking industry are more systemic in that if either a bank or insurance company fail, the repercussions are greater than when a pension fund fails.
- Banks and insurers market themselves on the strength of their financial position. By using more conservative confidence intervals they increase the perception of financial strength amongst investors.
- Pension fund members cannot easily access the benefits of their fund and the fund can arguably therefore take a bit more risk to enhance expected benefits / reduce expected cost, compared to banks/insurance companies where clients can withdraw their benefits relatively easily.
- Pension increases are discretionary, as opposed to the fixed contractual obligations of banks and insurers.

iii. Choice of time horizon:

- The 12-year time horizon probably coincides with the mean anticipated duration of the remaining life expectancy of the pensioners.
- The 12-year time horizon may also allow the fund to smooth asset returns over time to some extent in order to meet the inflationary pension increase objective *on average*.

Choice of confidence level:

- The confidence level will reflect, to a large extent, the trustees' attitude towards risk.
- They may be comfortable with the lower confidence interval in order to allow for a more flexible investment strategy.
- A confidence level higher than 95% may put financial pressure on the employer (e.g. through a higher contribution rate).
- Whereas, a lower confidence level may mean there is an unacceptably high risk of not meeting the trustees' objectives, particularly where the fund may have had a history of granting pension increases in line with 80% of CPI and would like to continue in this fashion given that a reasonable benefit expectation may have been created.
- The employer's accounting treatment of its pensioner liabilities may require this.
- It may be a regulatory requirement or industry practice may be to set the confidence level at 95%.

Generally students struggled with this question. The suggested solution is more comprehensive than would be expected of students under exam conditions, but does indicate the range of points that could have been made.

Very few students provided a well reasoned argument for (or against) the suggestion in part (i).

In part (ii), most students neglected to discuss, arguably, the most important reason for the more conservative confidence levels, namely the severe repercussions on the financial system of a country should a bank / insurance company fail.

In part (iii) very few students discussed the risk tolerance of trustees or the impact of the choice on the sponsor of the pension fund.

QUESTION 7

i.

- The life assurer would be concerned with interest rates declining below the level guaranteed within the annuity option, as the guaranteed annuity terms would become more attractive than current market annuity rates, and hence most/all policyholders would exercise their option.
- If this risk is not hedged, the life office makes a loss on the difference between the guaranteed interest rate and the rate that it can invest funds at when policyholders reach retirement and exercises the option.

Swaptions:

- The life office purchases an option on a future swap arrangement.
- The swap arrangement will be to receive a fixed rate of interest in exchange for variable rate payments.
- If interest rates rise, the life office will not exercise the option. If interest rates decrease, the office will exercise the option to meet the cost of the GAO.
- The duration of the swaption payments would probably reflect the expected duration of the annuity payments.
- However there will be a cost to purchase the swaption, which the office should aim to recover from the product.
- A significant advantage of a swaption is that it is generally not a standard contract and terms can be tailored to meet the life office's specific requirements.

ii.

- Credit risk: this is the risk that the counterparty defaults on payments to the life office (in general, OTC arrangements do not involve margin calls).
- Inadequate hedging: the life office needs to project the future value of the investments that could be converted to annuity income at the time of purchasing the swaptions (this is the principal to be used for the swaption).
- If the value estimated is too low, then the life office retains some exposure to the risk of falling interest rates.
- If the value estimated is too high, the life office will buy a contract in excess of its need which may negatively impact on profitability or product pricing (where the full cost is passed onto the policyholder).
- Longevity risk: If the term of the swaption is too short (e.g. due to increased longevity) then this would leave the life office exposed to the risk of low interest rates once the swaption expires.
- Costs: The intermediate bank may require relatively high fees given the nature of the transaction, which if passed onto policyholders may make the product less appealing.

- The product is complicated and may result in mistakes in implementing the strategy.
- Regulations / accounting standards may change, disallowing the use of these instruments & additional reserves may be set up to meet the guarantee provided.
- There is uncertainty wrt the exact retirement date of policyholders (they may move the retirement date), and this may mean that the strike date of the swaptions no longer coincides with the retirement date.

iii.

The value of the swaption is = $LA[R_x\Phi(-d_2) - F_0\Phi(-d_1)]$ where

$$A = \frac{1}{m} \sum_{i=1}^{mn} P(0, t_i)$$

$$L = R105m$$

$$A = e^{-19 \times 0.089} \left(\frac{1 - e^{-33 \times 0.089}}{e^{0.089} - 1} \right) = 1.875371484 \quad m=1 \quad n=33$$

$$R_x = 10.2\%$$

$$F_0 = [e^{8.9\%} - 1] = 0.093080656$$

$$T = 19 \quad \sigma = 0.3$$

$$d_1 = \frac{\ln\left(\frac{F_0}{R_x}\right) + \sigma^2\left(\frac{T}{2}\right)}{\sigma\sqrt{T}} = 0.583858128$$

$$d_2 = d_1 - 0.3\sqrt{19} = -0.723811555$$

$$\Phi(-d_2) = 0.765409$$

$$\Phi(-d_1) = 0.279658$$

$$\text{Swaption value} = R10.25m$$

Answers to this question, in general, were very poor. A number of students were unable to explain the interest rate risk inherent in a guaranteed annuity option.

Part (ii) required an outline of the key risks. Students who did not score well on this part, either only listed risks, without a short description of the risk as required by the word "outline" in the question or did not discuss the key risks, e.g. longevity.

Part (iii) was bookwork but very few students knew which pricing formula to apply.

END OF EXAMINERS' REPORT