

# QUESTIONS

## NUMBER ONE

Summarised financial data for GNLD is shown below:

GNLD

Year	Post-tax earnings (Sh. million)	Dividends (Sh. million)	Issued shares (million)	Share price (Sh.)
1997	86.2	34.5	180	36.00
1998	92.4	36.2	180	41.00
1999	99.3	37.6	180	34.50
2000	134.1	51.6	240	45.90
2001	148.6	53.3	240	44.80

Year	All-share index	Inflation rate
1997	2895	6%
1998	3300	5%
1999	2845	4%
2000	2610	3%
2001	2305	3%

GNLD's cost of equity is estimated to be 11%.

### Required:

- Explain, with supporting evidence, the current dividend policy of GNLD, and briefly discuss whether or not this appears to be successful.  
(10 marks)
- Identify and consider additional information that might assist the managers of GNLD in assessing whether the dividend policy has been successful.  
(5 marks)
- Evaluate whether or not the company's share price at the end of 2001 was what might have been expected from the Dividend Growth Model. Briefly discuss the validity of your findings.  
(5 marks)

(5 marks)  
**(Total: 20 marks)**

## NUMBER TWO

Summarised financial details of PK are shown below:  
Extract from the profit and loss account.

	<b>Sh. million</b>
Turnover	582
Profit before tax	93
Taxation (30%)	<u>(28)</u>
Profit after tax	65
Dividends	<u>(26)</u>
Retained earnings	39
Extract from the balance sheet	
Fixed assets (net)	210
Current assets	186
Current liabilities	<u>(153)</u>
	243
Financed by:	
Ordinary shares (25 pence par)	50
Reserves	122
12% debentures June 2006	<u>71</u>
	243

The company's ordinary shares are currently trading at Sh.22.00, and the debentures at Sh.105.50. The debenture is redeemable at its par value of Sh.100.

The company's equity beta is 1.25.

PK is considering investing in one of three projects. The company has Sh.50 million that is currently earning 5.8% in short-term money market deposits. Any surplus funds after the investment in one of the projects will continue to be invested in the money market.

The company has employed an external consultant to estimate risk/return data relevant to the three projects.

	Project 1	<b>Project 2</b>	<b>Project 3</b>
Investment cost (£ million)	35	40	28
Estimated correlation of returns with the market	0.76	0.63	0.58
Standard deviation of returns	8.4%	4.6%	14.3%
	15%	11%	17%

Expected return (IRR)  
Market return 15% per annum  
Market standard deviation of returns  
6.9%  
Risk free rate 6% per annum

**Required:**

- (a) Evaluate which project should be selected. Do not use information provided later in the question requirements in your evaluation. State clearly any assumptions that you make in all parts of this question.  
( 8 marks)
- (b) Estimate PK's cost of capital prior to undertaking the investment. Briefly discuss (do not calculate) what effect the project selected in (a) is likely to have on PK's cost of capital.

The profitability index of 1.3 also relates to this part of the question.  
( 8 marks)

- (c) The consultant has suggested that beta estimates should be adjusted by using the formula:  $[(0.67 \times \text{unadjusted beta}) + 0.33]$  in any estimate of required returns. Briefly discuss the reason for using an adjusted beta such as this:  
( 4 marks)

**(Total: 20 marks)**

**NUMBER THREE**

The managers of Rymond are investigating a potential Sh.25 million investment. The investment would be a diversification away from existing mainstream activities and into the printing industry. Sh.6 million of the investment would be financed by internal funds, Sh.10 million by a rights issue and Sh.9 million by long term loans. The investment is expected to generate pre-tax net cash flows of approximately Sh.5 million per year, for a period of ten years. The residual value at the end of year ten is forecast to be Sh.5 million after tax. As the investment is in an area that the government wishes to develop, a subsidized loan of Sh.4 million out of the total Sh.9 million is available. This will cost 2% below the company's normal cost of long-term debt finance, which is 8%.

Rymond's equity beta is 0.85, and its financial gearing is 60% equity, 40% debt by value. The average equity beta in the printing industry is 1.2, and average gearing 50% equity, 50% debt by market value.

The risk free rate is 5.5% per annum and the market return 12% per annum.

Issue costs are estimated to be 1% for debt financing (excluding the subsidized loan), and 4% for equity financing. These costs are not tax allowable.

The corporate tax rate is 30%.

**Required:**

- (a) Estimate the Adjusted Present Value (APV) of the proposed investment.  
(15 marks)
- (b) Comment upon the circumstances under which APV might be a better method of evaluating a capital investment than Net Present Value (NPV).  
(5 marks)

**(Total: 20 marks)**

**NUMBER FOUR**

- (a) Briefly discuss the meaning and importance of the terms ‘delta’, ‘theta’ and ‘vega’ (also known as kappa or lambda) in option pricing.  
(8 marks)
- (b) Assume that your company has invested in 100,000 shares of Quality Light (QL) plc, a manufacturer of light bulbs. You are concerned about the recent volatility in QLs share price due to the unpredictable weather in the United Kingdom. You wish to protect your company’s investment from a possible fall in QL’s share price until winter in three months’ time, but do not wish to sell the shares at present. No dividends are due to be paid by QL during the next three months.

**Market data:**

QL’s current share price: Sh.20

Call option exercise price: Sh.20

Time to expiry: 3 months

Interest rates (annual): 6%

Volatility of QL’s shares 50% (standard deviation per year)

Assume that option contracts are for the purchase or sale of units of 1,000 shares.

**Required:**

(i) Devise a delta hedge that is expected to protect the investment against changes in the share price until winter. Delta may be estimated using  $N(d_1)$ .  
(8 marks)

(ii) Comment upon whether or not such a hedge is likely to be totally successful.  
(4 marks)

**(Total: 20 marks)**

## **NUMBER FIVE**

You have been asked to produce a briefing memo for senior management at your company on the subject of mergers and acquisitions. Your memo should identify and discuss:

(a) Possible synergies that might occur in mergers and acquisitions.  
(8 marks)

(b) Potential problems in the achievement of synergies. (8 marks)

(c) Whether or not mergers and acquisitions should be undertaken to achieve corporate diversification only.  
(4 marks)

**(Total: 20 marks)**

## ANSWERS

### NUMBER ONE

(a) Estimates of earnings and dividends per share, and their growth rates are shown below:

	<b>Post-tax earnings per share (Sh.)</b>	<b>Growth (%)</b>	<b>Dividend per share (Sh.)</b>	<b>Growth (%)</b>	<b>Inflation (%)</b>
1997	0.479	-	0.192	-	
1998	0.513	7.1	0.201	4.7	5
1999	0.552	7.6	0.209	4.0	4
2000	0.559	1.3	0.215	2.9	3
2001	0.619	10.7	0.222	3.3	3
Overall growth	compound	6.6	3.7		

From the above data GNLD appears to be following a policy of paying a constant dividend per share, adjusted for the current year's level of inflation.

The only possible indication from the data of whether or not the dividend policy has been successful is the relative performance of GNLD's share price in comparison to the market index. This, however, would rely upon the assumption that the choice of dividend policy influences the share price.

	<b>NSE index</b>	<b>Growth (%)</b>	<b>Share price (Sh.)</b>	<b>Growth (%)</b>
1997	2895	-	36.00	-
1998	3300	14.0	41.00	13.9
1999	2845	(13.8)	34.50	(15.9)
2000	2610	(8.3)	45.90	33.0
2001	2305	(11.7)	44.80	(2.4)
Overall compound growth		(5.5)		5.6

GNLD's share price has increased over the four-year period by an annual compound rate of 5.6%, much better than the annual fall of 5.5% suffered by the all-share index. This does not prove that the dividend policy has been successful. The share price might be influenced by many other factors, especially the potential long-term cash

flow expectations of the shareholders. Additionally comparison with the all-share index does not measure the performance of GNLD relative to companies in its own industry sector.

(b) Additional information might include:

Direct feedback from shareholders, especially institutional shareholders, stating whether or not they are happy with the current dividend policy.

Full details of the registered shareholders, and size of holdings. GNLD might have a desired spread of shareholders, which could be influenced by the dividend policy adopted.

Knowledge of the impact of taxation of dividends on shareholders' attitudes, and specifically on their preferences between dividends and capital gains.

The amount of capital investment the company wishes to undertake. The use of retained earnings and other internally generated funds avoids issue costs and the information asymmetry problems of external financing. The level of dividends paid affects the amount of internal funds that are available for investment.

The impact of dividends on corporate liquidity.

The signals provided by dividend payments about the future financial health of the company. For example, would the fact the dividend growth is lagging behind earnings growth be considered a positive or negative signal?

(c) Using the Dividend Growth Model market price =  $\frac{D_1}{ke - g}$

where  $D_1$  is the expected net dividend,  $ke$  is the cost of capital and  $g$  the growth rate in dividends. Using the average compound growth of 3.7%:

$$\frac{D_1}{ke - g} = \frac{22.2(1.037)}{0.11 - 0.037} = 315 \text{ pence}$$

The actual share price at the end of 2001 appears to be overvalued relative to the dividend growth model.

This does not prove that the actual market price was overvalued. The dividend growth model relies upon restrictive assumptions, such as constant growth in dividends per share, which is unlikely to occur. There are also several factors that influence share prices that are not included within the model. Growth in earnings per share has increased more than growth in dividend per share, and it might be better to use the earnings growth rate in the model as this might more accurately reflect the financial health of the company.

## NUMBER TWO

- (a) CAPM may be used to estimate whether or not the projects are expected to yield a high enough return relative to their systematic risk.

$$\text{Beta} = \frac{\text{Correlation coefficient} \times \text{project standard deviation}}{\text{Market standard deviation}}$$

Project	1	2	3
	$\frac{0.76 \times 8.4}{6.9}$	$\frac{0.63 \times 4.6}{6.9}$	$\frac{0.68 \times 14.3}{6.9}$
Beta	0.93	0.42	1.20

Using CAPM, required return =  $R_f + (R_m - R_f) \text{beta}$

Project	1	2	3
Required return (%)	14.37	9.78	16.8
Expected return (%)	0.63	1.22	0.20
Abnormal return (%)			

All three projects are expected to generate satisfactory returns relative to their systematic risk. Other things being equal, the project with the highest expected NPV should be selected. However, NPVs cannot be estimated from this data. It is recommended that investment 2 is selected as it is the largest investment in terms of initial outlay, and also has the largest expected abnormal return.

The investment of any surplus funds in the money market is irrelevant as such investment has an expected NPV of zero (assuming the money market is efficient).



(b) The current gearing using market values is:

Equity, 20 million shares x Sh.22 = Sh.440 million.

The market price of debt is  $Sh.71m \times \frac{\pounds 105.50}{\pounds 100} = Sh.74.91$  million

The cost of equity is estimated to be:  $6\% + (15\% - 6\%) 1.25 = 17.25\%$

The cost of debt may be estimated from the redemption yield of existing long-term debt.

$$Sh.105.5m = \frac{12(1-.3)}{1+kd} + \frac{12(1-.3)}{(1+kd)^2} + \frac{12(1-.3)}{(1+kd)^3} + \frac{12(1-.3)}{(1+kd)^4} + \frac{100}{(1+kd)^4}$$

By trial and error

At 8%

$$\begin{array}{rcl} 8.4 \times 3.465 & = & 27.82 \\ 100 \times 0.735 & = & \underline{73.50} \\ & & 101.32 \end{array}$$

At 6%

$$\begin{array}{rcl} 8.4 \times 3.465 & = & 28.11 \\ 100 \times 0.792 & = & \underline{79.20} \\ & & 108.31 \end{array}$$

Interpolating

$$6\% + \frac{2.81}{2.81 + 4.18} \times 2\% = 6.8\%$$

The cost of debt is approximately 6.8%.

$$WACC = k_e \times \frac{E}{E+D} + kd(1-t) \times \frac{D}{E+D}$$

$$= 17.25\% \times \frac{440}{440 + 74.91} + 6.8\% \times \frac{74.91}{440 + 74.91} = 15.73\%$$

PK's cost of capital is 15.73%.

The new investment is not likely to alter the gearing of the company significantly, as the investment is financed by internal funds, which, in theory, does not alter gearing but only changes the nature of the company's assets. The Sh.12m NPV is likely to accrue primarily to the shareholders and might reduce gearing slightly as the value of equity increases.

The risk of the new project appears to be very low (asset beta of 0.33; given the company's gearing, the equity beta would only be a little higher than this), which will reduce the overall equity beta of the company, and the cost of equity. The overall effect is likely to be a small decrease in the weighted average cost of capital.

- (c) Betas estimated from standard regression techniques may not provide the best estimate of a company's true beta. High betas are argued to be overestimated, and low betas to be underestimated. Additionally estimation errors are likely to be greater in small companies than in large companies. Adjusted betas have been suggested to try to reduce estimation errors and produce a more accurate beta. The suggested adjustment lowers betas of more than 1 and increases betas of less than 1.

### NUMBER THREE

- (a) Assuming the risk of companies in the printing industry is similar to that of Rymond's new investment, the beta of the printing industry will be used to estimate the discount rate for the base case NPV. Ungearing the beta of the printing industry:

$$\text{Asset beta} = \text{equity beta} \times \frac{E}{E + D(1 - t)} = 1.2 \times \frac{50}{50 + 50(1 - 0.30)} = 0.706$$

Using the capital asset pricing model:

$$K_e \text{ ungeared} = 5.5\% + (12\% - 5.5\%)0.706 = 10.09\% \text{ or approximately } 10\%.$$

$$\text{Annual after tax cash flows} = \text{Sh.5 million} (1 - 0.3) = \text{Sh.3,500,000}$$

From annuity tables with a 10% discount rate:

	Sh.
Present value of annual cash flows 3,500,000	21,507,500
x 6.145 =	<u>1,930,000</u>
Present value of the residual value 5,000,000	23,437,500

x 0.386 =	$\frac{25,000,000}{(1,562,500)}$
Less initial investment	
Base case NPV	

Financing side effects relate to the tax shield on interest payments, the subsidized loan, and issue costs associated with external financing.

**Tax relief:**

Sh.5 million 8% loan. Interest payable is Sh.400,000 per year, tax relief is Sh.400,000 x 0.3 = Sh.120,000 per year

Sh.4 million subsidized loan. Interest is Sh.240,000 per year, tax relief Sh.72,000 per year.

Total annual tax relief Sh.192,000 per year.

The present value of this tax relief, discounted at the risk free rate of 5.5% per year is: Sh.192,000 x 7.541 = Sh.1,447,872

(The tax relief on interest payments allowed by government is assumed to be risk free. The mid-point between 5% and 6% in annuity tables is used. N.B. discounting at a rate higher than the risk free rate could be argued, especially if the company might be in a non taxpaying position in some years.)

**Subsidy:**

The company saves 2% per year on Sh.4,000,000 or Sh.80,000, or Sh.80,000 x (1 – 0.30) = Sh.56,000 after tax.

As this is a government subsidy it is assumed to be risk free and will be discounted at 5.5% per year.

Sh.56,000 x 7.541 = Sh.422,296

Issue costs:	Sh.	
Debt Sh.5 million x 1%	=	50,000
Equity Sh.10 million x 4% =	<u>400,000</u>	
		450,000

The adjusted present value is estimated to be:

(Sh.1,562,500) + Sh.1,447,872 + Sh.422,296 – Sh.450,000 = (Sh.142,332)

Based upon these estimates the project is not financially viable.

- (b) APV may be a better technique to use than NPV when:
- There is a significant change in capital structure as a result of the investment.
  - The investment involves complex tax payments and tax allowances, and/or has periods when taxation is not paid.
  - Subsidized loans, grants or issue costs exist.
  - Financing side effects exist (e.g. the subsidized loan) which require discounting at a different rate than that applied to the mainstream project.

## NUMBER FOUR

- (a) Delta measures the change in the option price (premium) as the value of the underlying share moves by 1%.

$$\text{Delta} = \frac{\text{Change in the price of the option}}{\text{Change in the price of the underlying share}}$$

It is measured by  $N(d_1)$  in the Black-Scholes option pricing model.

As the share price falls delta falls towards zero. Delta may be used to construct a risk free hedge position, whereby overall wealth will not change with small changes in share price.

Theta measures the change in the option price as the time to expiry increases. The longer the time to expiry of an option, the greater its value. Theta may be used to estimate by how much the value of an option will fall as time to maturity reduces.

Vega measures the change in option price as a result of a 1% change in the share price volatility or variance. As volatility increases, the value of both call and put options increases.

All three are of use to treasury managers when hedging their investments. As their values approach zero the hedged position will become unaffected by changes in these variables.

- (b) (i)  $N(d_1)$  is required in order to determine the delta hedge.

$$d_1 = \frac{\ln(20/22) + .06(.25)}{0.5(.25)^{.5}} + 0.5(0.5)(.25)^{.5}$$

$$= -0.19624$$

From normal distribution tables:

$$N(d_1) = 0.5 - 0.0778 = 0.4222$$

$$\text{Delta} = 0.4222$$

In order to protect against a fall in QL's share price, the easiest hedge would be to write (sell) options on QL's shares. A delta of 0.4222 means that the relevant hedge

$$\text{Ratio is } \frac{1}{0.4222} = 2.368$$

To hedge 100,000 shares:

$$\frac{100,000 \times 2.368}{1,000} = 237 \text{ options on QL's shares need to be written.}$$

- (ii) A hedge such as this is only valid for a small change in the underlying share price. As the share price alters the option delta will alter and the hedge will need to be periodically rebalanced.

## **NUMBER FIVE**

Briefing Memo: Mergers and acquisitions

- (a) The motive for many mergers and acquisitions is to create incremental value through the existence of synergy when two entities are combined. Synergy means that the value of the new whole is greater than the sum of the previous values of the component parts. Synergy may exist for several reasons:

### **Operating synergy:**

Operating synergies arise from improved productivity, or from cost cutting as a result of the merger. Economies of scale or scope might exist in the larger merged entity. Such economies may relate to production, marketing or finance, the latter including access to capital markets on improved terms. There might also be increased market power, allowing some advantage to be taken of an oligopolistic position.

If the victim company was relatively badly managed it might be possible to eliminate inefficiencies that previously existed. Alternatively better use may be made of talented managers who were not previously utilised to their full potential.

Where a victim company is 'cash rich' more efficient use might be made of such cash.

Gains may occur from horizontal mergers where competitors are purchased. Gains occur through rationalization of research and development, sales and distribution, duplicated facilities and sales outlets, computer facilities etc. Vertical mergers between customers and suppliers can create value by eliminating various co-ordination, security of supply and bargaining problems.

Synergy may exist though the greater ability to transfer from one division to another.

### **Financial synergy:**

Financial synergy may exist after a merger as the new entity may be more diversified. Diversification reduces the risk of cash flows, making the company more attractive to investors and reducing the company's cost of capital.

There may also be tax synergies, whereby the combined entity is able to fully utilize tax allowances or tax losses that could not previously be utilised.

(b) Evidence suggests that many mergers and acquisitions do not achieve the forecast synergies, and that shareholders in the target firm reap most benefits from any additional value created. Reasons for not achieving expected synergy include:

- The acquisition decision is based upon incomplete or incorrect information
- Synergies are difficult to value
- Unexpected costs and problems exist when combining two organizations with different organizational structures, cultures and managerial styles.
- Managers are not given suitable incentives to achieve maximum synergies.

(c) Mergers purely for diversification may be beneficial as they may reduce the cost of capital explained above. Other possible benefits from diversification are:

- The flexibility of the company may be enhanced
- Debt capacity is normally increased
- The risk of corporate failure is often reduced
- Competitors may find it more difficult to access relevant information about a diversified company, as it is not immediately clear how individual sections of the company are performing, and what is their strategy.

However, it is usually considered that investors can diversify far more efficiently through their portfolios than can company managers