Answers

Tutorial note: *These model answers are considerably longer and more detailed than would be expected from any candidate in the examination. They should be used as a guide to the form, style and technical standard (but not in length) of answer that candidates should aim to achieve. However, these answers may not include all valid points mentioned by a candidate – credit will be given to candidates mentioning such points.*

1 Blipton International Entertainment Group

Management Report: Blipton International Entertainment Group
400 bed Olympic Hotel, London
Completion: 31 December 2009

(a) Projection of $value cash flows for both the project investment and the project return.

In projecting the cash flow for this project we have created a forecast of the capital requirement, the six year operating cash flow and the residual value of the property net of repairs and renewals at the end of the project. On the basis of the specified occupancy rates and a target nightly rental of £60 we have projected the revenues for the hotel and the expected costs. These are projected at current prices to give a real cash flow before conversion to nominal at the UK rate of inflation. Tax is calculated both in terms of the offset available against the construction costs but also at 30% of the operating surplus from the project. We assume that the benefit of the capital allowances will be recovered irrespective of the success of the operating phase of the project. They are therefore considered a credit to the investment phase (candidates who assume that they are part of the recovery phase will not be penalised).

Finally, using purchasing power parity, future spot rates are estimated. The rate specified is indirect with respect to the dollar and declines as sterling strengthens.

We have separated the calculation of the present value of the investment phase from that of the return phase as follows:

Investment phase (values in £)	01 Jan 2009	31 Dec 2009	31 Dec 2010	31 Dec 2011	31 Dec 2012	31 Dec 2013	31 Dec 2014
Nominal project cash flow		–6,200,000					
Capital allowance (tax saving)		930,000	310,000	310,000	310,000		
Nominal project cash flow after tax (investment phase)		–5,270,000	310,000	310,000	310,000		
Rate of exchange	0·6700	0·6552	0·6409	0·6268	0·6130	0·5996	0·5864
$value of investment phase		–8,043,346	483,695	494,576	505,710	0	0
Return phase (value in £)							
Occupancy rate		0	0·4	0·5	0·9	0·6	0·6
Terminal value of property							8,915,309
Rooms let (400 × occ. rate × 365)			58,400	73,000	131,400	87,600	87,600
Revenue (rooms let × £60)			3,504,000	4,380,000	7,884,000	5,256,000	5,256,000
Variable operating costs (rooms let × £30)			–1,752,000	–2,190,000	–3,942,000	–2,628,000	–2,628,000
Fixed costs			–1,700,000	–1,700,000	–1,700,000	–1,700,000	–1,700,000
Project operating cash flow (real)			52,000	490,000	2,242,000	928,000	928,000
Project operating cash flow (nominal)			54,633	527,676	2,474,749	1,049,947	1,076,195
Tax on operating cash flows (at 30%)			–16,390	–158,303	–742,425	–314,984	–322,859
Nominal project cash flow after tax (return phase)			38,243	369,373	1,732,324	734,963	9,668,646
Rate of exchange	0·6700	0·6552	0·6409	0·6268	0·6130	0·5996	0·5864
$value of return phase			59,670	589,300	2,825,977	1,225,755	16,488,141

(b) Project evaluation

Net present value

Given that the Dubai rate of inflation is 4·8% per annum and the company's real cost of capital is 4·2% per annum the nominal cost of capital is estimated using the Fisher formula:

$i_{nom} = (1 + \text{inf})(1 + i_{real}) - 1$
$i_{nom} = (1{\cdot}048)(1{\cdot}042) - 1 = 9{\cdot}2016\%$

Discounting the project cash flows (investment plus return) at this nominal cost of capital gives a project net present value as follows:

	01 Jan 2009	31 Dec 2009	31 Dec 2010	31 Dec 2011	31 Dec 2012	31 Dec 2013	31 Dec 2014
Nominal project cash flow (investment plus return)		–8,043,346	543,365	1,083,876	3,331,687	1,225,755	16,488,141
Nominal cost of capital (Dubai)	0·092016						
Discounted cash flow	0	–7,365,593	455,653	832,324	2,342,870	789,330	9,722,942
Net present value	6,777,525						

A net present value of $6,777,525 strongly suggests that this project is viable and will add to shareholder value.

Modified internal rate of return

The modified internal rate of return can be estimated by calculating the internal rate of return of the sum of the return cash flows compounded at the cost of capital to give a year six terminal value. The discount rate which equates the present value of this terminal value of return cash flows with the present value of the investment cash flows is the modified internal rate of return.

$$MIRR = \left[\frac{PV_R}{PV_I}\right]^{\frac{1}{n}}(1+r_e)-1$$

Where PV_R is the present value of the return phase of the project, PV_I is the present value of the investment phase and r_e is the firm's cost of capital.

	01 Jan 2009	31 Dec 2009	31 Dec 2010	31 Dec 2011	31 Dec 2012	31 Dec 2013	31 Dec 2014
Modified internal rate of return							
Present value of return phase	13,002,093		50,038	452,532	1,987,251	789,330	9,722,942
Present value of investment phase	–6,224,568	–7,365,593	405,614	379,792	355,619		
Present value per $ investment	2·0888						
Sixth root of present value of PV_R/PV_I	1·1306						
MIRR	23·47%						

The calculation of the MIRR is as follows:

$$MIRR = \left[\frac{13,002,093}{6,224,568}\right]^{\frac{1}{6}}(1{\cdot}092016)-1 = 23{\cdot}47\%$$

Alternatively the modified internal rate of return can be found by compounding forward the return phase cash flows at the firm's cost of capital and then calculating the internal rate of return using the terminal value of the return phase and the present value of the investment phase as follows:

	01 Jan 2009	31 Dec 2009	31 Dec 2010	31 Dec 2011	31 Dec 2012	31 Dec 2013	31 Dec 2014
Modified internal rate of return (Method 2)							
year 6 cash flow							16,488,141
year 5 cash flow							1,338,544
year 4 cash flow							3,369,975
year 3 cash flow							767,403
year 2 cash flow							84,854
Future value of return phase							22,048,918
Present value of investment phase	–6,224,568						

The modified internal rate of return is the discount rate which solves the following equation:

$$6,224,568 = \frac{22,048,918}{(1+MIRR)^6}$$

$$MIRR = \sqrt[6]{\frac{22,048,918}{6,224,568}}-1 = 23{\cdot}47\%$$

(c) Recommendation and discussion of method

I have examined the project plan for the proposed project and referring to the appendices (see above) report that this project is expected to deliver an increase in shareholder value of $6·78 million, at the firm's current cost of finance. I have estimated the increase in shareholder value using the net present value (NPV) method. Net present value focuses on the current equivalent monetary value associated with capital expenditure leading to future cash flows arising from investment. The conversion to present value is achieved by discounting the future cash flows at the firm's cost of capital – a rate designed to reflect the scarcity of capital finance, inflation and risk.

Although the net present value technique is subject to a number of assumptions about the perfection and efficiency of the capital market it does generate an absolute measure of increase in shareholder value and as such avoids scale and other effects associated with percentage performance measures. Given the magnitude of the net present value of the project it is safe to assume that it is value-adding assuming that the underlying cash projections can be relied upon.

However, in certain circumstances it can be useful to have a 'headroom' percentage which reliably measures the rate of return on an investment such as this. In this case the modified internal rate of return of 23·47% is 14·26% greater than the firm's cost of capital. MIRR measures the economic yield of the investment (i.e. the discount rate which delivers a zero net present value) under the assumption that any cash surpluses are reinvested at the firm's current cost of capital. The standard IRR assumes that reinvestment will occur at the IRR which may not, in practice, be achievable. MIRR does not suffer from the multiple root problem when calculating IRR on complex cash flows.

Although MIRR, like IRR, cannot replace net present value as the principle evaluation technique it does give a measure of the maximum cost of finance that the firm could sustain and allow the project to remain worthwhile. For this reason it gives a useful insight into the margin of error, or room for negotiation, when considering the financing of particular investment projects.

2 Jupiter Co

To: Rosa Nelson
From: An accountant
Briefing Note:

The impact of the proposed financing package requires an estimation of the firm's cost of capital before and after the event and a calculation of the likely impact of the refinancing scheme upon the value of the firm:

(a) The current cost of debt, equity and the weighted average cost of capital.

The current debt has a cost of finance of 4·65% (4·2% + 45bp) for a yield to maturity of four years in the Euro market.

The current cost of equity is as follows:

$r_e = r_f + \beta_i(r_m - r_f)$
$r_e = 4\% + 1{\cdot}5 \times 3\% = 8{\cdot}5\%$

The weighted average cost of capital relies upon a valuation of the current debt. This is achieved by discounting the current average coupon rate applied to a nominal $100 of borrowing at the current cost of debt finance:

$$MV_d = \frac{5{\cdot}6}{(1{\cdot}0465)} + \frac{5{\cdot}6}{(1{\cdot}0465)^2} + \frac{5{\cdot}6}{(1{\cdot}0465)^3} + \frac{105{\cdot}6}{(1{\cdot}0465)^4} = £103{\cdot}4\ percent$$

This gives a total market value of debt of 103·4% × $800 million = $827·17 million

Given the current share price, the market value of equity is ($13·80 × 500 million shares in issue) $6,900 million and the market gearing ratio w_d is therefore 10·70%.

From this the weighted average cost of capital is as follows:

$WACC = (1 - w_d)r_e + w_d r_d(1 - T)$
$WACC = (0{\cdot}8930 \times 8{\cdot}5\%) + (0{\cdot}1070 \times 4{\cdot}65\% \times 0{\cdot}75) = 7{\cdot}96\%$

(b) The revised cost of debt, equity and weighted average cost of capital

The revised cost of debt is calculated as a weighted average of the 10 year risk free rate plus the credit premium in both the Euro and the Yen markets:

Cost of debt = (0·5 × 2·30%) + (0·5 × 5·45%) = 3·875%

The market value of the debt (on the assumption that the fixed rate on the bond is set at the current weighted average cost of debt) will be $2,400 million.

The increased gearing will impact upon the cost of equity for the company. The procedure for calculating the revised cost of equity is to ungear the current beta and revise it to the new gearing level using the tax-adjusted market gearing ratio. In practice this would entail an iterative calculation as the revised market gearing ratio will be dependent upon the value of the equity after the issue of the new debt.

The tax-adjusted market gearing ratio is:

$$w'_d = \frac{V_d(1-T)}{V_e + V_d(1-T)} = \frac{827{\cdot}17 \times 0{\cdot}75}{6{,}900 + 827{\cdot}17 \times 0{\cdot}75} = 0{\cdot}08249$$

The asset beta is as follows:

$$\beta_A = \beta_E(1 - w'_d)$$
$$\beta_A = 1{\cdot}5 \times (1 - 0{\cdot}08249) = 1{\cdot}3763$$

Assuming that the value of equity does not change the revised tax-adjusted gearing ratio will be:

$$w'_d = \frac{V_d(1-T)}{V_e + V_d(1-T)} = \frac{2{,}400 \times 0{\cdot}75}{6{,}900 + 2{,}400 \times 0{\cdot}75} = 0{\cdot}2069$$

And the revised equity beta:

$$\beta_E = \frac{\beta_A}{(1 - w'_d)}$$

$$\beta_E = \frac{1{\cdot}3763}{(1 - 0{\cdot}2069)} = 1{\cdot}735$$

The cost of equity capital to the new firm is:

$$r_e = r_f + \beta_i(r_m - r_f)$$
$$r_e = 4\% + 1{\cdot}7353 \times 3\% = 9{\cdot}21\%$$

Assuming no alteration in the market value of the firm's equity the revised gearing and WACC after the issue of the new debt will be:

$$w_d = \frac{2{,}400}{2{,}400 + 6{,}900} = 0{\cdot}258$$

$$WACC = (1 - w_d)r_e + w_d \times r_d(1 - T)$$
$$WACC = (0{\cdot}742 \times 9{\cdot}21\%) + (0{\cdot}258 \times 3{\cdot}875\% \times 0{\cdot}75) = 7{\cdot}58\%$$

(c) Estimation of the minimum rate of return on the additional debt financing required to maintain shareholder value

The free cash flow to equity model appears to satisfactorily predict the value of the firm. The model gives a share price as follows:

$$V_0 = \frac{FCFE_0(1 + br_e)}{r_e - br_e}$$

$$V_0(\text{million}) = \frac{400 \times (1 + 0{\cdot}3 \times 0{\cdot}085)}{0{\cdot}085 - 0{\cdot}3 \times 0{\cdot}085} = \$6{,}894 \text{ million}$$

Or \$13·79 per share

Given the refinancing of the business and the revised cost of equity capital we can rearrange the valuation formula to find the free cash flow required to maintain shareholder value as follows:

$$FCFE_0 = \frac{V_0 \times \left(r_e - br_e\right)}{(1 + br_e)}$$

Using 9·21% as the revised cost of equity following refinancing the free cash flow to equity required to maintain shareholder value is as follows:

$$FCFE(million) = \$6{,}894 \times \frac{(0{\cdot}0921 - 0{\cdot}3 \times 0{\cdot}0921)}{(1 + 0{\cdot}3 \times 0{\cdot}0921)} = \$432{\cdot}3 \text{ million}$$

or an increase of \$32·3 million.

The addition to the operating cash flow that this implies is calculated by estimating the free cash flow before tax and adding back the interest charge on the new debt:

$$\Delta OCF(\$million) = \frac{32{\cdot}3}{0{\cdot}75} + \left[(2{,}400 \times 0{\cdot}03875) - (800 \times 0{\cdot}056)\right] = \$91{\cdot}30 \text{ million}$$

This means that the company needs to generate \$91·30 million on the new debt investment of \$2,400 million or 3·80%.

(d) Comparison of the proposed method of raising finance for investment compared with the alternatives

The proposed method of financing through a bond issue is an attractive means of raising large scale debt. There are significant issue costs and there is the risk that the issue will not be fully subscribed – although much of that risk can be mitigated through an underwriting agreement. A more popular means of financing an issue of this size is through a syndicated loan.

Global lending through this means is now believed to exceed US$3 trillion with an average loan size in excess of US$400 million. Syndication entails the creation of a banking syndicate led by an 'arranging' bank whose function it is to bring together other banks who are willing to participate in the loan. The arranging bank may also act in an ongoing agency relationship with the client company once the deal has been established. The advantages of syndication are:

(i) Loans can be arranged that are considerably greater than could be managed by any single bank without unbalancing its lending portfolio or indeed breaching its capital requirements under the Basle agreements.

(ii) Banks in different currency jurisdictions combine to create mixed lending packages to suit the needs of companies requiring finance for investment in different countries.

(iii) Speed of creation and relatively low transaction costs.

Excluding the FOREX risk arising with any overseas borrowing, the disadvantages of syndication from the borrower's point of view are relatively small: there is a risk of bank default and the rates offered may be somewhat above the spreads available in the bond market.

3 Aston Co

(a) Default is defined as that point at which the firm is unable to discharge its interest and/or principal payments when they fall due. From the monthly average cash flow we deduct the monthly interest payment. The monthly payment is based upon the effective monthly rate as follows:

$$i_m = \sqrt[1/12]{(1+i_a)} - 1 = \sqrt[1/12]{1{\cdot}08} - 1 = 0{\cdot}6434\%$$

The expected monthly cash flow will then be:

c_m = \$14,400 – 0·006434 × \$1,500,000 = \$4,748·4.

To give an annual expected cash flow after interest of \$56,987·4.

We now need to determine the probability over the course of 12 months that this figure will fall below zero. For this we need to calculate the annual volatility of cash flows. Given that the monthly volatility before interest is 13%, we must translate this to volatility after fixed interest in two stages. First, calculate the proportion of fixed interest to monthly cash flow (G):

$$G = \frac{(0{\cdot}006434 \times \$1{,}500{,}000)}{14{,}400} = 0{\cdot}6702$$

And second, calculate the monthly volatility after interest (σ_m) as follows:

$$\sigma_m = \frac{\sigma'_m}{1-G} = \frac{13\%}{1-0{\cdot}6702} = 39{\cdot}42\%$$

The annualised volatility is as follows:

Annualised volatility = $0{\cdot}3942 \times \sqrt{12}$ = 136·55%

Standard deviation of annual cash flows = 136·55% × \$56,987 = \$77,818

Given a critical cash value of zero (i.e. if the cash flow less interest falls below zero) then the expected cash difference to default including the \$8,500 of cash in hand is \$65,487. This figure represents 0·842 standard deviations.

Using the standard normal tables this shows a value of 0.3 or a cumulative probability that the cash flow plus reserve will be above the default probability of 0·8. This tells us that there is a 20% chance of failure within 12 months.

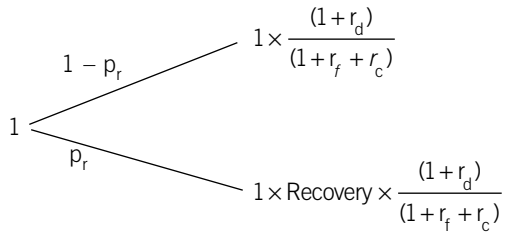
Alternatively this can be expressed as a 'distance to default' of 12 months × 0·8 = 9·6 months.

(b) Making a loan of this type resolves down to an estimate of the probability of default, the potential default loss, the rate the lender needs to recover to cover the cost of finance in the inter-bank market plus an additional charge for bearing the risk attaching to the loan.

The probability of default on interest payments is determined by the expected annual cash flow after interest payments and the volatility of that residual cash flow. If, on an annual basis, that cash flow falls below zero then default is deemed to occur.

The next most important issue for a lender is the potential recoverability of its borrowing. This will be governed by a number of factors: the percentage of the loan covered by the firm's net assets excluding the loan, the liquidity of those assets under forced sale, the market demand for these assets (and hence their price) and any director's or other guarantees that may be in place. If the net assets exceed the value of the outstanding loan then default will not occur as it would be possible for the firm to liquidate some of the surplus asset value to service the debt.

In this case the probability of recovery is 90% which implies a loss of 10% of the loan in the event of default. When estimating its potential loss the bank will calculate the present value of the outcomes over a year of each £1 invested discounting at the risk free rate plus the additional rate of return it requires as compensation for bearing the risk of default. Using the following decision tree:



Where: p_r is the probability of default, r_d is the rate of return required to compensate for the loss on default, r_f is the risk free rate and r_c is the additional return required by the bank for bearing the risk attaching to this loan.

The logic of this calculation is that the bank has put at risk, over 12 months, the value of its original loan (£1) and the rate of interest it decides to charge (r_d). If the bank was indifferent to the outcomes, i.e. it is risk neutral with respect to those outcomes, then it would discount each of the possibilities at the risk free rate (r_f). However, it is not risk neutral and r_c is the premium it requires to offset its risk aversion.

Putting the information given in the question into an equation and solving:

$$1 = (1 - p_r) \times \frac{(1 + r_d)}{(1 + r_f + r_c)} + p_r \times \text{Recovery} \times \frac{(1 + r_d)}{(1 + r_f + r_c)}$$

$$r_d = \frac{1 + r_f + 0{\cdot}034}{(1 - p_r) + p_r \times \text{Recovery}} - 1 = \frac{1{\cdot}0584}{(1 - 0{\cdot}2) + 0{\cdot}2 \times 0{\cdot}9} - 1 = 8{\cdot}00\%$$

To summarise, the bank requires 5·5% to cover its own cost of finance on the money market, 2·16% to cover the expected loss on the loan given the probability of default and the potential for recovery and 0·34% as compensation for carrying the risk attaching to the loan.

In practice the estimation of default probability and recoverability will depend upon a number of judgements about the credit worthiness of the business, an assessment of its business plan and the willingness of the lender to finance high risk business of this type.

4 Solar Supermarkets

The directors of Solar Supermarkets face a number of issues which may reflect a lack of understanding of the consequences:

(i) The company's more hostile competitive environment with pressure on prices and costs;

(ii) The need to offer management compensation that will provide an incentive to seek value adding business opportunities;

(iii) The investor pressure to release the value in property assets with the implied concern that if they do not acquiesce a private equity team may well do the job for them; and

(iv) The willingness of the firm to support the potential liabilities of a final salary pension scheme for its employees.

In reviewing these issues it is important to bear in mind the overarching duty of the directors which is to maximise the value of the firm and to act in its (i.e. the company's) best interests. Traditionally this concept of duty to the firm has been taken to mean the same as duty to existing shareholders. However, this is neither the legal nor arguably the moral duty of directors. The threat of a private equity acquisition may be real or it may simply be a ploy by institutional investors to liquidate a part of the value of the firm on the assumption that the firm will be able to operate just as effectively without owning its premises. Leaving aside the issue of whether such leases would be financial or operational, the investors do not appear to recognise that the market has valued the firm currently on the basis that its value generation is both retail and property driven. Disinvestment of the property portfolio will simply skew the risk of the business towards retail and given the increasing international competition in the sector this may result in the firm's value falling even if the firm manages to maintain its current levels of profitability and growth. As things stand the investors (and other stakeholders) in Solar Supermarkets benefit from its diversified value generation with the added benefit that management can focus on the difficult job of retailing and leave the property market to look after itself.

Disinvestment of the property portfolio could increase the risk of the business and in this context it is worth reviewing the share option proposal. Currently, senior management and directors are compensated by a mix of salary, perks and profit related bonuses. To this extent there is a degree of risk sharing between owners and managers. The problem with share options schemes is that they tend to increase the risk appetite of managers in that the holder is no longer so concerned about downside risk in the company's performance which is shifted to the writer (effectively the shareholders). However, to the extent that the firm is financed by debt, the shareholders in their turn hold a call option written by the lenders on the underlying assets of the firm and so the lenders are the ones who bear the ultimate risk. The combination of limited liability and equity options in the hands of directors may well create a wholly unacceptable appetite for risk and a willingness to take on new projects that the directors would otherwise have rejected.

Finally, the move to a money purchase pension scheme may be suggestive of a less than generous approach to the firm's future employees who, in the retail sector, tend to be poorly paid with incomes of shop floor workers close (in the UK and Europe) to the minimum hourly wage. It is safe to assume that the pension fund is principally designed for the various management grades within the firm. The move from a final salary scheme to a money purchase scheme brings benefits in terms of fund management and

financing but passes risk to the beneficiaries of the fund particularly in terms of their exposure to future investment returns and annuity rates. The maintenance of the final salary scheme for existing staff will no doubt be welcomed by them but the firm should recognise that it may be more difficult to appoint staff of the same quality as currently at current rates of pay. In so far as the labour market is efficient we would anticipate wage rates to rise to compensate for the reduction of pension benefit and so the gains from this move may well be illusory.

From an ethical perspective, the directors are in the position of attempting to balance the interests of a range of different stakeholders as well as satisfying their own compensation requirements. It is clear that all four options involve the transfer of risk from one stakeholder group to another in ways which are not immediately obvious. The duties of directors in this case can be summarised as ones of transparency, effective communication and integrity in the choices that they make. It is important that the directors should not be seen as taking a more advantageous position with respect to other groups, without their consent, either in terms of the return they take or the risk they bear.

5 Phobos Limited

(a) (i) This is a straightforward question on hedging interest rate exposure using interest rate futures:

Step (1) Calculate the current interest:

Current interest = (SIBOR + 50) × exposure time × principal

$$\text{Current interest} = 6{\cdot}50\% \times \frac{4}{12} \times \$30{,}000{,}000 = \$650{,}000$$

Step (2) Select the shortest available future with maturity following the commencement of exposure and choose the appropriate hedging strategy.

Sell March with an open of 93·8 and a settlement of 93·88.

Step (3) Calculate the number of contracts:

$$\text{Contracts} = \frac{\text{principal}}{\text{contract size}} \times \frac{\text{Exposure period}}{\text{Contract period}}$$

$$\text{Contracts} = \frac{\$30{,}000{,}000}{\$500{,}000} \times \frac{4}{3} = 80$$

Step (4) Calculate the basis:

Basis = spot price – futures price = 94·00 – 93·88 = 12 basis points or 'ticks'

Assuming linear convergence then movement between closure and maturity is four ticks given the contracts will have one month to run.

Step (5) Estimate close-out price if interest rates (a) increase by 100 basis points (b) decrease by 100 basis points.

(a) Close out will be 93·00 – 0·04 = 92·96
(b) Close out will be 95·00 – 0·04 = 94·96

Step (6) Calculate gain and/or loss in the futures market and the equivalent cost:

Interest rate at close out	**7·00%**	**5·00%**
Current open price	93·88	93·88
Futures price at close out	92·96	94·96
Ticks	92	–108
On 80 contracts at $12·50 per tick	92,000	–108,000
Cost of loan in spot market	750,000	550,000
less profit/(loss) on futures	92,000	–108,000
Net cost of loan	658,000	658,000
Annual equivalent	6·58%	6·58%

(ii) Traded options allow the management of this type of risk, but the hedge carries a premium. Given the current SIBOR of 6% and an exposure commencing in March, the end of March puts at 94·00 are best suited for this type of exposure. A put option allows the holder, at exercise, the right to short the futures at the stated price. These options are exercised (or sold back to the market) if the March futures rate is less than the stated exercise price.

Step (1) Choose the most effective option strategy to minimise basis risk from the point of exposure to contract exercise date on the underlying and to minimise time value.

March puts on three month futures at 94·00

Step (2) Calculate the required numbers of contracts:

The calculation as for futures = 80 contracts

Step (3) Calculate premium payable:

Premium = $80 \times 16{\cdot}8 \times \$12{\cdot}50 = \$16{,}800$

Step (4) Calculate basis on the underlying (as before) = 4 ticks

Step (5) Test outcomes against expected movements in interest rates:

Interest rate at close out	**7·00%**	**5·00%**
Futures price at close out	92·96	94·96
Exercise price	94·00	94·00
Option payoff	104·00	0
Position payoff on 80 contracts at $12·50 per tick	104,000	0
Cost of loan in spot market	750,000	550,000
less option payoff	–104,000	0
less premium	16,800	16,800
Net cost of loan	662,800	566,800
Annual equivalent	6·63%	5·67%
Expected payoff assuming equal likelihoods	6·15%	

In this calculation we have ignored the time value of the option at close out but have assumed that it will only be the intrinsic value. With one month before close out with the volatilities implied in this example the time value of the in-the-money options could be significant and should be calculated.

At 6·63% the effective cost is just above the required threshold of 6·6% but with an expected payoff of 6·15% (given equal likelihoods of a rise or a fall in interest rates). Given the absence of a time value estimate on close out, and the possibility of capturing the benefit of a fall in rates, the use of options should be the preferred alternative.

(b) Derivatives offer an opportunity for a firm to vary its exposure to interest rate risk at a given rate of interest on the underlying principal (hedging) or to decrease the rate of interest on its principal at an increased level of risk exposure. For hedging purposes derivatives permit the management of exposure either for the long term (swaps) or for the short term (Forward Rate Agreements (FRAs), Interest Rate Futures (IRFs), Interest Rate Options (IROs) and hybrids). With forward and futures contracts, the mechanism of hedging is the same in that an offsetting position is struck such that both parties forego the possibility of upside in order to eliminate the risk of downside in the underlying rate movements. Where the option to benefit from favourable rate movements is required or in situations where there is uncertainty whether a hedge will be required, then an IRO may be the more appropriate but higher cost alternative. Such hedging can be more or less efficient depending upon the ability to set up perfectly matched exposures with zero default risk. Matching depends upon the nature of the contract. With OTC agreements the efficiency of the match may be perfect but the risk of default remains. With traded derivatives, the efficiency of the match may be less than perfect either through size effects or because of the lack of a perfect match on the underlying (for example the use of a SIBOR derivative against an underlying reference rate which is not SIBOR). There will also be basis risk where the maturity of the derivative does not coincide exactly with the underlying exposure.

Where a company forms a view that future spot rates will be lower than those specified by the forward yield curve they may decide to alter their exposure to interest rate risk in order to capture the benefit of the reduced rate. This can be achieved through the use of IROs. Alternatively, leveraged swap or leveraged FRA positions can be taken to avoid the upfront cost of an IRO. For example, taking multiples of the variable leg of a swap (i.e. agreeing to swap fixed for variable) where a higher than market fixed rate is swapped for 'n' multiples of the variable rate. However, as a number of cases have demonstrated it may be very difficult with these types of arrangement to gauge the degree of risk exposure and to ensure that they are effectively managed by the firm. In the 1990s a number of companies in the US and elsewhere took leveraged positions, without recognising the degree of their exposure and took losses that threatened the survival of the firm.

Professional Level – Options Module, Paper P4 (SGP)
Advanced Financial Management (Singapore) **December 2008 Marking Scheme**

Professional marks are awarded for the quality of the layout, clarity and persuasiveness of the presentation and integration of analytical data with the written text.

			Marks
1	**(a)**	Identification of construction cost and estimation of terminal value	1
		Estimation of the number of room/nights let	2
		Projection of real cash flow on the return phase	2
		Conversion to nominal using the UK inflation rate	2
		Estimation of investment phase including the savings attaching to the capital allowances	2
		Tax charge and capital gain	1
		Conversion to dollars	2
		Total	**12**
	(b)	Calculation of the nominal $ rate of discount using the Fisher formula	2
		Calculation of the net present value	2
		Calculation of the MIRR	4
		Total	**8**
	(c)	Definitive conclusion on the project	1
		NPV as absolute as opposed to relative measure of increase in shareholder value	2
		Problems with underlying assumptions of the NPV model (efficiency arguments)	2
		Weaknesses of return measures	2
		Advantage of MIRR to IRR (reinvestment rate and single root arguments)	2
		MIRR gives headroom in cost of finance negotiations	1
		Total	**(maximum) 8**
	(d)	Professional marks	**2**
2	**(a)**	Calculation of current debt cost	1
		Calculation of cost of equity	1
		Calculation of market value of current debt	2
		Calculation of current WACC	2
		Total	**6**
	(b)	Calculation of revised cost of debt	2
		Ungearing of current beta to give the asset beta	2
		Regearing the beta	1
		Calculation of the new cost of equity	1
		Calculation of the new WACC	2
		Total	**8**
	(c)	Estimation of the firm's market value using the FCFE model	2
		Calculation of the FCFE required to maintain SH value	2
		Required change to the firm's OCF	1
		Calculation of required rate of return on new investment	1
		Total	**6**
	(d)	Outline of mechanism and rationale of a bond issue	2
		Note of importance as a financing method	2
		Advantages	2
		Alternatives: syndication or single source loan	2
		Total	**8**
		Professional marks	**2**

			Marks
3	**(a)**	Definition of default	1
		Calculation of effective monthly rate	2
		Calculation of expected annual cash flow	1
		Calculation of leverage	1
		Calculation of monthly volatility after interest	1
		Calculation of annual volatility	1
		Calculation of standard deviation of cash flows	1
		Calculation of Z	1
		Calculation of probability of default	1
		Total	**10**
	(b)	Bank issue: probability of default and determinants	3
		Bank issue: estimation of recoverability and determinants	3
		Rationale for the risk premium	1
		Justification of interest charge as 5·5% + 2·16% + 0·34%	3
		Total	**10**
4	Essay		
	Overarching duty of directors		3–4
	Commentary on the threat of acquisition by private equity		3–4
	Merits or issues of sale/leaseback (cost of breakup and risk effects)		3–4
	Commentary on share options schemes and redistribution of risk		3–4
	Labour market reactions to move to a money purchase scheme		3–4
	Ethical commentary on distribution of risk between stakeholders		5–6
	Total		**(max) 20**
5	**(a)**	Calculate current interest rate	1
		Identification of appropriate future and hedge strategy	1
		Calculation of number of contracts	3
		(i) Calculation of basis for IRF	2
		Calculate gain or loss on alternative closeouts	2
		(ii) Identification of most appropriate option strategy	1
		Calculate premium payable	1
		Calculate loan cost under alternative payoffs	2
		Estimate expected payoff given equal likelihoods	1
		Total	**14**
	(b)	Discussion of the use of derivatives for interest rate risk management	
		Problems of making an efficient match	1
		Hedge efficiency issues	1
		Default and basis risk	1
		Use of derivatives to reduce interest rate	
		Leveraged swaps and FRAs	2
		Dangers of leveraging	1
		Total	**6**