Question 01

(a) **Principal general risks associated with a large acquisition**

Regulatory risk

This is a large acquisition and may therefore be subject to scrutiny from the Government or other regulatory agencies if there is a threat to public interest. However, Polar Finance is not in the retail trade therefore is unlikely to attract attention from agencies regulating competition or restrictions to it. One potential issue is the lack of accountability of private equity funds and the background to Anchorage may result in scrutiny from regulatory authorities.

Disclosure risk

An acquisition of this size must be supported by reliable information that reflects the potential earning power and financial business of the company. It is essential to ensure that all supporting information, such as the financial statements, have not been manipulated to give a more favourable picture. The statement of profit or loss must be supported by the relevant cash flow for example and all other supporting documents should be subject to scrutiny to verify their authenticity.

Valuation risk

This size of acquisition may change the risk of Polar Finance due to changes in exposure to financial risk or market risk. As a result, investors' or potential investors' perceived risk of Polar Finance may also be altered. Such changes to risk mean that the post-acquisition value of Polar Finance is unlikely to be a simple sum of its pre-acquisition value and the value of Anchorage.

(b) **Performance of Anchorage in 20X8 and 20X9**

(i) **Return on capital employed (ROCE)**

ROCE is a measure of the return that is being earned on total capital employed. Any reduction in the ratio indicates that funds are being used less efficiently than in previous years. There are numerous ways in which ROCE can be calculated but the following formula has been used for the purpose of this report:

$$\text{ROCE} = \frac{\text{PBIT}}{\text{Capital employed}}$$

Where capital employed = total equity + non-current liabilities

	20X9	*20X8*
	$m	$m
PBIT (operating profit)	1,250	1,030
Capital employed		
Total equity	2,030	1,555
Non-current liabilities	1,900	1,865
Capital employed	3,930	3,420
ROCE	31.8%	30.1%

ROCE has improved slightly, indicating that capital is being used more efficiently than in 20X8.

A major driver of this is an increase in operating margin from 12.1% (1,030 / 8,500) to 13.9% (1,250 / 9,000).

(ii) **Return on equity**

This ratio measures the return on equity funds only – that is, the funds provided by the shareholders – and is calculated by dividing total equity funds by profit after interest and tax.

	20X9	*20X8*
	$m	$m
Profit after interest and tax	860	650
Total equity funds	2,030	1,555
Return on equity	42.4%	41.8%

Similar to ROCE, return on equity has shown a slight improvement in 20X9. The improvement is not as high as with ROCE because the 20X9 equity figure as risen quite strongly (by $475m). This is because the company is reinvesting most ($475m / $860m = 55%) of its profits after tax.

Based on the ratios analysed Anchorage appears to providing a good return to its investors. Sales and profits are rising, and its financial gearing is falling and it is cash generating. Without any industry yardsticks to compare against, it is not possible to give a definite conclusion bout Anchorage's performance over this time period, but such strong ratios give little indication of any reason for the concerns over Anchorage's performance; this is surprising if a recession is having an impact on the retail sector.

(c) **Impact of acquisition on the required rate of return of equity investors in Polar Finance**

One of the differences between Anchorage and Polar Finance is the fact that Polar Finance does not pay tax on its income. This means that there is no benefit to be gained from the tax shield on debt. In order to calculate the asset beta of Polar Finance we would use the following formula:

$$\beta_a = \beta_e \times \frac{V_e}{V_e + V_d}$$

The asset beta of Polar Finance is given as 0.285.

However as Anchorage gains benefit from the tax shield on debt, its asset beta should be calculated using the following formula:

$$\beta_a = \beta_e \times \frac{V_e}{V_e + V_d(1-T)}$$

$\beta_a = 0.75 \times [0.76/(0.76 + 0.24 \times 0.7)] = 0.614$

Anchorage's proportion of post-acquisition cash flows is expected to be 20%, meaning that Polar Finance will have 80%. The **combined asset beta** post-acquisition is therefore estimated as:

$(0.8 \times 0.285) + (0.2 \times 0.614) = 0.351$

Before we can determine the required return from investors in the combined company and compare it with that of investors in Polar Finance only, we need to calculate the **equity betas** of Polar Finance and the combined entity.

Polar Finance's debt is given as 85% of the total company, meaning that equity of $1,125 million makes up 15%. Debt can be calculated as:

($1,125 million/0.15) × 0.85 = $6,375 million

Post-acquisition level of debt = $6,375 million (Polar) + $2,500 million (additional borrowing)

= $8,875 million

Equity beta post-acquisition can be calculated using the following formula:

$$\beta_e = \beta_a \left(\frac{V_e + V_d(1-T)}{V_e} \right)$$

There is no benefit from the tax shield therefore (1 – T) can be ignored.

$\beta_e = 0.351 \times [(1{,}125 + 8{,}875)/1{,}125] = 3.12$

Equity beta of Polar Finance is:

$\beta_e = 0.285 \times [(1{,}125 + 6{,}375)/1{,}125] = 1.9$

The CAPM can now be used to calculate the required return on equity pre- and post-acquisition.

Pre-acquisition

$r_e = R_f + \beta_i(E(r_m) - R_f)$

$r_e = 5\% + 1.9 \times 2.224\%$ (calculated in Appendix 1)

$r_e = 9.23\%$

Post-acquisition

$r_e = 5\% + 3.12 \times 2.224\%$

$r_e = 11.94\%$

As a result of the acquisition, shareholders in Polar will require an increase in return of 2.71%.

(d) **Evaluation of argument that Anchorage may have been undervalued by the market**

The argument that the market may have undervalued Anchorage suggests **market inefficiency**. The **efficient market hypothesis** (EMH) suggests that this argument is unlikely. Further support for the EMH is given by the number of investors that operate in the market for a business such as Anchorage – it is unlikely that this number of investors would misprice the company. Although there is evidence of investors being deterred by Anchorage's reputation in the past, which may affect current investors' rational expectations about the company, the effect of such expectations is likely to be diversified away during the pricing process.

However, share prices may be affected by a number of behavioural factors. For example, **availability bias** can occur when people will often focus more on information that is **prominent (available).** In this case the share price Anchorage may be depressed because of **recent** rumours or press articles about the success of Anchorage's strategy.

The current share price of Anchorage is $2.60. With 1,600 million shares in issue, this represents a market capitalisation of $4,160 million. Return on equity is 6.668% (see Working 1). If dividend payments were capitalised at this return on equity, this would suggest a market capitalisation of $4,049 million. The market appears to expect very little growth in Anchorage in the future, perhaps partly due to its reputation. As a result, a bid price of $3.20 should be attractive to Anchorage's shareholders.

Working 1

Anchorage – estimation of cost of equity

Calculate the cost of equity

(i) Calculate expected market return using dividend growth model:

$$P_0 = \frac{D_0(1+g)}{(r_e - g)}$$

Rearranging the formula to express in terms of r_e:

$$r_e = \frac{D_0(1+g)}{P_0} + g$$

$$r_e = \frac{0.031(1+0.04)}{1} + 0.04$$

r_e = 7.224%

This result suggests that the market will have an expected return of 7.224%. The risk-free rate is given as 5% therefore the market risk premium is 2.224%.

(ii) Use the CAPM to calculate return on equity:

$r_e = R_f + \beta_i(E(r_m) - R_f)$

$r_e = 5\% + (0.75 \times 2.224\%)$

r_e = 6.668%

Question 02

(a) **Estimation of effective interest rate cost using different hedging techniques**

(i) **Futures**

Current interest = Length of exposure × amount of exposure × (LIBOR + 50 basis points)

= 4/12 × £30 million × 6.5%

= **£650,000**

Type of future = **March** future with an open price of 93.800 and a settlement price of 93.880

$$\textbf{Number of contracts} = \frac{\text{Amount of exposure}}{\text{Contract size}} \times \frac{\text{Length of exposure}}{\text{Contract period}}$$

$$= \frac{£30\,\text{million}}{£500,000} \times \frac{4\,\text{months}}{3\,\text{months}} = \textbf{80 contracts}$$

Basis = Current spot price – settlement price = 94.00 – 93.88 = 12 basis points (ticks)

Between the closure and maturity of the contract (one month), movement will be 4 ticks (12/3).

Close-out price if interest rate (a) increases, or (b) decreases by 100 basis points

Interest rate at close-out	7%	5%
Open price	93.88	93.88
Futures price at close-out	92.96	94.96
Number of ticks	92	(108)
Total value (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**

Type of option = March put option

Number of contracts = 80 (see above)

Premium = Number of contracts × premium on March put option × tick size

= 80 × 16.8 × £12.50

= £16,800

Basis = 4 ticks (see (a)(i) above)

Outcomes versus expected movements in interest rates

Interest rate at close-out	7%	5%
Futures price at close-out	92.96	94.96
Exercise price	94.00	94.00
Exercise option?	Yes	No
Option payoff (ticks)	104.00	Nil
80 contracts at £12.50 per tick	104,000	Nil
Cost of loan in spot market	750,000	550,000
Less option payoff	(104,000)	Nil
Less premium	16,800	16,800
Net cost of loan	662,800	566,800
Annual equivalent	6.63%	5.67%
Effective interest rate (average)	**6.15%**	

(b) **Pros and cons of using derivatives to manage interest rate risk**

Pros

In a climate of volatile interest rates, exposure to potential interest rate risk is more acute. Companies can use various financial derivative instruments to hedge against such risk, including futures, forward rate agreements (FRA), options and swaps.

The most obvious advantage of using derivatives is that the interest rate that will be applied in the future is **fixed** and there are no surprises. This helps with **financial planning** as companies know how much interest they will have to pay and can budget accordingly.

Futures and FRAs allow companies to **perfectly match** their hedged amounts with the amount of exposure as they can be tailored to the particular needs of the company in question. Whilst **traded options** do not offer this facility, they do offer **flexibility**. If the prevailing interest rate at the time at which options should be exercised is better than the 'locked-in' rate, companies can just let the options lapse – that is, options offer companies **the right but not the obligation** to accept the locked-in rate at the date of maturity.

To avoid the expensive premiums that come with the flexibility of options, companies may use **interest rate swaps** – for example, a company may swap a fixed rate stream of interest payments for a variable rate stream. This allows companies to take advantage of **favourable movements** in interest rates.

Cons

Traded options do not allow perfect hedging as they come in standardised amounts. This could lead to a company purchasing more options than required (expensive and unnecessary) or less than required (leading to some of the exposure being unhedged). In order to hedge the outstanding exposure the company may have to purchase **futures or FRAs**.

Options are **expensive** means of hedging as their flexibility comes at a high price. Regardless of whether the option is exercised, the company must pay a **premium** for the right (but not the obligation) to exercise.

Whilst **swaps** allow companies to exchange fixed rate interest payment streams for variable rate streams, it is often **difficult to gauge the extent of the risk exposure** and to ensure that the exposure (and the swaps) are effectively managed by the company. This can lead to companies suffering **losses** that may be on such a scale as to threaten their survival.

(c) **Short-term nature of instruments**

The finance director's assertion about the nature of instruments is correct. Most are designed to hedge for interest rate changes over months rather than years. They are a form of **insurance** for the buyer, where the seller assumes the risk in return for a premium. They are not designed to deal with interest rate changes over a long period, where movements are less certain and the **risks to the provider of the option** would be **greater**.

Renewal of instruments

Costs to Phobos will become **less certain** if a succession of short-term instruments are used to hedge the risk. Phobos may find that once the term of the instrument has expired, an instrument offering the same rate is not available or only available at an **increased premium,** because **expectations about rate rises** have **changed**.

Pricing of instruments

The pricing of instruments will take account of **predicted interest rate movements, uncertainties in predictions** and build in a **profit element** as well. Every time Phobos buys a new instrument, it will be paying a premium to the sellers of the instrument that reflects these considerations. The cumulative cost of these premiums over the time period will be greater than the increased interest costs that Phobos will incur if it purchases the fixed interest rate swap.

Question 03

(a) **Report**

To: Seal Island Nuclear Power Company directors
From: Accountant
Subject: Advanced Boiling Water Reactor project
Date: X-X-XX

The purpose of this report is to appraise the Advanced Boiling Water Reactor project and to discuss various aspects surrounding its financial viability.

(i) **Net present value**

For the purposes of the NPV calculation it is assumed that 1st January 20X2 is the beginning of Year 1.

Value of cash inflows from electricity generation

Use the annuity factor formula provided in the question to determine the annuity factor to be applied to the annual cash inflows of $100m.

$$A_n = \left[\frac{1-\left(\frac{1+g}{1+i}\right)^n}{i-g}\right](1+g)$$

Where

g = 0.04 i = 0.10 n = 30

A_n = 14.11

Tutorial note. Be careful how you enter this complicated formula into your calculator. It is better to take the calculations one step at a time rather than trying to input the entire formula into your calculator at once.

	20X2	*20X3*	*20X4*	*20X5 – 20Y4*	*20Y4*
	$m	$m	$m	$m	$m
Construction costs	(300)	(600)	(100)		
Cash inflows				100	
Decommissioning costs (W1)					(2,189)
Discount factor (10%)	0.909	0.826	0.751	14.11 × 0.751	0.043
Present value	(272.7)	(495.6)	(75.1)	1,059.7	(94.1)

NPV = $122.2m

W1 Decommissioning costs = $600m × 1.04^{33} = $2,189m ($1.04^{33}$ represents growth)

(ii) **Principal uncertainties associated with the project**

Capital expenditure

One of the main uncertainties of the project is the estimation of required capital expenditure. There are possibilities of delays which can cost both time and money, unexpected increases in labour costs that had not been factored in, and greater than expected increases in raw material costs (perhaps due to shortages). Incorrect estimates of timing of capital expenditures can have a significant effect on the NPV of the project, given that cash flows may have been discounted using an incorrect discount factor.

Discount rate

If the discount rate is incorrect, the results of the NPV calculations will be meaningless. Discount rates for projects of this size can be difficult to estimate. They are often estimated using various models and sources, all of which have their own uncertainties attached, therefore there is considerable scope for error. The project also has potential social and environmental elements that must be built into the discount rate - or example, the project is aiming to reduce emissions and Roseland's dependence on fossil fuels. There is a risk associated with securing a stable supply of energy which should also be accounted for in the chosen discount rate.

Cash surpluses

Given the length of the project, it is difficult to estimate cash surpluses to the end of its life. Such surpluses will also depend on the capacity of the reactor, the demand for the alternative energy and the prices charged for this energy. Such prices will be affected by preferences for other sources of energy (such as fossil fuels, which may be priced at a lower rate) and the continued availability of these sources.

Decommissioning costs

Such costs will depend on the effect the reactor has had on the environment (think of the decommissioning costs associated with such nuclear power stations as Dounreay on the north coast of Scotland). However such costs will occur far into the future and as such any errors in estimation will have very limited effect on the outcome of the project as a whole.

Real options

There may be a number of real options attached to such a project – the option to delay, the option to abandon at different points throughout the project's life or the option to expand or contract capacity. All of these options may add value to the project as they help to reduce the downside risk associated with it.

(iii) **Sensitivity analysis**

If the project is to become infeasible the NPV must fall by $122.2m.

Changes in construction costs

Total discounted increase in construction costs = $122.2m

Increase per $100m in construction costs × (3 × 0.909 + 6 × 0.826 + 1 × 0.751) = $122.2m

Increase per $100m in construction costs = $122.2m/ 8.434 = $14.49m

This means that before NPV becomes zero:

20X2 costs must increase to ($300m + 3 × $14.49m) = $343.47m

20X3 costs must increase to ($600m + 6 × $14.49m) = $686.94m

20X4 costs must increase to ($100m + 1 × $14.49m) = $114.49m

This represents an annual increase in construction costs of 14.49%.

Changes in annual operating surplus

Annual operating surplus reduction = $122.2m/(14.11 × 0.751) = $11.53m

Surplus must reduce to $88.47m ($100m – $11.53m) before NPV reaches zero. This is a reduction of 11.53% per annum.

Changes in decommissioning costs

Decommissioning costs must increase by $122.2m/0.1571 = $777.8m (in January 20X2 prices) before NPV becomes zero.

This represents an increase of 129.6%.

(iv) **Assessment of volatility**

Simulations (such as Monte Carlo simulation) can be used to estimate the volatility of the project's NPV. Such techniques amount to adopting a particular probability distribution for the uncertain (random) variables – such as cash surpluses – and then using simulations to generate values of these variables.

In this particular project, the decommissioning costs are not considered to be a random variable, but rather a variable with a limit value and a most likely value.

The simulation is performed in the first instance to obtain a 'trial value' but is then repeated thousands of times for the variables of interest to derive the NPV for each possible simulated outcome. A distribution of NPVs is then obtained which should estimate a normal distribution. This can be used to estimate project volatility.

The output from a simulation will give the expected NPV and other such statistics as the standard deviation of the output distribution. The output can also rank the variables in order of significance in determining the NPV of the project.

Should you wish to discuss any of the above in more detail, please do not hesitate to contact me.

(b) **WACC**

A company's weighted average cost of capital (WACC) is the **average of the after-tax costs** of the **different sources of finance** that it uses, **weighted in proportion to the market values** of **those funds**. WACC can be used as a **discount rate** to evaluate the company's potential projects provided that:

(i) There is **no significant change in the capital structure** of the company as a result of the investment.

(ii) The **operating (systematic) risk of the new project** is the **same** as the **company's existing systematic risk**.

If these conditions are true then a project whose return exceeds the WACC will be worthwhile and its NPV will indicate the expected increase in shareholder value if it is accepted.

Problems of WACC

(i) One practical problem is whether to **include short-term debt** (eg overdraft) in the computation. This depends on whether the **short-term debt** is effectively used as a **long term source of finance**.

(ii) If the new project has **different systematic risk** to the company's existing business (ie condition (ii) above is untrue) then a risk-adjusted version of the WACC must be computed if the method is to give reasonable results.

(iii) WACC cannot be used if the finance for the new project would cause a **significant change to the company's capital structure** (ie condition (i) above is untrue).

(iv) It is also difficult to use WACC if there are **specific financing opportunities**, for example subsidised loan finance, or complex tax allowances.

Adjusted present value

Adjusted present value (APV) is a more advanced method that can be used for any project appraisal exercise, but it is in the more complex cases (involving a **change in capital structure** and/or **other complex finance problems**) that it is the most useful.

(i) The first stage is to **evaluate the base case NPV** of operating cash flows by discounting at the ungeared cost of equity.

(ii) The **present value of each individual financing side effect** is then evaluated separately. The sum of the base case NPV and the PV of financing side effects is the APV.

The method has the advantage over basic net present value using WACC that it allows **each different type of cash flow** to be **discounted at a rate specific to the risk** of that cash flow. It also allows the effects of more complex financing situations to be considered.

Problems with APV

The main practical problem is to **identify correctly the financing side effects** and their appropriate discount rates. Theoretical weaknesses of the method stem from simplifications introduced by the Modigliani and Miller model of capital structure. For example:

- It is assumed that the only effect of debt issued at market rates is the tax relief on debt interest.
- The computation of an asset beta assumes that **cash flows** are perpetuities.

(c) (i) **No conversion: share price is 470 cents**

If no conversion takes place, the value of the convertible will be as debt with 4 years to maturity. Its value is found by **discounting interest** and **redemption** value at 9%, which is the company's pre-tax cost of debt.

Year			*9% factors*	*PV*
		$		$
1–4	Interest	8	3.240	25.92
4	Redemption	100	0.708	70.80
				96.72

(Note that the value per share for conversion to take place would need to be at least $96.72/20 = 484 cents.)

Total market value of the loan stock = 96.72/100 × $20 million
= $19.34 million

Other debt has a market value of $23m, giving total debt value of $42.34m and a cost of 9%(1 – 0.3) = 6.3% after tax.

If the share price falls to 470 cents:

Total market value of shares = 470/520 × $180m
= $162.69 million

The cost of equity is 15% because its systematic risk is the same as that of the market.

Total value of debt plus equity = $42.34m + $162.69m = $205.03 million
Weighted average cost of capital = 15% × 162.69/205.03 + 6.3% × 42.34/205.03
= 13.2%

(ii) **Conversion: share price is 570 cents**

Number of new shares issued = 20 × $20m/$100
= 4 million
Value of new shares issued = 4m × 570c
= $22.8 million
Value of existing shares = 570/520 × $180m
= $197.31 million
Value of all shares = $220.11 million
Debt remaining = $23 million
Total value of equity and debt = $243.11 million

Assuming the cost of equity and debt are unchanged

Weighted average cost of capital = 15% × 220.11/243.11+ 6.3% × 23/243.11
= 14.2%

The cost of capital is higher if conversion takes place because **cheaper debt** has been **replaced** with **more expensive equity shares**.

Conclusion

This calculation is unlikely to be correct because the **assumption** that the costs of equity and debt are unchanged by the conversion is probably **wrong**. When debt is reduced, the **financial risk** to shareholders **decreases**, causing a reduction in the cost of equity. However, it is unlikely that the cheaper equity will compensate for the loss of cheap debt in the capital structure because **debt interest** is **tax allowable** whereas dividends to shareholders are not.