

EXAMINERS' REPORT

June 2014 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.

QUESTION 1

- charts
 - identify patterns or trends in the behaviour of a security price (or index)
 - use past as a guide to the future in order to make trading decisions
 - based on support and resistance levels
 - price below support level gives a sell signal (above resistance level gives a buy signal)

- mechanical trading rules
 - trading signals given by set price movements
 - share bought if moves x% above previous low or sold if it moves y% below previous high
 - if x and y are too small: profits eroded by trading costs
 - if x and y are too large: miss out on profitable trades

- relative strength analysis:
 - examines share performance relative to market or sector
 - can be used to identify, at early stage, a change in relative strength which is unlikely to recur in the immediate future
 - (based on mean reversion)
 - or to buy (sell) stocks which have out-(under-)performed in the short-term past, in the belief that this performance will persist in the short-term future
 - (based on momentum)

Examiners' comments:

This was straightforward bookwork, and handled well by most candidates. The most pervasive problem was a classic exam technique problem, failure to offer sufficient detail. The command verb 'describe' and the 6-mark allocation ought to have persuaded candidates that some descriptive detail was a requirement.

QUESTION 2

i.

Key characteristics:

- Relatively new industry of information technology
- Provide hardware and software and computer services
- Many internet-based companies have not found a way to make profits yet
- Usually low/no dividends paid out
- Assets are largely intangibles
- Prospects for a company are highly dependent on key staff/skills

ii.

Private debt refers to loan capital issued by companies that is not publicly listed and traded on a stock exchange. It is therefore not actively traded. It is a debt capital market transaction that generally has covenant features similar to a bank loan and is often used as an alternative to bank funding.

Advantages:

- Lower costs of issuing, especially as the debt issue may not be large enough for it to be financially viable to obtain a listing.
- No requirement to obtain a costly formal credit rating (although it may reduce cost of debt if a rating was obtained).
- Allows the company to free up credit lines with relationship banks.

Disadvantages:

- Due to the risks and illiquidity of private debt, investors will probably require greater covenant protection, which may restrict future business operations.
- Even with covenants, the cost of borrowing may be higher than listed debt to make up for low liquidity and a lack of a credit rating.
- There will be a costly “make whole” penalty/premium to compensate investors for early redemption.

iii.

Reasons:

- The debt plus CDS yield may not be risk free due to:
 - Counterparty credit risk on the CDS which reduces the cost of the CDS
 - The no-default value of the bond may be different to face value due to changes in interest rates (i.e. the risk free and risky bond price changes are inconsistent due to inefficient markets)
 - Documentation differences (resulting in some credit events not leading to a claim thus reducing the cost of the CDS)

- The debt plus CDS package is illiquid and requires funding, and so typically the basis will be negative when funding is expensive.
- Different supply and demand dynamics in different markets.

iv.

Credit events can include:

- bankruptcy (insolvency, winding-up, appointment of a receiver)
- repudiation (when the debt issuer chooses to cancel all interest and capital repayments)
- failure to pay a particular coupon
- cross-default (a clause allowing a credit event on another security of the issuing firm to be considered as a credit event on the bond in question)
- a rating downgrade (if the firm obtained a rating for its debt)

Ways to settle a claim under a CDS:

- A pure cash payment, representing the fall in the market price of the defaulted security. However the market value will be difficult to determine.
- The exchange of both cash and a security (physical settlement). The protection seller pays the buyer the full notional amount and receives, in return, the defaulted security.

v.

Cost of funding may be higher for private equity, as equity investors will require greater compensation for:

- Higher level of risk (as they cannot impose covenants to protect their investment);
- Lower liquidity (as private debt matures after a pre-defined term, while unlisted equity investors may not be able to sell their holdings until the company lists its shares on an exchange)

Private equity investors may require greater level of governance than may be in place currently (e.g. greater control on expense sign-offs, contract acceptances etc) which could make the business less nimble as administration/documentation requirements increase.

It may also increase costs if more staff need to be hired to increase governance.

Investors are also likely to require a greater level and frequency of disclosures than currently required e.g. monthly financial information and updates, which will take up more management time.

Private equity investors are likely to require a director appointment to represent their interests, which may make future strategic decision-making slower and more difficult if agreement cannot be reached by all directors.

Additional requirements that may be imposed by private equity investors:

- a commitment to list the shares by some deadline. Listing is likely to increase costs and governance and disclosure requirements further;

- approval of budgets, investments, appointments of staff;
- the right to replace management in some circumstances.

Private equity and private debt restrictions might be in conflict e.g. private equity investors might cap gearing levels or disallow some forms of debt funding, while private debt covenants might disallow any further capital raising until the debt is repaid.

Examiners' comments:

On average, candidates managed to obtain a third of the marks available for this question, with the most challenging aspect of the question being the application of bookwork as were required in parts (iii) and (v):

- i. Bookwork – generally well attempted by most candidates who made the effort to learn the core reading relating to the characteristics of the technology sector.*
- ii. Bookwork with some application – few candidates were able to provide the proper core reading definition of private debt, and many confused the definition with that of private equity. The balance of the question dealing with advantages and disadvantages were generally well-attempted by those who made the effort to properly prepare themselves for this relatively straightforward assessment of private debt.*
- iii. Poorly attempted application question – very few candidates provided more than counterparty credit risk therefore failing to demonstrate the level of application required for this specialist technical subject.*
- iv. Bookwork – generally well-attempted by most candidates.*
- v. Application – this part was the worst attempted. Many candidates were able to regurgitate the bookwork relating to private equity, but very few were able to apply these principles in formulating a solution that demonstrates the high-level skill and ability to apply the bookwork to a practical situation. Disappointingly, almost no one was able to expand on the possible conflicts between the private equity and private debt restrictions that may exist.*

QUESTION 3

i.

- Risk in MPT is characterised by standard deviation or variance of the portfolio returns.
- The portfolio will lie on the efficient frontier; i.e. it will maximise return for the given level of standard deviation, or equivalently minimise standard deviation for the given level of return.
- The chosen portfolio will further maximise the expected utility of the organisation, based on the risk preferences communicated to the firm.

ii.

- ALMs project asset income and liability outgo simultaneously.
- In a stochastic setting, the main parameters are modelled as random variables with given means and distributions, and a given correlation structure, based on past data, most likely overlaid with judgement as to how the future outlook is likely to differ from the past.
- In this way, allowance is made for common and unique variations in assets and liabilities.
- A range of investment strategies will be modelled, and the model will generate a distribution of outcomes (in the form of e.g. surplus at the terminal date).
- The output results should be tested for their sensitivity to the input parameters.
- The optimal strategy will be the one that best meets the investor's objectives and risk profile.
- Tools for this assessment include utility theory, ruin theory and metrics such as Value at Risk.
- ALMs are therefore primarily concerned with actuarial risk, i.e. the risk of the assets failing to meet the liabilities.

iii.

- The biggest issue is that the MPT approach takes no account of the liabilities, while the risk preferences of the organisation are likely to be closely linked to the likelihood of meeting their spending objectives, and as such, the ALM is likely to capture more accurately the risk preferences of the organisation.
- In addition, it is unlikely that standard deviation can be a sufficient indicator of investment risk.
- Other reasons for the difference may include different assumptions about the mean returns of different asset classes, and their standard deviations, and correlations.

iv.

- Market risk:
 - relating to changes in the portfolio value resulting from changes in market value of the constituent assets.
- Credit risk:
 - that a counterparty will be unable or unwilling to fulfil its obligations.
- Operational risk:
 - of loss due to internal operations of the organisation and/or any third party asset manager, including fraud and mismanagement.
- Liquidity risk:
 - of failing to have sufficient liquid assets to meet operational needs, including the spending needs as they arise during the roll-out period.
- Actuarial risk:
 - of the assets not meeting the investor's objectives.
- (Note: relative performance risk is not an issue in this context.)

Examiners' comments:

This question was done reasonably well.

Parts (i) and (ii) were mostly done well, although some students listed some very brief points in (ii) when asked to "describe" the process of performing a stochastic asset-liability modelling exercise, and many obvious points were missed.

Parts (iii) and (iv) were also generally well answered, but with many obvious point being missed. In part (iv) a number of students listed "currency risk" in addition to "market risk", and a number of students listed "relative performance risk" which is not applicable in this case.

QUESTION 4

i.

Three uses of yield indices:

- Provide a standard against which yields on various fixed interest investments can be assessed;
- Provide a picture of general yield structures of fixed interest investments;
- Allow comparison to be made with yields on ordinary shares as a measure of the yield gap between bonds and equities.

Yield indices are most likely to be used for identifying anomaly switch opportunities e.g.

- Position of a bond relative to a yield curve/suitable index compared to history.

ii.

The main disadvantages of using forwards to hedging currencies include:

- Many investments are of a longer term than the contracts available in the market, and the forward contracts will therefore have to be rolled over on expiry at an unknown rate.
- The extra cost of bid-offer spread compared with a straight spot currency transaction, especially on smaller deals, such as hedging dividend receipts.
- Removing the possibility of favourable currency movements (i.e. market risk)
- Counter-party credit risk
- Mismatching real liabilities by eliminating purchasing power parity protection against unexpected inflation differentials
- The difficulty of hedging unknown future income.
- Illiquid if there is a need to close out the position before expiry.

iii.

This is a forward on the bond (F_0 in US\$) combined with a forward currency (F):

$$F_0 \text{ (Rands)} = [F] \times [F_0 \text{ (\$)}] = [S \times (1+r_d)^5 / (1+r_f)^5] \times [(B_0 - I) \times (1+r_f)^5]$$

where

$$B_0 = \text{current price of the bond} = 100(1+r_f)^{-20}$$

I = income not received on the bond prior to settlement at the forward date = nil for a zero-coupon bond

S = current exchange rate, F = forward exchange rate,

r_d and r_f = SA and US yields (annual effective)

$$\begin{aligned} \text{Hence } F_0 \text{ (Rands)} &= [R10/1\$ \times (1.07^5/1.01^5)] \times [\$100 \times 1.01^{-20} \times 1.01^5] \\ &= R13.345 \times R86.1349 = R1\ 149.45 \end{aligned}$$

iv.

$$P = (1+r_f)^{-5} [X \Phi(-d_2) - F_0 \Phi(-d_1)]$$

Where:

$$F_0 (\text{US\$}) = [(100(1+r_f)^{-20} - I) \times (1+r_f)^5] = [\$100 \times 1.01^{-20} \times 1.01^5] = \$86.1349$$

$$X = \$85$$

$$\sigma = \text{forward price volatility} = D y_0 \sigma_y$$

where D = modified duration = Duration / $(1+i)$ = 15yrs/1.01 = 14.85 yrs and

y_0 = initial forward yield on the bond = 0.01 and $\sigma_y = 0.15$

$$\text{hence } \sigma = 0.022277$$

$$d_1 = [\ln(F_0/X) + (T=5\text{yrs})/2 \sigma^2] / \sigma \sqrt{5} = 0.014505/0.049813 = 0.29118$$

$$d_2 = d_1 - \sigma \sqrt{5} = 0.241366$$

$$\Phi(-d_1) = 0.385457 \quad \Phi(-d_2) = 0.404636$$

Hence

$$P = P(0,5) [X \Phi(-d_2) - F_0 \Phi(-d_1)] = (1+r_f)^{-5} \times 1.192714 = \$1.1348$$

(or R11.348) per \$100 nominal

Examiners' comments:

There was a big variation in marks on this question. There were a number of reasonable attempts for the calculation parts (iii) and (iv).

Parts (i) and (ii) were bookwork, despite this, part (i) was not done well, and indicated that a number of students did not really know what a yield index is. A number of students thought that it can be used for portfolio performance monitoring (by comparing a manager's return to the yield index), however a total return index would be used for this purpose.

In part (iii) a number of students only calculated one part of the forward i.e. either the currency or the bond forward, but not both, as was required.

In part (iv) very few got this completely right, but many made a reasonable attempt.

QUESTION5

i.

- weighted arithmetic index (free float)
- composed of 500 leading US companies
- representing a broad cross-section of market sectors
- used as a basis for stock index futures
- preferable to both DJIA and NASDAQ 100 for benchmarking purposes for most portfolios
- DJIA is an unweighted arithmetic index
- of 30 industrial shares
- it is therefore flawed in terms of index construction (due to concentration and failure to weight appropriately)
- and provides a measure only of share price movements in the industrial sector, which has become a smaller component of the US economy over time
- the NASDAQ 100 is based on movements of the 100 largest non-financial companies listed on the NASDAQ (it is a modified cap-weighted index)
- which excludes a significant proportion of major US companies
- and is concentrated in technology stocks.
- The exclusion of financial companies is also a limitation.

ii.

- wish to reduce exposure to US equity market movements, so reduction in beta to 0.8 is more appropriate
- and wish to reduce exposure to interest rate movements, as an increase in interest rates will reduce the value of the bond portfolio, so a reduction in modified duration to 4 years is more appropriate
- equity futures contracts: $(0.8 - 1.2) * (80,000,000 / (250 * 1750)) = -73.143$
- so short position in 73 S&P500 futures contracts (leading to beta of 0.80078)
- bond futures contracts: $(4-6)/5 * 60,000,000 / 100,000 = -240$
- so short position in 240 bond futures contracts

iii.

- basis risk:
 - basis (difference between futures and spot prices) may not move exactly as expected
 - this is however only an issue if the position needs to be closed out early
- cross-hedging risk:
 - arises where the basket of securities underlying the index is not the same as the securities held
 - the use of modified duration to effect the hedge assumes parallel shifts in the yield curve
 - so there is residual exposure to non-parallel shifts

- likewise, if the portfolio does not move in line with its beta of 1.2 then the equity hedge will be imperfect
- and it is only approximate because of the need to trade in whole numbers of contracts
- market risk:
 - is managed to some extent, but the hedge is only partial, so provides limited protection
 - and opens the portfolio to the risk of markets moving in the opposite way to that expected
- liquidity risk:
 - remains, and may be exacerbated by margin calls on the futures contracts
- Operational risk:
 - there is the possibility of additional operational risk as a result of the inclusion of futures contracts
- other risks remaining:
 - systematic risk
 - interest rate risk
 - relative performance risk

iv.

- futures markets are very liquid
- with relatively low transaction costs
- the required position can be achieved quickly and easily
- there is no risk of moving markets with sizeable cash market transactions
- although this risk is limited given the size of the portfolio
- it minimises the research costs associated with identifying suitable equities and bonds to buy and sell in order to effect the transition
- it minimises the operational risk that would be associated with the execution of a significant cash market buy and sell transaction strategy
- since this is a short-term tactical decision, it avoids the need to reverse the transactions at a later stage
- which would incur another layer of transaction costs
- it avoids the crystallisation of capital gains

Examiners' comments:

This question was reasonably well-handled by most candidates, the significant exception being part (ii), where many candidates appeared unsure of how to apply their theoretical knowledge to a practical strategy. Several candidates omitted this part entirely, which was extraordinary given that it would have seemed obvious, at least, that beta should be reduced. A surprising number of candidates thought that the modified duration of the portfolio should increase, revealing either sloppy thinking under exam pressure or a fundamental misunderstanding of the relationship between bond values and interest rates.

Some candidates' answers to part (iv) revealed another classic exam technique failing, viz. the regurgitation of every piece of bookwork that could be retrieved relating to the advantages of derivative market trading for portfolio transitions, rather than the selective application of this theory to the specific situation presented.

QUESTION 6

i.

Quantitative Easing (QE) is a monetary policy used by some central banks to increase the supply of money. It usually involves both a direct increase in the money supply and a knock-on effect from the fractional reserve system, increasing the money supply further, although it can involve just making changes to the fractional reserve system.

QE is usually implemented by a central bank first crediting its own account with money it creates out of nothing ("ex nihilo"). It then purchases financial assets, for example, government bonds, quasi-government debt, mortgage-backed securities and corporate bonds, from banks and other financial institutions in a process referred to as 'open market operations'. It can also involve changing the reserve requirements for banks, which, through the fractional reserve system, would increase the money supply.

ii.

The repurchase or repo rate is the interest rate at which a central bank lends money to private banks.

The repo system of borrowing and lending involves the temporary sale of a financial asset by the borrower (private bank) in exchange for the needed cash from the lender (the central bank). In such a transaction, there is an explicit agreement that the borrower must repurchase the financial assets at an agreed future date – for example, after one week.

iii.

The most direct application would be reducing the repo rate to a negligible level. This would encourage private banks to borrow more and thereby increase the supply of money. The repo rate also directly affects the interest rates offered by private banks to the retail and institutional markets (public markets). The public supply of money would increase as a result of:

- Lower levels of savings
- Higher levels of borrowings

The central bank may be willing to accept less secure financial assets as collateral. The private banks may then be able to temporarily exchange illiquid financial assets for cash. The central bank may also extend the repurchase of these assets to a much later date, for example, one year. This will allow the private banks to hold cash for a longer period to aid their banking operations.

The central bank may reduce the proportion of collateral to cover the debt to the central bank. This would leave more assets under the control of the private banks. These assets can then be used to aid their banking operations.

The repo system cannot be used to print money.

iv.

The increase in money supply may be translated directly into inflation without the necessary increase in economic growth.

Quantitative easing usually results in the purchase of illiquid assets from private banks. If these assets do not at least retain their accounting value then the central bank would be fully exposed to the fall in their value. This will ultimately lead to a strain on the government's budget and be borne by taxpayers.

Reducing the fractional reserve system reduces the amount of capital that private banks need to hold. This should mean less secure private banks with potentially greater defaults. This may result in systemic risk within the financial system.

Low interest rates make less risky investments unattractive. The excess liquidity may therefore flow into higher yielding, riskier assets that may cause asset bubbles.

The tapering of quantitative easing will need to be carefully managed. In particular, if the tapering is too slow, the excess liquidity may result in inflated asset prices.

v.

Prospect theory is a theory of how people make decisions when faced with risk and uncertainty. It replaces the conventional risk-averse / risk-seeking decreasing marginal utility theory based on total wealth with a concept of gains and losses relative to a reference point. This generates utility curves with a point of inflexion at the chosen reference point.

vi.

The point of inflection can be seen as the minimum economic growth rate to ensure that the current government stays in power. When the economic growth rate is below this minimum, governments may become risk-seekers in terms of their monetary policy. Furthermore, the further away the current economic growth and the target growth, the more risky the policies may become.

Quantitative easing is a particularly dangerous monetary policy. Governments would ordinarily only consider this when economic growth is very low or negative.

Credit was awarded for alternative plausible explanations.

Examiners' comments:

Students who were well prepared answered this question reasonably well. In contrast, students who did not know and understand their bookwork struggled in this question. Parts i and v were pure bookwork, but were also necessary knowledge in order to sensibly attempt parts iii, iv and vi. The answers to part ii were generally disappointing, given that it is the core monetary policy in South Africa. The best students were able to construct logical arguments for parts iii, iv and vi.

END OF MARKING SCHEDULE