Subject ST5 — Finance and Investment
Specialist Technical A

September 2009 examinations

EXAMINERS' REPORT

Introduction

The attached subject report has been written by the Principal Examiner with the aim of helping candidates. The questions and comments are based around Core Reading as the interpretation of the syllabus to which the examiners are working. They have however given credit for any alternative approach or interpretation which they consider to be reasonable.

R D Muckart
Chairman of the Board of Examiners

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Comments for individual questions are given with the solutions that follow.

1

a. *A*n investment trust where the ordinary share capital consists of income and capital shares. Holders of income get distributed income, holders of capital little or no income but get residual value of assets after income shares have been redeemed at fixed value.

b. Issue of further shares at a given price to existing shareholders in proportion to their existing shareholdings. The purpose is for the issuing company to raise more money.

c. Sometime called capitalisation or bonus issue is a further issue of new shares (with the original nominal value) to existing shareholders in proportion to their holdings. Reserves are capitalised to provide the additional shareholders' equity.

d. Existing shares are split into two shares of half the original nominal value. No new capital is raised and no reserves are capitalised.

[6]

2

(i) The main difference between (OTC) forwards and (exchange-traded) futures is that, for a forward, there is no cash flow until the maturity. For a future, there are daily marking-to-market and settlement of margin requirements.

If interest rates are constant then the values of the cash flows are equal and, hence, the prices must also be equal. When interest rates vary unpredictably, forward and futures prices are no longer the same because of the daily cash flows from settlement and the interest earned on cash received (or paid on borrowing). When the price of the underlying asset is strongly positively correlated with interest rates, a long futures contract will be more attractive than a similar long forward contract and futures prices will tend to be higher than forward prices. The reverse holds true when the asset price is strongly negatively correlated with interest rates.

The theoretical differences between forward and futures prices for contracts that last only a few months are, in most circumstances, sufficiently small to be ignored. However, for long-term futures contracts, the differences between forward and futures rates are likely to become significant. To convert futures to forward interest rates, a *convexity adjustment* is applied:

Forward rate = Futures rate $- \frac{1}{2}\sigma^2 t_1 t_2$

where t_1 is the time to maturity of the futures contract, t_2 is the time to maturity of the rate underlying the futures contract and σ is the standard deviation of the change in the short-term interest rate in one year. (A typical value for σ is 1.2%). [Note that the forward and futures rates in this expression are expressed in continuously compounded form δ.]

(ii)

a. Basis risk can be defined as "the residual risk that results when the two sides of a hedge do not move exactly together".

b. It may arise if:

- The asset whose price is to be hedged is not exactly the same as the asset underlying the futures contract
- The hedger is uncertain as to the exact date when the asset will be bought or sold.
- The hedge requires the futures contract to be closed out well before its expiration date.

(iii) The optimal *hedge ratio, h*, (ratio of the size of the position taken in futures contracts to the size of the exposure) is given by:

$h = \rho\sigma_S / \sigma_F$

where σ_S is the standard deviation of ΔS, the change in spot prices

σ_F is the standard deviation in ΔF, the change in futures price

and ρ is the correlation coefficient between ΔS and ΔF.

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

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

(v) Assuming that the bond prices at the maturity of the option are log-normally distributed, the value of the call option *c* is given by

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

where $\Phi(x)$ is the standard cumulative Normal distribution function,

$d_1 = (\ln(F_0 / X) + (\sigma^2 T / 2) / \sigma\sqrt{T}$ and

$d_2 = (\ln(F_0 / X) - (\sigma^2 T / 2) / \sigma\sqrt{T}$

F_0 (the forward bond price) $= (B_0 - I) / P(0,T)$

where B_0 is the bond price at time zero and

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

In this case, $I = 30\,e^{-0.25 \times 0.02} + 30e^{-0.75 \times 0.025} = 59.293$

Thus $F_0 = (1269 - 59.293)\,e^{0.8333 \times 0.026} = 1236.203$

Then d_1 $= (\ln (1236.203 / 1300) + 0.09^2 \times 10/24) / (0.09 \sqrt{(10/12)})$

$= (-0.0503197 + 0.003375) / 0.0821583$

$= -0.57139$

and d_2 $= (-0.0503197 - 0.003375) / 0.0821583$

$= -0.65355$

Hence, c $= e^{-0.8333 \times 0.026} [1236.203\ \Phi(-0.57139) - 1300\ \Phi(-0.65355)]$

$= 0.97857\ [(1236.203 \times 0.2839) - (1300 \times 0.2567)]$

$= £16.83$

3

(i)

a. Beta is a measure of a stock's volatility relative to movements in the whole of the market and is thus a measure of systematic risk. It is usually defined as the covariance of the return on the stock with the return on the market, divided by the variance of the market return.

b. Pension Fund A would have been less volatile than the market, Pension Fund B would have shown more volatility.

(ii)

a. Value investing is a style of investing based on picking shares that have low valuations relative to their current profits, cash flows and dividend yield. Value factors commonly analysed include:

- Low Book to Price
- Earnings Yield
- Sales to Price

Growth shares are shares with high price to book values. The expectation is that earnings and profits will grow above average. Other factors analysed include:

- Sales Growth
- Return on Equity
- Earnings Revisions

b. Growth – internet/tech, clean tech

Value – utilities, consumer staples

(iii) Performance over 12 months has been negative

Low beta expected to perform better as less volatile than high beta (everything being equal)

Financials underperformed market in general so being underweight would be better

Growth stocks tend to underperform value when markets are falling

Overall we would expect Pension A to perform better

(iv) Cashflows

Tax differences

Management Fee structure

Performance calculation in different base currencies

Credit was given for other sensible reasons

4

(i) The key factors in managing credit risk are:

- the creditworthiness of the counterparties with which an institution deals
- the total exposure to each counterparty

Creditworthiness of counterparties can be controlled by placing limits on the credit ratings (as published by the major rating agencies) with which an institution may deal. It can be also controlled in derivatives transactions by dealing on a recognised exchange with a central clearing house which stands as counterparty to all deals, rather than over-the-counter. The clearing house will seek to protect itself by requiring the counterparties to deposit "margin" with it. These margin payments are a particular example of the use of *collateral* provided by a counterparty as a tool against credit risk.

It is important to monitor and place limits on the credit exposure to any single counterparty. This will involve aggregating exposures in different areas. For example a pension fund may hold both equity and debt issued by a bank as well as having cash on deposit with the same bank and having them as a counterparty to a derivatives deal. It will also be necessary to be aware of the particular relationships between different companies within the same group.

Credit risk can be controlled by the use of Credit Default Swaps and other credit derivatives.

(ii) Ratings agencies will seek to understand the following issues:

- fundamental risks of the company's industry
- 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

Specifically:

Purpose

What does the company do and why do they need to borrow? Possible reasons for seeking finance include:

- organic growth
- acquisition
- investment in an associated company
- capital expenditure
- dividend / share buy-back

Payback

What is the expected source of repayment? Is there a secondary source? Issues to consider include:

- cash flow / profit profile (over time)
- possible sale of assets and / or businesses
- refinancing

Risks

What risks (quantitative *and* qualitative) could jeopardise debt servicing in future? Factors to consider include:

- macro considerations (industry analysis and competitive trends, regulatory environment, sovereign macro-economic analysis)
- company specific issues (qualitative analysis, financial performance, market position)

Structure

Does the bond structure reflect the risks and protect investors' interests? (Structure, Status, Safeguards, Pricing)

(iii) A higher rating would apply where the bond has additional security relative to an unsecured creditor of the issuer (e.g. a fixed or floating charge, or seniority due to some other factor). [1; 1/2 if no example]

A lower rating would apply where the bond has weaker security relative to an unsecured creditor of the issuer (e.g. the bond is subordinate to unsecured creditors). [1; 1/2 if no example]

5

(i) *Liability hedging* is where the assets are chosen in such a way as to perform in the same way as the liabilities. A specific example of this is the familiar concept of immunisation, where assets are matched to liabilities by term in order to hedge interest rate risk (to some degree). Other familiar forms of hedging would include matching by currency and the consideration of the real or nominal nature of liabilities when determining the choice of assets.

However, these examples relate only to specific characteristics of the liabilities, whereas liability hedging aims to select assets which perform *exactly* like the liabilities in all states.

The most familiar example would therefore be the choice of assets to hold in order to hedge unit-linked liabilities.

In most cases the problem is "solved" by establishing a portfolio of assets, determining a unit price by reference to the value of the asset portfolio, and then using this price to value units held, allocated or realised.

However, even this "simple" approach can generate many practical problems — use of historic prices for transactions, moving between bid and offer pricing bases, delays in notification of new money / withdrawals / units allocated or realised.

A particular problem may arise when intermediaries are given delegated authority to switch clients' holdings between funds, which may result in extreme volatility of movements for myriad small holdings.

A potentially greater problem arises when the assets held are not the same as those underlying the value of the liabilities.

Thus, if units are allocated and realised by reference to some *external* fund, then it is likely that the internal investment manager will not know what assets are held by the external manager at any given point in time.

Alternatively, the requisite information may only be available after some delay, by which time the assets actually held by the external manager are likely to have changed.

An extreme example of this problem is where the value of liabilities is linked to some external index (for example, "guaranteed" contracts where the

movement of market indices determines the value of the contract in some way). In order to hedge such liabilities, use is often made of over-the-counter derivatives purchased from an investment bank, thereby avoiding the uncertainty (and expense) of "rolling-over" short term exchange traded derivatives over the lifetime of the underlying contract.

Credit was given for other sensible issues discussed

(ii)

Year (t)	*Interest rate*	*Bond*	*1st condition*	*2nd condition*	*3rd condition*
1	1.0475	10	10	10	10
2		10	9	18	36
3		10	9	26	78
4		10	8	33	133
5		100	79	396	1982
			115	484	2240

Year (t)	*Interest rate*	*Liability A*	*1st condition*	*2nd condition*
1	1.0475	11	11	11
2		0	0	0
3		5	4	13
4		32	27	106
5		93	74	369
			115	499

Year (t)	*Interest rate*	*Liability B*	*1st condition*	*2nd condition*	*3rd condition*
1	1.0475	5	5	5	5
2		10	9	18	36
3		13	11	34	102
4		27	22	90	359
5		85	67	337	1685
			115	484	2187

Liability A fails at the second test of immunisation, Liability B matches all three conditions.

6

(i) REITs work much like closed-end pooled funds, but instead of owning a portfolio of securities, the REIT owns a portfolio of real estate properties and/or mortgages.

REITs are registered securities and trade in the secondary market, like stocks.

As a result, investors get the benefit of diversification (since most REITs own a large number of properties) and liquidity.

Unlike other pooled funds, REITs are permitted to use leverage – the income from the properties within the REIT is then used to pay the costs of any loans involved.

There are two main types of REITs:

Equity REITs – these invest mainly in actual real estate properties, such as office buildings, residential property eg apartments, warehouses and shopping centres. Equity REITs are usually not highly leveraged.

Mortgage REITs – these invest mainly in mortgages and construction loans for commercial properties and tend to use leverage to a greater degree than equity REITs.

(ii) Total return from REIT is dividends plus price appreciation. Unlike other quoted equities, most of the expected return of a REIT comes not from price appreciation but from dividends.

On average, about two thirds of a REIT's return comes from dividends.

As a high-yield investment, a REIT can be expected to exhibit sensitivity to interest rate changes.

Typically there is a strong inverse relationship between REIT prices and interest rates.

On average, it would be safe to assume that interest rate increases are likely to be met by REIT price declines although the actual change will vary by sector.

For example, some argue that in the case of residential and office REITs rising interest rates would drive up REIT prices because increasing rates correspond to economic growth and more demand.

However individual REITS may perform differently depending on their underlying property exposures and degree of leverage.

(iii) From 2007 to 2008, Equity in Property's net income, or earnings grew by almost 30% (+$122,500 to $543,847).

These net income numbers, however, include depreciation expenses, which are significant line items.

For most businesses, depreciation is an acceptable non-cash charge that allocates the cost of an investment made in a prior period.

But real estate is different than most fixed-plant or equipment investments in that property rarely 'depreciates' in value (in the short term) as the result of physical wear.

Net income, a measure reduced by depreciation, is therefore an inferior gauge of performance and so valuation measures based on earnings are equally flawed.

(iv) The general calculation involves *adding* depreciation back to net earnings (since depreciation is not a real use of cash) and *subtracting* the gains on the sales of depreciable property.

These gains are subtracted because we assume that they are not recurring and therefore do not contribute to the sustainable dividend-paying capacity of the REIT.

Hence the calculation and reconciliation of net income to FFO for EiP is:

	2008	*2007*
Net earnings	**543847**	**421313**
Plus Depreciation	444339	419039
Gain on Depreciable Property Sales	(300426)	(102614)
Other miscellaneous Depreciation items and gains	69838	100651
FFO	**757598**	**838389**

Credit was given for appropriate description of the calculation, since the requisite data was not provided in the question.

(v) FFO does not deduct for capital expenditures required to maintain the existing portfolio of properties, hence the most important adjustment made to calculate AFFO is the subtraction of capital expenditures.

FFO	757598	838389
Minus Capital Expenditures	(181948)	(156776)
AFFO	575650	681613

This number can be taken directly from the accounts as an estimate of the cash required to maintain existing properties, although you could make a better estimate by looking at the specific properties in the REIT.

(vi) Once we have the FFO and the AFFO, we can try to estimate the value of the REIT.

The key assumption here is the *expected growth* in FFO or AFFO.

This involves analysing the underlying prospects of the REIT and its sector exposure, considering:

- Prospects for rent increases
- Prospects to improve/maintain occupancy rates
- A specific plan to upgrade/upscale properties – A popular and successful tactic is to acquire "low-end" properties and upgrade them to attract a higher quality tenant. Often a virtuous cycle ensues. Better tenants lead to higher occupancy rates (fewer evictions) and higher rents.
- External growth prospects – Many REITs favour fostering FFO growth through acquisition, but it's easier said than done. An REIT must

distribute most of its profits and therefore does not have a lot of excess capital to deploy. Many REITs, however, successfully prune their portfolios: they sell underperforming properties to finance the acquisition of undervalued properties.

The total return on a REIT investment comes from two sources: (1) dividends paid and (2) price appreciation.

Expected price appreciation comprises two components:

1. Growth in FFO/AFFO
2. Expansion in the price-to-FFO or price-to-AFFO multiple

Given a market capitalisation of $8 billion, then:

Price/FFO = 8000/758 = 10.55*x*

Price/AFFO = 8000/575.7 = 13.9*x*

Interpreting price-to-FFO or price-to-AFFO multiples is not an exact science, and the multiples will vary with market conditions and specific REIT sub-sectors (for example, apartments, offices, industrial).

Want to avoid buying into a multiple that is too high.

If you are looking at a REIT with favourable FFO/AFFO growth prospects, then consider both sources together.

If FFO grows at 10%, for example, and the multiple of 10.55*x* is maintained, then the price will grow 10%. But if the multiple expands about 5% to 11*x*, then price appreciation will be approximately 15% (10% FFO growth + 5% multiple expansion) making the current market valuation more attractive.

Debt is ignored by assuming that Equity in Property's debt burden is modest and "in line" with the industry peers.

If EiP's leverage (debt-to-equity or debt-to-total capital) were above average, we would need to consider the extra risk implied by the additional debt and adjust the valuation accordingly.

7

(i)

a. Bid/offer spreads

   Taxes

   Market impact costs

   Commission costs

   Opportunity costs

   There may be rebates payable if a Multilateral Trading Facility (MTF) is used.

b. Trades are relatively small compared to market and you would have to establish the names they are trading in, as larger trade might be highly liquid where as small trade might be small cap

Everything being equal (timing and stocks traded), bid/offer slightly higher on £1bn trade

Taxes the same (proportionally)

Market impact higher on £1bn trade

Commission – depends but might be lower on larger trade

Opportunity costs will depend on trading time etc. Would be proportionally equal if traded together

(ii) Sell the equities

Short equity futures

Buy puts set at a level investor is willing to see market value decrease

Use Total Return swaps.

(iii) Sell equities – market risk, if equities rise then miss out on the upside, risks sell at the wrong time

Short equity futures – investment performance risk, basis risk

Buy puts – investment performance risk, might not be able to buy puts for all shares in portfolio.

Swaps – investment performance risk.

For all derivative-based strategies, counterparty / default risk is a further issue when over the counter approaches are used.

(iv) Sell equities – Would be in cash. Mismatch performance between cash and the equity markets. Lose out on dividends.

Short equity futures – would lose out on market performance would still pick up alpha from mismatch of futures and underlying portfolio. Could under or out perform depending on alpha.

Buy puts – depends the levels that they are set at. There would be the negative drag on paying for puts. However, for some shares in the portfolio that fall in value then could positively impact overall performance as cap losses on those securities.

Swaps – Mismatch performance between the equity market and the other side of the swap.

END OF EXAMINERS' REPORT