EXAMINERS' REPORT

9 June 2010

Subject F105 — Finance and Investment Specialist Technical

QUESTION 1

i. *This question was straightforward bookwork, and generally well-answered.*

The three main systems are:

a. Classical: company profits are taxed twice. The company pays tax on its profits, and then the investor is taxed on dividends received.

b. Split-rate: as for the classical system except that different tax rates are levied on distributed and retained profits. This is often used in conjunction with differential tax treatment of income and capital gains for individuals.

c. Imputation: company deducts some tax payable by investors on dividend distributions at source, and pays it directly to the government, allowing an offset against its total corporate tax bill. This tax is then imputed to the shareholders. No further tax is payable if the imputation rate is equal to the shareholder's marginal tax rate, but tax-exempt investors may be able to reclaim the imputed tax, and those taxed at higher marginal rates will have to pay more tax on assessment.

ii. *This question called for interpretation, and was generally poorly-answered. A common answer interpreted the current system as imputation (although STC is effectively a tax paid on shareholders' behalf, there is no corresponding tax credit) and the proposed system as split-rate (which betrayed a misunderstanding of the split-rate system, which refers to different rates on distributed and retained profits in the corporate's hands).*

The current system is a split-rate system, as different rates are attached to distributed and retained profits.

The proposed system is classical, with tax once in the hands of the company and next in the hands of the shareholder.

QUESTION 2

i. *Generally satisfactorily-answered. Credit was given for defining the ERP as the difference between the return on equities and that on index-linked bonds if there was some evidence of the appreciation of the role of inflation.*

The prospective equity risk premium (ERP) reflects the expected nominal excess return on equities relative to a risk-free asset class, usually bonds of an appropriate term. This excess reflects the additional expected risk (or uncertainty) assumed by equity investors (greater variability of returns and risk of capital loss). The historical ERP measures the realised differential, and is often taken as a base for projections of the prospective ERP.

Within the expected utility paradigm, the size of the ERP is only consistent with an implausibly high level of risk aversion, given the relative distributions of returns for equities and bonds over the time horizons of long-term investors. The Behavioural Finance school explains this by the observed investor psychological trait of loss aversion combined with the fact that investors re-evaluate their portfolios on a regular short-term basis, even if their planning horizons are much longer. This combination is termed "myopic loss aversion".

ii. *This question gave rise to some misinterpretation. While it is clear reading from part (i) to part (ii) that the question revolves around the Behavioural Finance view of the equity risk premium specifically, simply reading part (ii) with the question preamble could be misinterpreted to ask for the impact of a wider range of Behavioural Finance heuristics and biases. Some marks were awarded for relevant observations not related to the equity risk premium or myopic loss aversion, but even with this reading of the question it should have been clear that these were the most important aspects, which was missed by many students.*

Ideally, investment allocation decisions ought to be taken in the light of the term (usually very long) of the investment horizon. The BF view suggests however that policyholders are likely to base their allocations on a much shorter planning horizon. They are therefore likely to under-invest in long-term real asset classes (equities) which are more volatile in the short term, and over-invest in bonds and cash. Given the expected return differential (measured by the ERP), this allocation is sub-optimal and is likely to lead to reduced accumulated values at retirement.

Product design features to compensate:

- Provide a default strategy which is based on outstanding term to retirement, and is heavily invested in equities for policyholders with more than (say) ten years to retirement As outstanding term to retirement falls so should the relative equity allocation.

- Provide asset allocation advice at outset as well as key points in the future i.e. 'key' outstanding term to retirement.

- Follow up every few years (3 years, say) with policyholder regarding their current asset allocation and proposed asset allocation for next few years. This is very important as

most policyholders will tend to stick to the choice they made at outset which may no longer be appropriate for the remaining term.

- Limit opportunities for reallocation to e.g. annually

- Provide policyholders with investment advice as part of the product package

- Provide policyholders with information on the relative returns and volatilities of the major asset classes over long periods (5-20 years)

QUESTION 3

Straightforward bookwork and applied bookwork; mostly well-answered.

i. The main aims of financial services regulation are to:

   a. Correct market inefficiencies

   b. Promote efficient and orderly markets

   c. Correct information asymmetries

   d. Protect consumers of financial services

   e. Maintain confidence in the financial system

   f. Combat financial crime

ii. Relative advantages and disadvantages of self-regulation vs. prescriptive regulation:

   a. Advantages:

   - Provides an incentive for proper management (recognition of regulation as an economic good valued by consumers, fear of government imposing regulations if self-regulation does not achieve objectives)

   - Implemented by those with greatest knowledge of the market, i.e. participants, who have an incentive to maximise the benefit-cost ratio of regulation

   - Should be able to respond rapidly to market developments

   - May be easier to persuade firms to comply with a self-regulatory body

   - Likely to be quicker to establish than government-sponsored body

   - Arguably more adaptable to changing needs

   b. Disadvantages:

   - Closeness of industry to regulator: danger of undue influence by industry participants and unfair sympathy for industry perspective

   - May lead to anticompetitive behaviour, e.g. raising barriers to entry

   - May reduce consumer perceptions of fairness and efficiency, undermining confidence in the system

   - Enforcement/redress mechanisms and processes may not be transparent

- At this stage, the only industry participants with any experience are those who have worked for the government-owned institutions: questionable whether this experience is relevant to a competitive industry

- The sector will need to compete globally and there is no experience of competition in Redstripia.

- The outsider perception of a self-regulated industry may not be positive

QUESTION 4

i. *Very high marks achieved by almost all students. A number of students did not use the arithmetic approximation, and were awarded full marks.*

Assumption: we can reasonably approximate return by assuming that cashflows take place halfway through the year, and using the arithmetic approximation $R = \dfrac{(MV_1 - MV_0 - CF)}{(MV_0 + 0.5\, CF)}$.

Returns:

Domestic equities	17.72%
Offshore equities	-10.53%
Bonds	14.38%
Fund	13.30%

ii. *A common response was to base the benchmark returns on the index returns, i.e. linked IRR rather than money-weighted returns. This is clearly inconsistent with the money-weighted approach taken above (necessary by virtue of not having mid-year asset values) and betrays a lack of understanding of performance analysis and attribution. Some marks were awarded for this approach. Higher marks were awarded for an approach which used benchmark initial weights but actual cashflows.*

Assumptions: no rebalancing of benchmark over the year, cashflows notionally invested in accordance with benchmark weights.

Net cashflow = 90 – 150 = -60

Benchmark returns:

Equities: $\dfrac{\left(1000 \times \frac{28500-25000}{25000} - 60 \times \frac{28500-27000}{27000}\right)}{(1000 - 0.5 \times 60)} = 14.09\%$

Offshore: $\dfrac{\left(1000 \times \frac{11400-12000}{12000} - 60 \times \frac{11400-11000}{11000}\right)}{(1000 - 0.5 \times 60)} = -5.38\%$

Bonds: $\dfrac{\left(1000 \times \frac{11500-10000}{10000} - 60 \times \frac{11500-10800}{10800}\right)}{(1000 - 0.5 \times 60)} = 15.06\%$

Fund: $0.5 \times 0.1409 + 0.05 \times -0.0538 + 0.45 \times 0.1506 = 13.55\%$

iii. *Marks were awarded for correct formulae evaluated correctly, even if based on incorrect parameters carried down from the previous question. A surprising number of students gave no commentary on their results.*

Effective weight allocations to sectors:

Equities: $\frac{420+0.5\,(30-80)}{1000+0.5\,(90-150)} = 0.407216$

Offshore: $\frac{90+0.5\,(10)}{1000+0.5\,(90-150)} = 0.097938$

Bonds: $\frac{490+0.5\,(50-70)}{1000+0.5\,(90-150)} = 0.494845$

Sector allocation outperformance:
$$= (0.407216 - 0.5)(0.1409 - 0.1355) + (0.097938 - 0.05)(-0.0528 - 0.1355)$$
$$+ (0.494845 - 0.45)(0.1506 - 0.1355)$$
$$= -0.89\%$$

Stock selection outperformance:
Equities: $0.407216\,(0.1772 - 0.1409) = 1.48\%$
Offshore: $0.097938\,(-0.1053 + 0.0538) = -0.50\%$
Bonds: $0.494845(0.1438 - 0.1506) = -0.34\%$
Fund: 0.63%

(Check: $0.63 - 0.89 \approx 13.30 - 13.55$; difference due to rounding)

Overall, the fund has been hurt by underallocating assets to domestic equities and overallocating to offshore equities. Both offshore equity and bond managers underperformed their benchmarks, but the domestic equity manager outperformed the benchmark handsomely, offsetting stock selection losses in the other two asset classes and partly offsetting the sector allocation losses.

iv. *Unsatisfactorily-answered on the whole.*

The primary reason for including offshore assets is diversification. If there is low correlation between domestic and offshore equity returns, then the inclusion of offshore equities will reduce portfolio risk for a given target return. If however the local equity market is highly correlated with offshore markets, this diversification benefit will be minimal.

It may also be the case that offshore equity markets offer higher potential returns than local markets, in which case there is also a return enhancement argument for allowing some offshore allocation. Opportunities may exist overseas that are not available locally so provide diversification of risk. Must caution against exchange rate risk which could easily wipe out overseas investment benefits. Offshore investment carries a long-run effective inflation hedge through the purchasing power parity relationship. Exchange rate risk can also be hedged. Surplus

in the fund may have increased risk-taking ability.

The benchmark allocation of 5% is however fairly low, recognising that the fund's liabilities ought to be a primary driver of investment strategy. Given that the benchmark is such a small proportion is it worth bothering with since extra costs of research etc. may outweigh the extra expected return.

QUESTION 5

i. *Generally well-answered. Students who suggested strategies involving contracts of terms longer than six months which would have to be closed out early did not receive full marks, unless this was predicated on the possibility that no six-month futures contracts were available.*

The strategy would involve selling a six-month futures contract on an equity market index. and buying a representative bond index futures contract of equal duration. The principal amount of these contracts would be equal to the short-term transition, i.e. 20% of asset market value. Futures price likely to be based on current market levels so that you can hedge the portfolio at its current funding level.

ii. *Fairly well-answered.*

Advantages relative to transactions in the underlying market: usually quicker and cheaper, futures market usually more liquid than underlying, no risk of moving prices in the underlying market, position can be closed out easily, avoid crystallising taxable capital gains.

Risks: risk of calling the market incorrectly (equities run and bond values tumble), underexposure to equities and overexposure to bonds will worsen the funding position, basis risk (the futures price does not follow the spot price as expected), cross-hedging risk (due to differences in the composition of the underlying portfolios relative to the indices on which the futures contracts are based, will result in an imperfect hedge)

iii. *Adequate answers from most students. Few noted the importance of not sacrificing upside potential through the collar, given the funding position.*

Comparison of merits of the two transactions:

- Zero-cost collar has no initial cost since the option premium paid for the put option is equal to the premium received for writing the call., whereas put option requires a premium. Both options provide downside protection, although the put option strategy still allows for a further 5% fall in domestic equity values before kicking in. The zero-cost collar gives downward protection but at the sacrifice of upside potential. This is potentially problematic for the with-profits portfolio, which requires exposure to any possible market rebound to recover its fully funded status.

- Zero-cost collar requires writing call options, which will involve the payment of margin.

QUESTION 6

i. *Well-answered by some students, with some however demonstrating little understanding of swap pricing dynamics. Some credit was given for an incorrect attempt which however displayed some intelligible effort to equate the PV of the fixed-rate leg to that of the floating leg.*

Present values:

Three months: $1/(1 + 0.0725*0.25) = 0.98220$
Six months: $1/(1 + 0.072*0.5) = 0.96525$
Nine months: $1/(1 + 0.071*0.75) = 0.94944$
Twelve months: $1/(1.07) = 0.93458$

Swap rate $= 4[(1 - 0.93458)/(0.9822 + 0.96525 + 0.94944 + 0.93458)] = 6.83\%$

ii. *Reasonably-answered by most, with a handful of students again displaying little understanding of swap dynamics.*

Since the bank is the fixed rate payer, the swap rate should be set lower than the theoretical rate to provide a margin for expenses (initiating, pricing and maintaining the contract) and profit/cost of capital/risks undertaken.

iii. *Most students recognised that the statement was incorrect, but few provided a complete justification. A number of students noted that market risk remains, which was (generously) not penalised.*

Only the swap rate risk is removed by the swap agreement. The bank still runs credit risk against both clients and consequently ought still to hold regulatory capital against credit risk. It will also be required to hold capital against operational risk.

QUESTION 7

i. *Bookwork; generally well-answered.*

Active return is the actively managed fund return in excess of the appropriate strategic benchmark for that asset class. Active return can be historic or expected.

Tracking error is the standard deviation of the difference between active fund returns and benchmark returns, and provides a measure of active risk.

The information ratio is active return divided by tracking error, and provides a measure of the marginal active return provided by the assumption of an additional unit of active risk (tracking error). The information ratio is a measure of the investment manager's skill.

ii. *There was an unfortunate omission from this question of an instruction to assume that there is no correlation between the active returns of funds A and B. Solving the general problem allowing for variable correlation requires more mathematical manipulation due to the extra terms involved, probably too much for a 7 mark question under exam conditions. Performance on this question was poor, perhaps as a consequence. This was taken into account in determination of the final pass mark. However, none of those students who implicitly or explicitly made the assumption of zero (or unity) correlation were able to get to the correct solution, and a significant number of candidates made the erroneous statement that minimising tracking error is equivalent to maximising information ratio.*

The model solution for the question as given is as follows:

Let:
x = proportion invested in fund A
$(1-x)$ = proportion invested in fund B
then:
$$u = xr_A + (1-x)r_B$$
$$y = x^2\sigma_A^2 + (1-x)^2\sigma_B^2 + 2x(1-x)\rho_{AB}\sigma_A\sigma_B$$
$$v = y^{-0.5}$$

Then the information ratio $I = uv$. In order to maximise I with respect to x, we need to set its partial derivative with respect to x to zero.

$$\frac{\partial I}{\partial x} = v\frac{\partial u}{\partial x} + u\frac{\partial v}{\partial y}\frac{\partial y}{\partial x}$$

$$= y^{-0.5}(r_A - r_B) - \frac{1}{2}uy^{-1.5}[2x\sigma_A^2 - 2(1-x)\sigma_B^2 + 2(1-2x)\rho_{AB}\sigma_A\sigma_B]$$

$$= y^{-1.5}\{(r_A - r_B)[x^2\sigma_A^2 + (1-x)^2\sigma_B^2 + 2x(1-x)\rho_{AB}\sigma_A\sigma_B]$$

$$-[xr_A + (1-x)r_B][x\sigma_A^2 - (1-x)\sigma_B^2 + (1-2x)\rho_{AB}\sigma_A\sigma_B]\}$$

$$= [x^2\sigma_A^2 + (1-x)^2\sigma_B^2 + 2x(1-x)\rho_{AB}\sigma_A\sigma_B]^{-1.5}\{(1-x)r_A\sigma_B^2 - xr_B\sigma_A^2 + xr_A\rho_{AB}\sigma_A\sigma_B - (1-x)r_B\rho_{AB}\sigma_A\sigma_B\}$$

$$= [x^2\sigma_A^2 + (1-x)^2\sigma_B^2 + 2x(1-x)\rho_{AB}\sigma_A\sigma_B]^{-1.5}\{r_A\sigma_B[x\rho_{AB}\sigma_A + (1-x)\sigma_B] - r_B\sigma_A[(1-x)\rho_{AB}\sigma_B + x\sigma_A]\}$$

Noting that $[x^2\sigma_A^2 + (1-x)^2\sigma_B^2 + 2x(1-x)\rho_{AB}\sigma_A\sigma_B]^{-1.5} > 0$, and using x_m to denote the value which maximises the information ratio, we have that:

$$x_m\{r_A\sigma_B[\rho_{AB}\sigma_A - \sigma_B] - r_B\sigma_A[\sigma_A - \rho_{AB}\sigma_B]\} = \rho_{AB}\sigma_A\sigma_B r_B - \sigma_B^2 r_A$$

$$\therefore x_m = \frac{\rho_{AB}\sigma_A\sigma_B r_B - \sigma_B^2 r_A}{r_A\sigma_B[\rho_{AB}\sigma_A - \sigma_B] - r_B\sigma_A[\sigma_A - \rho_{AB}\sigma_B]}$$

The simpler solution allowing for the implicit zero correlation is as follows:

Let:
x = proportion invested in fund A
(1-x) = proportion invested in fund B
then:
$$u = xr_A + (1-x)r_B$$
$$y = x^2\sigma_A^2 + (1-x)^2\sigma_B^2$$
$$v = y^{-0.5}$$

Then the information ratio $I = uv$. In order to maximise I with respect to x, we need to set its partial derivative with respect to x to zero.

$$\frac{\partial I}{\partial x} = v\frac{\partial u}{\partial x} + u\frac{\partial v}{\partial y}\frac{\partial y}{\partial x}$$

$$= y^{-0.5}(r_A - r_B) - \frac{1}{2}uy^{-1.5}[2x\sigma_A^2 - 2(1-x)\sigma_B^2]$$

$$= y^{-1.5}\{(r_A - r_B)[x^2\sigma_A^2 + (1-x)^2\sigma_B^2] - [xr_A + (1-x)r_B][x\sigma_A^2 - (1-x)\sigma_B^2]\}$$

$$= [x^2\sigma_A^2 + (1-x)^2\sigma_B^2]^{-1.5}\{(1-x)r_A\sigma_B^2 - xr_B\sigma_A^2\}$$

Noting that $[x^2\sigma_A^2 + (1-x)^2\sigma_B^2]^{-1.5} > 0$, and using x_m to denote the value which maximises the

information ratio, we have that:

$$(1-x_m)r_A\sigma_B^2 = x_m r_B \sigma_A^2$$

$$\therefore x_m = \frac{r_A\sigma_B^2}{r_A\sigma_B^2 + r_B\sigma_A^2}$$

iii. Hedge fund:

   a. *Bookwork.*

   The Sharpe ratio is the expected return of a security or portfolio over the risk-free rate, divided by the standard deviation of the security's or portfolio's return.

   b. *Generally poorly-answered. Many students simply rattled off a bookwork "shopping list"(selection bias, survivorship bias, mark-to-market bias etc.), points which were relevant but miss the most important points regarding the Sharpe ratio's assumption of normality and the ways in which hedge fund returns depart from this. Most students got some credit but very few got full marks or close to it.*

   Factors:

   - Sharpe ratio assumes normal distribution of returns; hedge fund returns are known to be non-normally distributed.

   - Hedge funds tend to offer lower standard deviations for equivalent expected returns, thus improving their Sharpe ratios, but usually at the expense of skewness and excess kurtosis. These statistical properties of the hedge fund's return ought to be investigated further.

   - Hedge funds are not regulated in the same way as long-only funds, and are not subject to the same disclosure requirements. The reported Sharpe ratio should be independently verified, and should be considered in the light of possible survivorship bias.

   - Diversification of risk suggests that it would be imprudent to allocate the entire domestic equity portion of the fund's assets to a single hedge fund manager.

   - Investigate performance of other similar hedge funds.

   - Investigate track record of hedge fund management. Is this one successful fund out of a stable of unsuccessful funds?

   - Regulatory restrictions on hedge fund investment should be borne in mind.

   - Additional fees of hedge funds (especially performance-related).

   - Consider match to liabilities.

QUESTION 8

i. *Well-answered by some, but overall disappointing. Many students failed to read the question properly, spending time outlining company- rather than industry-specific factors.*

Factors:

- Global industry experience, if any

    Demand:

    - Projected demand for products (local and global)

    - Is ongoing demand reasonably certain?

    - Competition: how competitive is the industry and is it likely to attract new entrants in future? What are the implications for margins?

    - Any industry capacity constraints that might result in unmet demand

Revenue/costs:

- Dependency of revenue/costs on external factors, e.g. commodity prices and currencies

- Dependency on labour supply; labour supply forecast and wage rigidities

- Production inputs: labour- or capital-intensive? How will financial performance be affected by availability/quality of labour/capital?

- Level of fixed to variables costs

- Requirement for extensive physical infrastructure

- Potential for future economies of scale

- Dependency on local/overseas markets

- Importance of branding

- Stability of supply of key inputs and supplier relationships

Risk

- Risk: is ongoing demand reasonably certain, or is there a significant chance of the new ventures failing before they deliver profit?

- Cyclicality: are profits likely to be linked to the business cycle?

- Projected volatility of costs and revenues

- Leverage: what is the typical capital structure of companies in this sector? How does this affect profit volatility?

- Is the industry regulated? If so, what impact will this have on growth prospects and profit levels?

b. Extent of government participation (current and projected), and likely impact

Other:

- Estimated covariance of industry returns with other industries

ii. *A number of marks were available for bookwork responses here (company-specific factors, sources of information), and by and large, students who did well overall scored on these areas. Discussion of valuation methodology, at a high level, was however disappointing, with most students proposing continuation with the DDM or relative PE approaches without discussion of the difficulties posed by the nature of the new industry, and very few offering viable alternatives.*

Projections of earnings or dividends from a current base would be nonsensical since none of the firms have begun to make profits or pay dividends.; similarly, we cannot use justified PE ratios given widespread negative earnings.

The valuation approach would most likely involve the projection of future cashflows (e.g. free cashflows to equity, or to the firm). The information gathered above on the industry would be used together with company-specific research in order to make reasonable projections of these future cashflows. These future projected cashflows would then be discounted back to the present date at a suitable risk discount rate, e.g. shareholders' required return on capital for FCFE or the WACC for FCFF, and adjusted (if relevant, e.g. in the case of FCFF) for the market value of debt. Issues that need to be resolved in this projection are the precise definition of this new industry. Also the classification of new companies as well as the reclassification of some of the existing companies (currently classified in other industries) needs to be considered.

Company-specific areas which need to be assessed include:

- Management ability

- Competitive position relative to peers

- Relative product quality

- Growth prospects

- Input costs

- Dividend payout philosophy (once profits are made)

- Liquidity

- Capital structure relative to peers

- Competitive strategy

Information may be sourced from:

- Financial statements

- Financial/trade press

- Company announcements

- Exchange information and analyst publications

- Discussions with management and competitors/suppliers/customers

- Statutory information