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Revision Mock – Answers

ANSWER 1

(a)   Laceto will wish to pay the minimum price that will attract the majority of Omnigen's shareholders to sell. The current market price of 410 cents per share, or a total market value of $123 million, is likely to be the lowest that shareholders of Omnigen would accept, and unless there is an expectation that Omnigen's shares will fall further in value in the near future, a premium over the current market price will normally be payable.

If industry P/E ratios are used to value Omnigen, the range of values would be $182 million to $210 million. (Omnigen's total earnings after tax of $14 million, multiplied by the P/Es of 13:1 and 15:1.) However, Omnigen's current P/E ratio is 8.78:1, given a value of $123 million. Even if the share price had not fallen it would only have been just over 13:1, or a value of $184 million. Unless there is an expectation that Omnigen's share price will soon return to a higher level, the use of a forecast P/E or comparative P/Es of companies that might have very different characteristics to Omnigen is not recommended.

The realisable value of assets, $82 million, is substantially below the estimates based upon P/E ratios, probably because Omnigen is a profitable company that is planned to continue trading after the potential acquisition. The realisable value of assets is not the recommended valuation method unless it produces a value higher than the value as a going concern.

A better method of estimating the value of Omnigen is to use the cash flow projections to find the present value of Omnigen to Laceto. This will be based upon the free cash flow after replacement expenditure and expenditure required to achieve the forecast growth levels.

A discount rate of 14% is used. See the note below for an explanation of this choice of rate.

Financial year	*20X2*	*20X3*	*20X4*	*20X5*
Net sales	230.0	261.0	281.0	298.0
Cost of goods sold (50%)	115.0	131.0	141.0	149.0
Selling and administrative expenses	32.0	34.0	36.0	38.0
Capital allowances	40.0	42.0	42.0	42.0
	187.0	207.0	219.0	229.0
Taxable	43.0	54.0	62.0	69.0
Taxation (30%)	12.9	16.2	18.6	20.7
	30.1	37.8	43.4	48.3
Add back capital allowances	40.0	42.0	42.0	42.0
Less cash flow needed for asset replacement and forecast growth	(50.0)	(52.0)	(55.0)	(58.0)
Net cash flow = free cash flow	20.1	27.8	30.4	32.3
Discount factors (14%)	0.877	0.769	0.675	0.592
Present values	17.6	21.4	20.5	19.1
Total PV, 20X2 – 20X5	= 78.6			

Assuming 3% growth per annum beyond 20X5 in perpetuity, the present value of the post-20X5 cash flows, in terms of 20X5 values, will be (in £ million):

$$\frac{32.3\,(1.03)}{(0.14 - 0.03)} = \$302.4$$

Discount factor at 14% to convert to PV = 0.592.

Present value of post-20X5 cash flows = 302.4 × 0.592 = $179.0 million.

The total present value is (78.6 + 179.0) $257.6 million. This value is the value of the entire entity, i.e. equity plus debt. The value of debt will depend upon the final gearing, and will vary between approximately $46 million and $59 million (18% – 23% gearing), giving a value of equity between $199 million and $212 million.

If annual growth beyond 20X5 is 5% in perpetuity, the present value of the post – 20X5 cash flows, in terms of 20X5 values, will be (in $ million):

$$\frac{32.3\,(1.05)}{(0.14 - 0.05)} = \$376.8$$

Discount factor at 14% to convert to PV = 0.592.

Present value of post – 20X5 cash flows = 376.8 × 0.592 = $223.1 million. The present value of the entity would be (78.6 + 223.1) $301.7 million, and the value of equity between (77% – 82%) $232 million and $247 million.

These estimates use a present value to infinity estimate beyond 20X5. If a shorter time horizon was used, for example ten years, the estimates would be considerably reduced.

Assuming these cash flow projections are reasonably accurate (which itself must be subject to serious doubt, e.g. can the imbalance after Year 5 between capital allowances and replacement capital expenditure continue indefinitely?), it is worth Laceto offering a premium over the current market price for the shares of Omnigen. In theory, using present values to infinity, it could afford to offer a premium above the current market price. In order to increase its own value it would offer the lowest price that would attract more than 50% of the shareholders of Omnigen. It is not possible to know what this price would be. An initial bid might offer a 20% premium above the current price, or (20% of 30 million shares × 410¢) about $25 million. This would give an offer price of $148 million. If that bid was refused then there could be scope for increasing it up to a maximum of the estimated equity present values discussed above.

It must be stressed that all of the above estimates are subject to significant margins of error, and that valuation for take-overs is not a precise science.

Discount rate:

Using the capital asset pricing model, the cost of equity of Omnigen would be (allowing for a 0.1 increase in the beta factor):

k_e = 6% + 1.3 (14% – 6%) = 16.4%.

Omnigen's cost of equity after the acquisition is used as this is likely to reflect the systematic risk of the activities of Omnigen within Laceto. As the range of expected gearing levels is quite small (18% – 23%), and gearing is relatively low, it is assumed that the cost of equity will not significantly change over this range of gearing, other than the change already reflected in the increase in the equity beta by 0.1.

The cost of debt is not given but may be estimated from the data regarding Laceto's debenture. As Omnigen currently has a lower gearing than Laceto, it is assumed increasing Omnigen's gearing should not have a significant effect on Laceto's cost of debt, even if the overall gearing increases to 23%.

The cost of debt, by trial and error, is:

At 6% interest			At 5% interest		
Cash flow	Discount factor	PV	Cash flow	Discount factor	PV
12 (1 – 0.3)	2.673	22.45	12 (1 – 0.3)	2.723	22.87
100	0.840	84.00	100	0.864	86.40
		————			————
		106.45			109.27
Value	1.000	(108.80)	Value	1.000	(108.80)
		————			————
NPV		(2.35)			0.47
		————			————

By interpolation:

$$5\% + \frac{0.47}{(0.47 + 2.35)} \times 1\% = 5.17\%$$

The weighted average cost of capital may be estimated for the full range of expected gearing:

At 18% gearing:

The WACC is (16.4 × 0.82) + (5.17% × 0.18) = 14.38%.

At 23% gearing:

The WACC is (16.4 × 0.77) + (5.17% × 0.23) = 13.82%.

The estimated WACC does not change dramatically over the possible range in gearing. 14% will be used as the discount rate.

(b) **Report on possible defences against a bid by Agressa, and methods of payment**

To: Managing director

From: AN Other, Consultant

Corporate defences

Defences against a bid will differ according to whether or not the bid has yet been made.

Pre bid defences

If no bid has been made, Laceto can attempt to make itself unattractive to any potential bidder. Laceto might establish 'poison pills' such as granting the right to alternative shareholders to purchase its shares at a deep discount, or dispose of some of its key activities ('crown jewels') to make it less attractive to Agressa. The company might also introduce 'golden parachutes' for key staff, expensive severance contracts that come into effect if executive jobs are lost as a result of an acquisition. The articles of association could be amended to require a high percentage of shareholders to approve a merger or acquisition, for example 75% plus. Strategic acquisitions are also possible, whereby companies are acquired by Laceto that would be unattractive to a bidder, but are developed to be an integral part of Laceto's activities.

Laceto should also ensure that the financial press and the company's shareholders are kept fully informed about the company's financial strengths and future strategy, with particular focus on key institutional shareholders that are likely to determine the success or failure of any bid. Assets should be regularly revalued to ensure that shareholders are aware of 'current' values.

If Laceto has significant free cash flow it might consider the repurchase of shares in the expectation that the share price will increase and make a take-over more expensive to a potential bidder such as Agressa.

Financial summaries of the two companies are:

	$ million	
	Agressa.com	*Laceto*
Turnover	190	420
Profit before tax	8	41
Taxation	2	12
Market capitalisation of shares	397.5	304
Price/earnings ratio	66:1	10.5:1

Despite its smaller turnover and net assets, Agressa.com has a higher market capitalisation, which is manifested in the P/E ratio of 66 times. This probably reflects its position as a 'dot.com' company rather than a traditional retailer.

Post bid defences

Once a bid has been made, probably the most important defence against the bid is to persuade shareholders that Agressa.com is currently overvalued. It has relatively small earnings, but a P/E of 66 suggests that the market expects the company to experience rapid future growth. In the limited period of their existence, dot.com companies have experienced great volatility in their share price, many have yet to exhibit sustained growth, and many have failed. Laceto might highlight the history of dot.com companies and their relative risk. It could also criticise the logic behind the acquisition, and the strategic fit of the two companies, although the latter might be difficult as there is an overlap in existing activities.

It might also be argued that the shares of Laceto are undervalued. The company is earning more than $40 million before tax, and its P/E ratio at 10.5 is lower than other companies in the electrical sector. Unless the P/E and prospects of the company are being strongly pulled down by the clothing activities, Laceto should release forecasts (with supporting assumptions) of future earnings and dividends in order to support the argument that it is undervalued.

Laceto might consider making a counter bid for Agressa.com, although this could be contrary to the strategic plans of the company, and might be difficult to achieve given the P/E difference of the companies.

If the combined market share of the two companies is large enough, the bid might be referred to regulatory authorities such as the Competition Commission in the UK. Given the size of the companies this is not likely in this case.

A further possibility is to approach a 'white knight', a preferred alternative bidder for the company, but this, if successful, would also result in the company being taken over.

(c) **Methods of payment**

Payment may be made in ordinary shares, preference shares, some form of debt, often with a conversion or warrant option attached, cash, or some combination of these. From an investor's perspective, cash provides a known, precise sum, and might be favoured for this reason. However, in some countries payment in cash might lead to an immediate capital gains tax liability for the investor. Preference shares and debt are rarely favoured by investors as they alter the characteristic and risk of the investment. Payment with ordinary shares offers a continuation in ownership of the entity, albeit as part of the successful bidder. However, relative share prices will change during the period of the bid, and the owner of shares in the potential victim company will not know the precise post-acquisition value of the bid.

Neither of the potential bids in (a) or (b) could be financed entirely in cash without significant new external borrowing, with its resultant impact on gearing. In part (b) the volatility of dot.com shares might make payment in shares unattractive to investors. Sometimes investors are given a choice in the method of payment, with the logic that different forms of payment might be attractive to different types of investor. This could influence the success or failure of both bids, but is problematic for the bidder in that the cash needs and number of shares to be issued are not known, and the company's capital structure may alter in an unplanned manner. Ideally, a bidder would like to tailor the form of the bid to that favoured by major investors in the potential victim company.

		Marks
Marking scheme		
(a)	**Calculations**	1
	Current share price	2
	P/E values – 1 each for using industry P/Es and Omnigen's own	1
	Realisable value of assets	
	DCF approach	
	Sales, COS. S+A expenses, Taxable profit, Tax – ½ each	2½
	Correct treatment of capital allowances	1
	Deduct capital expenditure	1
	Discount factors at WACC	1
	Discounting 1st 4 years and PV	1
	Discounting growing perpetuity at 3%	1
	Discounting growing perpetuity at 5%	1
	Total PV (1st 4 years plus perpetuity)	1
	WACC	
	Cost of equity	1
	Cost of debt – IRR method	1
	Post tax interest included	1
	Current debt value and correct redemption amount – ½ each	1
	IRR	1
	WACC calculation	1
	Maximum for calculations	Max 16
	Discussion points – 1 mark per sensible point throughout	
	Comments on current market price	Max 1
	Comments on P/E ratio method	Max 2
	Comments on asset valuation	Max 1
	Comments on DCF approach	Max 4
	Maximum for discussion	Max 8
(b)	1 mark per sensible point	**Max 24**
(c)	1 mark per sensible point	**Max 24**
	Professional marks (1 report heading, 1 subheadings, 1 neat calculations, 1 quality of communication)	**Max 6**
		Max 6
	Total	**40**

ANSWER 2

(a)   Tovell has a strategy of diversifying into many industries in order to reduce risk for the company's shareholders. Rational shareholders should already be well-diversified, in order to eliminate unsystematic risk. If shareholders are not well diversified this may be achieved quickly and cheaply through the purchase of such investments as general unit trusts. The expense of the company undertaking diversification is likely to be much greater than that of individual investors in the company diversifying themselves, and therefore a sub-optimal strategy from the investors' viewpoint. As the primary objective of companies is usually assumed to be the maximisation of shareholder wealth, the strategy would not normally be recommended.

However, diversification might have beneficial effects for shareholders, including:

(i)   Less volatile internal cash flows, making servicing existing debt less risky, and therefore increasing the debt capacity of the company. Greater use of debt with no extra risk could reduce the overall cost of capital, and increase shareholder wealth.

(ii)   If diversification is into foreign markets where exchange controls or other barriers prevent or restrict shareholders directly investing (i.e. segmented markets), it might be possible for shareholders to reduce their systematic risk through Tovell investing in such markets that have risk-return combinations that would not otherwise be available to shareholders.

(iii)   If a company fails, there are many 'bankruptcy' costs including receiver's fees and the possibility of assets being sold cheaply in a 'forced-sale'. Such costs may significantly reduce wealth of shareholders. A diversified company may have a lower risk of corporate failure because of reduced *total* risk of the company (measured by variance of returns). Shareholders may be willing to accept the costs of diversification if the probability of corporate failure is reduced.

(b)   If a company needs to appraise a new investment project, the most common method of appraisal is to discount the future cashflows using a suitable cost of capital.

If the new project has similar business risk to the company's existing operations, and the gearing of the company is expected to stay constant when the project is undertaken, the company's existing WACC is suitable for the investment appraisal. However, if one or both of the business risk and the gearing is likely to change when the new project is taken on, the existing WACC no longer reflects the risk of undertaking the new project, so it should not be used as a discount rate.

Change of business risk

If the project has a different level of business risk from the existing business, the company's WACC should be adjusted to reflect the business risk of the new project ("risk adjusted WACC") before being used for discounting.

The key here is to make sure that the new cost of equity (to be entered into the WACC calculation) reflects shareholders' expectations of the business risk of the new project. If a beta factor cannot be calculated for the new project specifically, a proxy beta factor from a company in the same business sector as the new project is often used as an approximation.

Change of gearing / capital structure

If the company intends to finance the project so that the overall gearing position of the firm will change, the existing WACC (which reflects the current gearing ratio) will again be unsuitable as a discount rate.

In this case, the firm could attempt to create a risk adjusted WACC as explained above, to reflect the new project's risk. However, a better method, which can deal with many complex financing methods, is the Adjusted Present Value (APV) method.

When calculating the APV of an investment project, the project is appraised initially as if the finance were all equity, and then the costs / benefits associated with the actual financing method are added on afterwards.

(c)   **Report on the financial viability of the fast food investment**

The proposed investment is in an industry where the company has no existing activities, and differs in risk to the company's existing activities, as is evidenced by the equity betas of the company and the industry. The investment is to be financed by $800,000 of debt and $1,578,947 of equity. This gives a gearing level of approximately 0.5 to 1, which is significantly different from the company's current market weighted gearing of 0.4 to 1.

As the investment results in a change in capital structure, is not marginal relative to the size of the company, and does not have the same level of systematic risk as the company, the current weighted average cost of capital should not be used as the discount rate.

There is no easy way to adjust the weighted average cost to take into account these changes. It is recommended that the fast food investment is evaluated using the adjusted present value (APV) technique. This approach examines directly the effects of the financing methods that are being used, which, for this investment, relate to tax relief on interest payments, the benefit of a subsidised loan, and issue costs associated with the rights issue.

The estimated APV of the investment is negative, ($113,608), which suggests that the investment is not financially viable. However, this ignores the potentially valuable option to continue operations after the initial five-year period by further investment in equipment. Any final decision should include consideration of the financial effects of this option, and any other opportunities that might arise as a result of diversifying into the fast food industry.

Limitations of APV

APV offers an opportunity to evaluate investments where gearing and risk differ from the company's existing operation. However, it has its limitations including:

(i)   The equation for asset betas in a taxed world assumes that cash flows are perpetuities. The cash flows for this investment are not perpetuities.

(ii)   APV requires the identification of all financing side effects and their discount at a rate reflecting their risk. In a complex investment situation, especially an overseas investment, it might be difficult to identify relevant financing side effects, and their appropriate discount rates.

Appendix

APV = Base case NPV + Present value of financing side effects.

Base case NPV

This may be estimated by discounting net cash flows by the discount rate applicable to the risk associated with an ungeared investment. As the investment is in the fast food industry, the base case NPV should be estimated using data from this industry.

Cost of equity ungeared

$$\beta_a = \left[\frac{V_e}{(V_e + V_d(1-T))} \cdot_e \right] + \left[\frac{V_d(1-T)}{(V_e + V_d(1-T))} \cdot_d \right]$$

$$\beta_{asset} = 1.4 \times \frac{1}{1+1(1-0.30)} + 0.25 \times \frac{1(1-0.30)}{1+1(1-0.30)} = 0.823 + 0.103 = 0.926$$

Using CAPM, Ke ungeared = $E(r_i) = R_f + \beta_i(E(r_m) - R_f)$, where $\beta_i = \beta_{asset}$

Ke ungeared = 5% + (12.5% − 5%) 0.926 = 11.945%.

A discount rate of 11.945% will therefore be used to calculate a base case NPV.

Year	0	1	2	3	4	5	6
	$000	$000	$000	$000	$000	$000	$000
Operating flows (+ 5% pa)		420	441	463	486	511	
Taxation (1 year in arrears)			(126)	(132)	(139)	(146)	(153)
Initial outlay	(2,300)						
Realisable value						1,250	
Tax saved by capital allowance (see note)	–	–	79	59	44	33	100
Net flows	(2,300)	420	394	390	391	1,648	(53)
Discount factors at 11.945%	1.000	0.893	0.798	0.713	0.637	0.569	0.508
Present values	(2,300)	375	314	278	249	938	(27)

Base case NPV = ($173,000)

Note: Tax saved by capital allowances

Year	Written down value	Allowance (25%)	Tax saving (at 30%)	Year available
	$000	$000	$000	$000
1	1,050	262	79	2
2	788	197	59	3
3	591	148	44	4
4	443	111	33	5
5	332	83	25	6
Balancing	249	249	75	6

(It might be argued that the tax saving is a relatively safe cash flow and should be discounted at a rate lower than the ungeared cost of equity. If so, the resultant base case NPV would be slightly larger.)

Financing side effects

(i) *Tax relief on interest payments (assumed available Years 2 − 6)*

The benefit from the investment in terms of increased debt capacity is $1 million. Although only $800,000 is being borrowed, the APV should be based upon theoretical benefits of the debt capacity as these are available to the company and may be used through debt issues for other investments (these too must be evaluated on their *own* impact on debt capacity). The tax shield benefit is therefore based upon $1 million of debt, $800,000 at 6% and the remaining $200,000 at the normal market rate of 9%.

Annual interest			*Tax relief*
	$		$
$800,000 × 6% =	48,000	× 0.3 =	14,400
$200,000 × 9% =	18,000	× 0.3 =	5,400
			―――
			19,800
			―――

The discount rate used will be a rate reflecting the risk of the debt, in this case the pre-tax cost of debt, 9%.

PV of an annuity at 9% for five years, from Years 2 – 6,

= 3.890 × 19,800 / 1.09 = $70,662

The PV of tax relief, commencing Year 2, is $70,662.

(ii) *Subsidised loan*

Tovell is receiving $800,000 at 3% less than normal market rates because of its financing choice.

This produces an after-tax saving (with a one-year lag in tax) of:

Years 1 − 5 $800,000 × (0.09 − 0.06) per year = $24,000

Years 2 − 6 tax of $800,000 × (0.09 − 0.06) × 0.3 = ($7,200)

The PV of this saving, discounted at 9% representing the market risk of debt is:

	$
3.890 × $24,000	93,360
3.890 × 0.917 × ($7,200)	(25,683)
	―――
	67,677
	―――

(iii) *Issue costs*

The cost of the investment after issue costs (it is assumed that none exist on the loan) is $2.3 million. Net proceeds of the rights issue are the cost of the investment minus the amount to be raised in debt capital = $2.3m − $0.8m = $1.5m.

With issue costs of 5% gross proceeds of the rights issue are $1.5 million/0.95 = $1,578,947. Issue costs are therefore $78,947.

The expected APV of the investment is:

	$
Base case NPV	(173,000)
Tax relief on interest	70,662
Benefit from subsidised loan	67,677
Issue costs	(78,947)
	───────
APV	(113,608)
	───────

Marking scheme		
		Marks
(a)	1 mark for each sensible, well explained point	Max 6
(b)	1 mark for each sensible, well explained point	Max 4
(c)	Asset beta for new industry	1
	ke for new industry	1
	Operating cash flows	1
	Taxation (inc timing)	1
	Capex and realisable value – ½ each	1
	Discount factors and base case NPV	1
	Tax saved due to capital allowances	1
	Tax relief on interest – using full debt capacity	1
	Annual tax relief – total	1
	PV of tax relief	1
	Annual saving due to subsidy	1
	Tax impact on subsidy	1
	PV of net of tax subsidy	1
	Issue costs	1
	Total APV	1
	Comments on method used and viability of project	Max 5
Total		**30**

SECTION B

ANSWER 3

(a)   A **yield curve** may be upward-sloping because of:

    (i)   **Future expectations**. If future short-term interest rates are expected to increase then the yield curve will be upward sloping. The greater the expected future rise in interest rates, the more steep the upward-slope of the yield curve will be.

    (ii)   **Liquidity preference**. It is argued that investors seek extra return for giving up a degree of liquidity with longer-term investments. Other things being equal, the longer the maturity of the investment, the higher the required return, leading to an upward-sloping yield curve.

    (iii)   **Preferred habitat/market segmentation**. Different investors are more active in different segments of the yield curve. For example banks would tend to focus on the short-term end of the curve, whilst pension funds are likely to be more concerned with medium- and long-term segments. An upward-sloping curve could in part be the result of a fall in demand in the longer-term segment of the yield curve leading to lower bond prices and higher yields.

(b)   (i)   **Basic approach:**

Market value of a bond = the amount an investor would be prepared to pay for the bond = present value of the future income stream discounted at the required rate of return (or yield)

Current bond prices

Zero coupon bond

Zero coupon bond price will be: $\dfrac{\pounds 100}{(1.06)^{15}}$ = **$41.73.**

Tutorial note

Alternative method

Year		Cash flow	Discount factor at 6%	Present value
15	Redemption value	100.0	0.417	41.70

This gives an answer that is not quite as accurate, since discount tables are to just three decimal places. However, it should provide an acceptable solution.

12% gilt with a semi-annual coupon

Present value of annuity of $6 for 30 periods at 3% is:

$$\frac{6}{0.03}\left(1-\frac{1}{(1.03)^{30}}\right) = 200\,(1-0.4120) = 117.60$$

This is the present value of the interest receipts to maturity.

	$
Present value of interest payments	117.60
Present value of redemption using $\dfrac{1}{(1+0.03)^{30}} \times \$100$	41.20
	_____
Bond market value	**158.80**
	_____

If interest rates increase by 1% to 7%

Zero coupon bond

Market price = $\dfrac{£100}{(1.07)^{15}}$ = **$36.25**

This would represent a decrease in price of $5.48 or 13.1%.

12% gilt with a semi-annual coupon

Present value of annuity of $6 per period for 30 periods at 3.5% is:

$$\frac{6}{0.035}\left(1 - \frac{1}{(1.035)^{30}}\right) = 171.43\,(1 - 0.3563) = 110.35$$

This is the present value of the interest receipts to maturity.

	$
Present value of interest payments	110.35
Present value of redemption using $\dfrac{1}{(1+0.035)^{30}} \times \$100$	35.63
	_____
Bond market value	**145.98**
	_____

This is a decrease of $12.82 or 8.1%.

If interest rates decrease by 1% to 5%:

Zero coupon bond

Market value = $\dfrac{£100}{(1.05)^{15}}$ = **$48.10**

This is an increase of $6.37 or 15.3%

12% gilt with a semi-annual coupon.

Present value of annuity of $6 per period for 30 periods at 2.5% is:

$$\frac{6}{0.025}\left(1 - \frac{1}{(1.025)^{30}}\right) = 240\,(1 - 0.4767) = 125.59$$

This is the present value of the interest receipts to maturity.

	$
Present value of interest payments	125.59
Present value of redemption using $\dfrac{1}{(1+0.025)^{30}} \times \$100$	47.67
	_____
Bond market value	**173.26**
	_____

This is an increase of $14.46 or 9.1%.

(ii) The price/yield relation is not linear; it has a convex shape. There is a bigger absolute movement in bond prices when interest rates fall than when they rise. The percentage movement is also higher for low coupon bonds than high coupon bonds. Other things being equal, a financial manager would prefer to hold high coupon bonds if interest rates are expected to increase, and low or zero coupon bonds when interest rates are expected to decrease.

(iii) If interest rates are expected to rise, and the gap between yields on short and long dated bonds to widen, the financial manager would not want to hold longer dated bonds as these would suffer a larger fall in price than short dated bonds. Short dated bonds, probably with high coupons, would be preferred.

Marking scheme			
			Marks
(a)	1 mark per sensible well-explained point		4
(b)	(i)	current market prices	2
		1% increase values	2
		1% decrease values	2
	(ii)	1 mark per sensible point	Max 3
		Reward awareness of different size of movement and its implication	
	(iii)	1 mark per sensible point	Max 2
			___
Total			**15**
			___

ANSWER 4

Using the Black-Scholes model for European options:

(1)   Time, t = 15.

(2)   Using the guidance given in the question, P_a (in $ million) is estimated to be either:

(i)   350 x $e^{-0.067(15)}$ = 350 x 0.3660 = 128.1, or

(ii)   500 x $e^{-0.067(15)}$ = 500 x 0.3660 = 183.0.

(3)   The exercise price, P_e = 400 (in $ million)

(4)   The interest rate, r = 0.05.

(5)   Volatility, s = $\sqrt{0.185}$ = 0.430.

These values can now be applied to the Black-Scholes formula values.

Call price for a European option = c = $P_aN(d_1) - P_eN(d_2)e^{-rt}$, where:

$$d_1 = \frac{\ln(P_a / P_e) + (r + 0.5s^2)t}{s\sqrt{t}} \text{ and } d_2 = d_1 - s\sqrt{t}$$

If P_a is 128.1

$$d_1 = \frac{\ln(128.1 / 400) + (0.05 + 0.5 \times 0.43^2)(15)}{0.43\sqrt{15}} = +0.599$$

$$d_2 = d_1 - s\sqrt{t} = 0.599 - 0.43\sqrt{15} = -1.066$$

From normal distribution tables:

- d_1 = 0.599 (approximately 0.60). Normal distribution value = 0.2257, say 0.226. d_1 is a positive value, therefore add to 0.5.

  N(d_1) = 0.5 + 0.226 = 0.726

- d_2 = − 1.066. Normal distribution value = approximately mid-way between 0.3554 and 0.3577 = 0.35655, say 0.357. d_2 is negative, therefore subtract from 0.5.

  N(d_2) = 0.5 − 0.357 = 0.143.

  Inputting data into call price = c = $P_aN(d_1) - P_eN(d_2)e^{-rt}$

  Call price (in $ million) = 128.1 (0.726) − [400 (0.143)/$e^{0.05(15)}$] = 93.01 − 27.02

  = $66m

If P_a is 183.0

$$d_1 = \frac{\ln(183.0 / 400) + (0.05 + 0.5 \times 0.43^2)(15)}{0.43\sqrt{15}} = +0.813$$

$$d_2 = d_1 - s\sqrt{t} = 0.813 \quad 0.43\sqrt{15} = -0.852$$

From normal distribution tables:

- d_1 = 0.813. Normal distribution value = between 0.2910 and 0.2939, say 0.292.

  d_1 is a positive value, therefore add to 0.5.

  N(d_1) = 0.5 + 0.292 = 0.792

- d_2 = − 0.852. Normal distribution value = above 0.3023, say 0.303.

  d_2 is a negative value, therefore subtract from 0.5.

  N(d_2) = 0.5 − 0.303 = 0.197.

  Inputting data into call price = c = $P_aN(d_1) - P_eN(d_2)e^{-rt}$

  Call price (in $ million) = 183.0 (0.792) − [400 (0.197)/$e^{0.05(15)}$] = 144.95 − 37.22

  = $108m

Recommendation

Under both scenarios the call option has a value in excess of the static NPV estimates.

(a)   With a $350 million present value from sales and development costs of $400 million, the expected NPV is ($50 million), but the value of the call option is $66 million.

(b)   With a $500 million present value from sales the expected NPV is $100 million, whilst the call option value is $108 million.

If the data are correct then the option pricing model would suggest that the company should develop the patent no matter which present value occurs.

However, valuing a long-term option such as this is subject to restrictive assumptions and will be subject to a considerable margin of error. Possible problems include:

(a)   The accuracy of the present value forecasts, and the use of the correct discount rate to assess their risk.

(b)   The accuracy of the estimated development cost of the drug for commercial use. This estimate could be subject to substantial error as it relates to a new product and probably to new technology.

(c)   The accuracy of the estimated variance. As this is a new drug the variance of returns from other Biotech companies might not be relevant, and the Black-Scholes model is quite sensitive to this variable. The model also assumes that this volatility will be constant for the 15-year period which is very unlikely.

(d)   The Black-Scholes model was developed for European options. As development of the drug could take place at any time during the 15 year period the option is an American option rather than a European option.

(e)   What will happen after 15 years? Although competition will probably eliminate most abnormal returns the company is likely to have built up a strong brand image and could still generate positive NPVs after this time, which have not been included in the above calculations.

(f)   How likely is it that a competitor might develop a superior drug? If this occurs the projections will be very adversely affected.

Because of the potential margin of error, Bioplasm should be cautious about accepting the values produced by the option pricing model, although they might be used as part of the overall decision process. This should also include the NPV estimates and strategic considerations. The company would also be advised to investigate possible cash flows after the patent period has expired.

Marking scheme	
	Marks
Correct P_a values	2
Estimates of $N(d_1)$ and $N(d_2)$	2
Call values	4
Comment on call prices and their implications	3
Discussion of possible problems and conclusion	5
	——
	Max 15
	——
Total	**15**
	——

ANSWER 5

(a)   Restrictive covenants may affect the directors' ability to make investment and financing decisions on behalf of Kiboko Co.

For example, the bank may set limits on the amount of funds the company may borrow and this may restrict the ability of the company to undertake projects in the future without breaching the covenants.

The company may raise the extra funding required by issuing shares but this may be against its overall financing plan and may also be a costly option.

The bank may also place restrictions on whether the company can buy and/or sell assets (and businesses) and this may prevent the directors from acting on profitable projects quickly enough.

(Other examples could be included).

(b)   **The credit crunch**

The credit crunch has led to an unwillingness by banks to lend, particularly to one another, resulting in a drain in the liquidity across the capital markets. Interest rates are now low as central banks attempt to stimulate their economies.

The business of banks is to earn profits by borrowing short and lending long and they are still willing to lend to high class corporate customers (probably at competitive interest rates). The banks will be concerned about the risk of default as they decide whether to offer a large loan.

Assessing the risk of default

Although there has been an increase in competition in recent months, it appears that Kiboko Co is still a successful and growing company. Therefore, the company will probably have a good credit rating, making it an attractive prospect for lenders.

Even so, the banks will need to undertake a credit risk assessment to assess the likely risk of default. Such an assessment will include a thorough examination of:

- Kiboko Co's asset strength – before assets are accepted as security for the loan, their attractiveness and realisable values will need to be analysed

- existing capitalisation – it appears that Kiboko Co has no existing debt finance, but this would need to be checked

- operating strength – forecasts of future earnings and margins

- income gearing – forecast interest cover after the loan has been granted, to assess the affordability of the interest payments to Kiboko Co.

Interest rates

Once the risk of default has been assessed, the bank will be able to choose whether or not to lend to Kiboko Co, and at what interest rate.

If Kiboko Co is considered to be a good credit risk, the interest rate charged by the bank (the "credit spread") will be low.

If the bank considers that the extra competition facing Kiboko Co is likely to cause problems in the future, it may decide to increase the interest rate on the loan, or it may decide not to lend to the company at all.

(c) The reasons for Kiboko Co obtaining a listing or remaining private depend largely on where the directors want to take the company in the future and to assess the funding requirements to enable them to do so. To a large extent the advantages of obtaining a listing are the opposite of staying private and *vice versa*.

Listing

Obtaining a listing has a number of benefits.

Firstly, it would be easier to raise new capital as Kiboko Co will have access to a much wider investor base. This could be especially useful for the company because it is in rapidly growing markets, and may require funding for acquisitions and new projects. Also, given the conditions in the global debt markets, this gives Kiboko Co a way of avoiding bank borrowing.

Secondly, obtaining a listing could enhance the company's reputation, especially if it is listed on a major stock exchange with a strong regulatory framework. If the company wants to enter new international markets, such a reputation could prove decisive.

Finally, being listed would make the shares of the company more marketable and as a consequence reduce costs related to searching for new shareholders if needed in the future.

There may also be a resulting increase in the value of the shares because they are more marketable.

Remaining private

On the other hand remaining private also has benefits attached to it.

Firstly, being listed makes Kiboko Co more susceptible to being taken over itself. This is especially so where the company's shares may be undervalued due to private information not released to the markets because of strategic reasons. Or it also may be that the markets are focusing on the short term rather than the long term. In Kiboko's case one could argue that this would be particularly disadvantageous as the market size and product range is growing rapidly but new competitors are entering the market as well.

Secondly, obtaining a listing would be more costly than staying private. There is the initial cost of issuing and marketing new shares. Then there are the ongoing costs of maintaining the listing and complying with the rules and regulations of the stock exchange and other corporate governance requirements expected from listed companies.

Finally, listed companies are subject to extra scrutiny from the markets and this may not always be accurate, as the markets only have access to the externally available information. When this is considered with the point above about the markets being more focused on the short term, it may tip the balance in favour of staying private.

Conclusion – application to Kiboko

However, in Kiboko Co's case, some of the benefits of staying private are lessened because of the directors' need to obtain a loan to pay off the venture capitalist. As explained in part (a) above, this could impact on the manner in which the directors may be able to operate strategically in the future. Also the directors have to bear in mind that if they go for the bank loan, they not only need funding to pay the venture capitalist but also to finance future opportunities. Ultimately, the choice of financing will depend upon how the directors wish to take the company forward and perhaps this would make them favour going for a listing as it gives them more flexibility and more options for the future.

Marking scheme	Marks
	Marks
(a) 1 mark for each well-explained valid point	Max 3
(b) 1 mark for each well-explained valid point	Max 5
(c) 1 mark for each well-explained valid point	
(Max 3 for listing, Max 3 for remaining private, Max 2 for application to Kiboko)	Max 7
	____
Total	**15**
	____