

EXAMINERS' REPORT

October/November 2012 examinations

Subject F105 — Finance and Investment Fellowship Principles

INTRODUCTION

The attached report has been prepared by the subject's Principal 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

Examiners' comments:

This should have been a straightforward question for well-prepared students. Most students were familiar with the fundamental structure of the general asset pricing model and hence able to make a reasonable attempt at part (i). However, part (ii) was well-answered by a minority of students. Well-prepared students will have been familiar with this proof from the F105 notes, and those with a solid understanding of asset pricing principles and the ability to apply simple mathematical logic under exam conditions were likewise able to pick up the marks on offer.

Solution:

i.

- p_t is the price of the asset at time t
- E_t is the expectations operator based on the information set at time t
- price is thus the discounted value of the expected future payoff; it is the purpose of the model to define the appropriate discount factor
- m_{t+1} is a stochastic discount factor (or pricing kernel/state price deflator)
- which is a function of data and parameters...
- which are derived either from an economic model or empirical data
- x_{t+1} is the asset payoff at time $t + 1$

ii.

Let π denote the amount of the asset purchased at time t .

Then the investor wishes to select π such that it maximises utility, where:

$$U(c_t) = u(e_t - \pi p_t) + \beta E_t[u(e_{t+1} + \pi x_{t+1})]$$

Differentiating with respect to π and setting equal to zero gives:

$$\begin{aligned} -p_t u'(e_t - \pi p_t) + x_{t+1} \beta E_t[u'(c_{t+1})] &= 0 \\ p_t u'(c_t) &= E_t[\beta u'(c_{t+1}) x_{t+1}] \\ p_t &= E_t \left[\beta \frac{u'(c_{t+1})}{u'(c_t)} x_{t+1} \right] \end{aligned}$$

Hence the stochastic discount factor is $\beta \frac{u'(c_{t+1})}{u'(c_t)}$.

QUESTION 2

Examiners' comments:

Part i was reasonably answered.

Part ii, in particular, was poorly answered. Most students tried to apply lists they had learnt, rather than consider the core elements in the question that the market would take into account. Very few students recognised that a large portion of Databin's value was due to goodwill and the composition of the goodwill.

For Part iii, very few students recognised that the purchase price for Databin acted as the major anchor.

Solution:

i.

The transaction is an acquisition. This view is supported by the following:

- a. Horizon is much larger than Databin, so assimilation of Databin is most likely;
- b. The Board has clearly stated that the purpose of the transaction is to bring the IT capabilities in-house;
- c. It is unlikely that a new entity will be created from the transaction; and
- d. Horizon will have control of Databin through share ownership.

This is a vertical acquisition. Vertical acquisitions involve companies engaged in different stages of the production process. Horizon provides financial products to clients, whilst Databin would provide the IT infrastructure to support the products. Co-ordination and administration should be improved post acquisition.

ii.

The change is a minor 0.05%. This may just be due to noise.

Price movements consist of movements in the overall market plus stock-specific movements. Need to isolate stock-specific part of movement.

Prices are determined through demand and supply. Horizon's supply of shares has remained unchanged, therefore (to the extent that this movement is unrelated to broad market movements) the change reflects lower demand. This means that the marginal investor's view of the discounted future profitability of Horizon has slightly worsened over the day.

Using the discounted dividend/earnings model, this may be because:

- a. Risk-free interest rates have risen over the day; and/or

- b. The risk premium associated with Horizon has increased; and/or
- c. Horizon's expected growth rate in dividends/earnings has decreased.

Alternatively, the market may be indicating that the purchase price for Databin is too high.

Databin's NAV = R10 million, Databin's Market Capitalisation = R20 million
Therefore, approximately R10 million can be attributed to goodwill.

The 10c fall in price may reflect the market's view that Databin's goodwill will be destroyed as a result of the acquisition. In this case, Horizon would have paid R20 million for just Databin's NAV of R10 million.

The goodwill may reflect the quality of developers at Databin. The reduction may reflect the market's fears that the human intellectual capital may leave.

The market may be indicating that it considers the previous outsourcing arrangement to be more cost-effective.

The market may be indicating that it foresees integration problems.

The opportunity cost of financing the purchase may be too great.

If new shares are issued to finance the deal then the price will drop due to an increase in supply.

iii.

The primary reason is due to overconfidence. People tend to overestimate their own abilities, knowledge and skills. Overconfidence is positively correlated with knowledge and expertise. In this case, Horizon's senior managers overestimated their ability to retain key staff. A particular element of overconfidence at play is confirmation bias. Horizon's senior management would more easily overlook signals disagreeing with the views of a smooth integration.

The appraisers are humans who dislike considering negative events. Thus the appraisers would be prone to underestimating the probability of the large staff turnover.

The appraisers would be aware that Databin's market capitalisation was R20 million. This provides an anchor to the final recommended price. The appraisers would adjust away from this initial anchor to arrive at the final price. The R10 million goodwill would be tied to the quality of the staff that needed to be retained. Thus, staff retention as a central assumption was needed to achieve the anchor value.

QUESTION 3

Examiners' comments:

For part (i), most candidates were able to suggest either a statutory or a self-regulatory framework without discussing these. Many candidates wasted time by providing information which was required, e.g. the purposes of regulation, the advantages and disadvantages of the different regimes. A previous examination dealt with principles and rules-based regulation and it is disconcerting to notice many candidates just copied the solution from that unrelated question in this instance. Whereas it is encouraging to know that candidates are using past examination papers as a revision tool, care must be taken to avoid presenting a solution from a previous examination question to an unrelated question.

Most candidates managed to score good marks on the bookwork aspect relating to the listings authority of part (ii). However, very few candidates were able to provide a sensible solution for the reasons for tipping off the regulator resulting in few marks scored in this part of the question.

Solution:

i.

The regulatory regime will most likely constitute a mixed regime with elements of:

- Statutory regulation: The government will, by statute, authorise the regulator to supervise the stock exchange.
- Self-regulation and voluntary codes of conduct:

The stock exchange will regulate the actions of

- its members (i.e. traders / brokers);
- subscribers (companies listed on the exchange); and
- transactions taking place on the exchange

by means of:

- rules and continuing obligations on issuing members;
- guidance notes;
- professional conduct standards; and
- disciplinary actions.

ii.

Role of listings authority

- the production of relevant business and financial information on the issue of shares.

- the process by which shares are offered to potential shareholders and the price is set for the issue of shares.
- continuing production and dissemination of business and financial information on a timely basis on companies with listed securities.
- the continuing conduct of the market in listed securities with a view to ensuring that the market is fair to all participants, and that the pricing process is fair and reasonable.
- rules to ensure that companies with listed securities and connected parties continue to behave in a manner that does not conflict with another.

Reasons for tipping off the regulator

- One of the major business objectives of the stock exchange as a business, and as a regulatory authority, is to attract capital to the market, especially foreign capital.
- It is only possible if one convinces potential investors that your market is a low-risk investment destination. The main issue in that regard is the prevalence of market abuse (insider trading, price manipulation and the publishing of false or misleading statements by issuers).
- It is universally accepted that markets with a perceived low incidence of market abuse are more likely to attract investors. An important part of this perception is the ability of the market to display effective anti-market abuse enforcement.
- For this reason, it is in the best interest of the financial market to co-operate fully with the regulator in anti-market abuse actions, as part of this, the financial market should run effective surveillance systems and report all instances of suspicious trading patterns to the regulator.
- It may be a statutory requirement for the exchange, or a professional requirement (whistle-blowing) for the professionals working in the exchange

QUESTION 4

Examiners' comments:

This question tested some basic mathematical statistics. What was surprising, however, was that some students scored well in part (ii) without having answered part (i) correctly.

Solution:

i.

- the information ratio is the excess return relative to benchmark
- divided by the tracking error
- and therefore provides a measure of reward for the tracking risk taken

$$IR = \frac{w_1\mu_1 + w_2\mu_2 + w_3\mu_3}{\sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + w_3^2\sigma_3^2 + 2(w_1w_2\rho_{12}\sigma_1\sigma_2 + w_1w_3\rho_{13}\sigma_1\sigma_3 + w_2w_3\rho_{23}\sigma_2\sigma_3)}}$$

where w_x represents the weight of the portfolio in asset class $x = 1,2,3$, μ_x represents the return relative to asset class benchmark for each of the asset class portfolios and σ_x its tracking error, and ρ_{xy} denotes the correlation between the tracking errors of portfolios x and y .

ii.

$$IR = \frac{0.2 \times 0.005 + 0.6 \times 0.008 + 0.2 \times (-0.001)}{\sqrt{0.2^2(0.016)^2 + 0.6^2(0.009)^2 + 0.2^2(0.003)^2 + 2 \times 0.6 \times 0.2 \times 0.3 \times 0.009 \times 0.003}} = 0.8672$$

QUESTION 5

Examiners' comments:

In general this question was well answered, which was surprising given past experience on valuation-type questions.

In part (i), many students got this part 100% correct. Of those that didn't, most made just one error (usually in one of the formulas), and part credit was awarded. A handful of students made more than one error, and consequently did not get much credit.

In part (ii), only a small minority of students realised that the liquidity premium is a component of the total observed spread, and that this is not allowed for in the Merton model. A large number of students explained why the Merton assumptions may not be realistic/ correct, forgetting that the comparison was with the market spread, not with a theoretically correct spread!

Part (iii) was bookwork and this generally well answered.

Solution:

i.

The value of the firm's equity is calculated as follows:

$E_0 = [V_0 \Phi(d_1) - D e^{-rT} \Phi(d_2)]$ where

$V_0 = R100m$, $D = R84m$, $r = 0.08$, $T = 5$, $\sigma = 0.25$

$$d_1 = \frac{\ln\left(\frac{V_0}{D}\right) + \left\{r + \left(\frac{\sigma^2}{2}\right)\right\}T}{\sigma\sqrt{T}} = 1.306943$$

$$d_2 = d_1 - 0.25\sqrt{5} = 0.747926$$

$$\Phi(d_1) = 0.904384$$

$$\Phi(d_2) = 0.772748$$

$$E_0 = R46.92739m$$

$$\text{Therefore the value of the debt} = R100m - R46.92739m = R53.07261m$$

The implied return i calculated from:

$$R53.07261m = R1.2 \times 70m \times e^{5i}$$

ie $i = 9.18\%$ p.a. so spread is 1.18% p.a.

ii.

The implied return j calculated from:

$$R0.7 \times 70m = R1.2 \times 70m \times e^{5j}$$

ie $j = 10.78\%$ p.a. so spread is 2.78% p.a.

Reasons for the higher spread:

- The quoted price will allow for liquidity premium, not just default risk
- The market price will reflect investor risk aversion
- The assumptions being used by the market to calculate the price differ from the bank
- Transaction costs, taxes which are ignored in the Merton model

iii.

Macro considerations:

- industry analysis and competitive trends – i.e. the growth prospects for the industry as a whole and how the total market will be split between the different companies operating within the industry.
- regulatory environment – which might change in a way that affects the financial position of the company
- sovereign macroeconomic analysis – in order to assess the state of the economy in which the company operates. This will often include an assessment of the “creditworthiness” of the particular country in order to obtain a rating for its sovereign (i.e. government) debt. (Problems with sovereign debt may be indicative of problems with corporate debt.)

Company-specific issues:

- qualitative analysis – of factors such as the company’s management, technology, range of goods and services, etc.
- financial performance – e.g. the trends in its financial ratios (profitability, liquidity, etc.), both the historical trends over recent years and projections of future trends over the next two or three years
- market position – relative to its competitors, as reflected in its market share.

QUESTION 6

Examiners' comments:

This should have been a relatively simple question, and yet it was poorly answered.

Part (i) was based on bookwork and generally well answered, although it was surprising to see how many students had not studied this material well.

Part (ii) was very poorly done. Only a handful of students understood the implications of a share price being forward looking (and hence will anticipate future earnings), while the earnings used in the PER is historic. A number of students missed many of the obvious points in the solution.

Part (iii) was poorly answered. While students had a general idea of the different techniques, their answers were in general vague and lacking detail. Some confused technical analysis with quantitative analysis, and some thought technical analysis is a passive strategy. A number of students provided no answer for quantitative analysis.

Solution:

i.

- Insurance companies include both life and general insurance companies, and like all financial companies they tend to be capital intensive.
- Insurers tend to have low levels of financial gearing;
- General insurers in particular have volatile profits that vary in a cyclical manner;
- Life insurers tend to have more stable profits, although high lapses can be experienced in times of recession.
- Labour costs form the biggest part of total expenses.
- Insurers have tended to focus on their own domestic market, but increasing competition has caused them to expand beyond traditional markets.
- Insurers are usually highly regulated due to upfront collection of premiums in exchange for future cover/benefits.

ii.

- The trading technique suggested by the junior analyst is not based on assessing the fundamental value of a share based on underlying economic and financial factors affecting the company's future profitability, so the trading technique, even if valid, would not be suitable for your fund as a primary rule as it might be at odds with the conclusion drawn by fundamental analysis.
- If the PER is volatile, it could lead to excessive trading and associated costs, taxes.
- To the extent that the market has been successful in anticipating changes to earnings (which are volatile for short-term insurers), this will have caused the PER to be volatile (as it is based on historic earnings):
 - Just prior to a downturn in earnings, PER will fall sharply.
 - Just prior to a recovery in earnings, PER will rise sharply.
- Therefore a fall in PER may not necessarily indicate a buying opportunity (or a rise in PER a selling opportunity).

- In using the standard deviation in this way it seems that the assumption is that daily PER is symmetrically distributed (if equal probability is assigned to PER lying outside the trigger points), which may not necessarily be correct.
- 3 years is too short to provide any useful information on the variability of PER, and is likely to only represent part of a business cycle.
- Price variability in the last 3 years might not be a good representation of the future.
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iii.

Technical analysis

- An active fund management style.
- Based on patterns of past prices and trading volumes√
- Three main forms:
 - o Chartism: Try to identify patterns or trends in past prices, and action will be based on the probability that what has tended to follow the trend in the past will be repeated.
 - o Mechanical trading rules: Removes the subjective element in chartism by attaching buy/sell signals to clearly defined patterns and price changes.
 - o Relative strength analysis: examine share price performance relative to the market.
- The success of this strategy depends on the skill of the manager in identifying patterns before other investors and on weak-form market inefficiency

Quantitative analysis

- Uses mathematical techniques to value assets to generate buy/sell signals.
- Usually based on multifactor models.
- Can be used to beat an index (active management) or to track an index by selecting a representative sample of shares (passive management).

Fundamental analysis

- An active management style.
- Aims to assess the future prospects and profitability of a company by analysis of underlying company characteristics.
- Firstly need to estimate future earnings, cashflows, dividends.
- This is done by analysing quantitative (e.g. accounting ratios) and qualitative factors (e.g. quality of management) as well as macroeconomic and industry factors.
- Projected cashflows are used to assess whether a share is cheap/dear using discount models or price-relatives.

Passive fund

- Aims to track the specified index.
- Under full replication, the portfolio will hold all the shares in the index, but the expenses will lead to the return lagging that of the index.
- Other methods used include partial replication (sampling) and a synthetic fund (utilising derivatives).

QUESTION 7

Examiners' comments:

The bookwork question in part (i) was well attempted by the candidates who knew their bookwork, resulting in either full marks or no marks in most instances.

For part (ii), most candidates scored marks in choosing the correct index and providing a suitable justification. However, very few candidates were able to highlight the main limitation of a country-specific index, as is the case here.

Part (iii) was poorly attempted by most candidates resulting on average in less than a third of the available marks being scored. The question is very specific in terms of the factual information presented, yet very few candidates tailored their solution in line with the facts, resulting in potentially easy marks being foregone. Whereas most candidates were able to propose a target in line with a suitable benchmark, they were not able to follow through their solution with sensible constraints, choosing rather to repeat the generic bookwork, of which not all is applicable in this instance. A further observation is that where a candidate was e.g. able to indicate that the portfolio can be diversified by investing in other industries, they were not able to demonstrate how diversification can be achieved. Disconcertingly, many candidates produced broad lists of specialist asset classes which they believe can be used for diversifying the portfolio without substantiating their proposals adequately. In these instances it becomes very difficult to award any credit.

Solution:

i.

Nikkei

- The Nikkei Stock Average 225 is an unweighted arithmetic index consisting of 225 constituents representing about 50% of the market value of the Japanese market.
- The constituents are reviewed annually and illiquid or unrepresentative stocks are replaced by more liquid stocks and the index is designed to reflect the overall market.
- It is the most widely used indicator of short-term movements in the Japanese market.

Topix

- The Tokyo Stock Exchange First Section Index comprises approximately 1,700 shares.
- It is a market capitalisation weighted arithmetic index reflecting “free float” from June 2006.

ii.

More suitable index for performance management:

- Topix
- The constituents represent the leading companies in the market, so the index is much more comprehensive than the Nikkei index.

- Topix is market capitalisation weighted and is therefore a better representation of the market and more suitable for performance benchmarking.

Main limitations of country-specific index:

- The portfolio only consists of motor manufacturing company shares whereas the country-specific index covers the entire spectrum of available shares in the economy
- This creates a mismatch between the portfolio and the benchmark which will result in unconnected performance results.
- Not all shares in the country-specific index may be available for investment by foreign investors.
- Tax treatments (particularly for dividends) differ across borders. This may cause problems when comparing total returns between the portfolio and the index. Adjustments may be necessary to the index to ensure consistency when measuring performance.

iii.

Targets:

- a strategic asset allocation is likely to be set out
- with suitable benchmarks for each asset class (or sub-class)
- your target will likely be outperformance of the strategic allocation-weighted benchmark returns

Constraints:

- as it is an institutional client, the strategic allocation is likely to be a function of the liabilities
- may impose a maximum tracking error, i.e. standard deviation of difference between portfolio and benchmark returns or a maximum Value at Risk
- alternatively may impose load differences (maximum absolute deviation from the strategic allocation) or load ratios (maximum proportional deviation from the strategic allocation)
- a requirement for ethical investment
- restrictions on the uses of derivatives in managing the asset portfolio

Diversification:

The portfolio is concentrated in equities and could be further diversified by the inclusion of other asset classes such as money-market, bonds, etc.

The portfolio is concentrated on motor manufacturing companies, which are classified as durable consumer companies or cyclical companies (in general), and which will react more severely to an economic downturn. The equity portion of the portfolio could be diversified by investing in other sectors, particularly those which react differently to the economic cycle.

The portfolio is geographically diversified between developed economies and a developing economy. However, the economic woes of the Eurozone, the recent earthquake in Japan and the slowing down of the US economy may detract in value. The investment in the developing economy (India) may counterbalance the performance of the portfolio as it is less correlated to the factors affecting the

developed economies and potential volatility in the developing economy creates an expectation of enhanced returns. Without the constraint of investing in car-producing economies, the portfolio could be further diversified geographically but whether it is desirable to do so depends on the nature of the liabilities, the purpose of the portfolio and hence the strategic allocation. It may be, for example, that since this is now a more balanced portfolio, rather than a niche portfolio, there is a need to be more US-focused if the liabilities are largely US\$-denominated.

In general, the risk-return relationship is enhanced by overseas investment in that returns can be enhanced by diversifying into strengthening currencies, fast-growing economies and potentially undervalued markets. The risk is diversified through the reduced correlation with returns from the domestic US market.

QUESTION 8

Examiners' comments:

This was a fairly straightforward application of bookwork and was the best-answered question of this examination. However, too many candidates failed to pay attention to the details of the question: treating the portfolio as a multi-asset class portfolio rather than a bond fund, identifying techniques for identifying either anomaly or policy switching opportunities, but not both, or naming but not describing these techniques. In addition, a surprisingly large number of candidates seemed to be under the impression that a mature defined benefit pension fund would invest only in short- and medium-dated bonds.

Solution:

i.

The pension fund portfolio is likely to be more tightly regulated than the private investor portfolio with regard to such factors as permissible credit ratings and permissible holdings/limits on holdings. We might therefore expect to see very little credit bond exposure in the pension fund portfolio and a greater weighting to government bonds, whereas the private investor portfolio might have exposure to corporate bonds, local government issues, securitisations etc.

The pension fund portfolio is likely to take broad account of the liability structure of the funds, so be concentrated towards the long end of the spectrum, while the duration of the private investor portfolio will be a function of relative value rather than being liability-driven.

Derivatives are likely to be used for hedging only, if at all in the pension fund portfolio, but may be used to pursue returns in the private investor portfolio (if permitted by regulation).

Differences in tax treatment may also influence allocation: the private investor portfolio may be relatively more heavily invested in zero- or low-coupon bonds.

The pension fund portfolio is more likely to be constrained to domestic bonds, while a greater proportion of the private investor portfolio may be exposed to overseas bonds if these present value.

ii.

Anomaly switching moves between bonds of similar volatility based on temporary price anomalies. It is relatively low-risk as there are no major alterations to portfolio duration, but limited opportunities will exist in efficient markets. They may be identified by:

- yield differences and position relative to yield curve: underpriced bonds have higher yields and plot above the yield curve
- price ratios: compare trend in price ratio of two bonds (complicated by coupons, but the price trend from this source can be corrected to give stabilised price ratios)

- price/yield models: internal models identify fair value for bonds to identify mispriced securities

Policy switching involves altering the duration of the portfolio based on expected future changes in the level or shape of the yield curve. Opportunities may be identified by:

- volatility and duration: higher volatility bonds are more exposed to parallel shifts in the yield curve
- reinvestment rates: if Bond A has a longer term than Bond B, consider the rate at which Bond B proceeds would have to be reinvested to give the same yield to A's maturity, and whether this seems attainable
- spot rates and forward rates: derive spot/forward rates from the yield curve, to reveal profitable anomalies in the term structure of interest rates.

iii.

Anomaly switching is most likely for the pension fund portfolio, given the need to maintain relationship with duration of liabilities. It is unlikely that manager will engage in switching to significantly alter the portfolio volatility.

Policy switching is more likely for the private investor portfolio, as the clients have fewer liability constraints, allowing greater freedom to alter volatility in pursuit of returns.

iv.

- consider the reliability of the information and of the methodology used to identify the policy switch
- consider the length of time which it will take for the predicted yield curve change to occur: the longer the time it will take, the greater the risk that is being taken
- consider whether the expected profit from the move covers the risk being taken and the expenses of the switch
- consider the risks of getting the predicted yield curve change wrong
- in particular, what are the business risks of underperforming competitors due to this switch?
- consider the tax liability that may be crystallised by the switch
- consider alternatives to transactions in the underlying bond market