

Financial Management

Module 14

June 2011

SOLUTIONS

Section A: All three questions to be attempted.

Section B: Two of the following three questions to be attempted.

Present Value tables are attached at the end of this paper.

Section A

Question 1 Part a)

3 marks for answer in report format, 5 marks for calculations and 4 marks for interpretation of results = 12 marks in total.

Report to Pet-Fit-Walkers Ltd.,

Your answer should be in a report format, properly addressed, dated and structured.

As the question does not state the current and expected financial position of the company the report will depend on what assumptions the candidate makes.

What the report requires is that the expected payment of \$1m in five months time will be paid and that Pet-Fit-Walkers Ltd. wishes to "lock in" the current value of this now using either a forward market hedge or a money market hedge so as to avoid currency risk.

We are told that we expect a payment of €1.5m also in five months time. This is obviously of interest but it is not explicitly stated that from these funds the \$1m will be sourced. As these receipts are in Euro there is no need to hedge this €1.5m.

The following money market calculations could be included in the body of the report or as part of the appendices. If in the appendices then the main numbers should be alluded to in the main body.

Using the rates given in the question should Pet-Fit-Walkers Ltd. choose to the lowest cost of the following strategies.

Assuming that Pet-Fit-Walkers Ltd. have the required funds at hand they could:

- 1) Simply convert into dollars the required euro amount today from funds already held by Pet-Fit-Walkers Ltd. and save in dollars for the five months to payoff the \$1m.
- 2) Simply enter into a forward contract to buy \$1m in five months. For comparison purposes value the cost of this strategy in terms of investing the Euro equivalent today.

Assuming that Pet-Fit-Walkers Ltd. do not have the required funds at hand they could:

- 3) Borrow today the required funds in Euro, convert to dollars today and save in dollars for the five months to payoff the \$1m and pay off the euro loan in five months time with the receipts they expect in Euro.
- 4) Simply enter into a forward contract to buy \$1m in five months. For comparison purposes value the cost of this strategy in terms of borrowing the Euro equivalent today.

Strategy 1:

If saving in dollars then you would need to save $\$FV/(1+r)^t$ today to have \$1m in five months time, i.e. $\$1m/(1+.02)^{(5/12)} = \$1m/(1.02)^{(0.8333)} = \$991,735.54$ today.

This will cost in Euro today: $\$991,735.54 / 1.4100 = \text{€}703,358.54$ today.

Strategy 2:

We are not told in the question the exact cost of a five month forward. However as we are given the three month and one year forward rates we can make a reasonable interpolation which will suffice if the answers are sufficiently different. Should the two answers be very close then in the real world as opposed to an exam situation it would be appropriate to get the actual five month rate.

We will need to purchase \$1m in five months time. The three month buying rate is \$1.4050 and the annual rate is \$1.4000 hence the implied five month rate is:

$\$1.4050 + \{(\$1.4000 - \$1.4050)/12*5\} = \1.402083333 approximately.

Hence we could fix at $\$1m / 1.402083333 = \text{€}713,224.37$ approximately in five months time.

For comparison purposes the cost of this strategy in terms of the opportunity cost in Euro equivalent today would be found by saving in Euro you would need to save $\text{€}FV/(1+r)^t$ today to have $\text{€}713,224.37$

in five months time, i.e. $€713,224.37 / (1+0.03)^{(5/12)} = €713,224.37 / (1.03)^{(0.8333)} = €709,542.22$ today.

Thus if Pet-Fit-Walkers Ltd. have the required funds at hand then the money market hedge at $€703,358.54$ today is cheaper than the forward contract at $€709,542.22$ today.

Strategy 3:

However if Pet-Fit-Walkers Ltd. do not have the required funds at hand and wish to use the money market hedge then they must borrow today the required funds in Euro, convert to dollars today and save in dollars for the five months to payoff the \$1m and pay off the euro loan in five months time with the receipts they expect in Euro.

As we saw with strategy 1 if saving in dollars then you would need to save $\$FV/(1+r)^t$ today to have \$1m in five months time, i.e. $\$1m/(1+0.02)^{(5/12)} = \$1m/(1.02)^{(0.8333)} = \$991,735.54$ today.

This will cost in Euro today: $\$991,735.54 / 1.4100 = €703,358.54$ today. As this must be borrowed this will cost us $€PV \times (1+r)^t = €703,358.54 \times (1 + 0.06)^{(5/12)} = €703,358.54 \times (1.06)^{(0.8333)} = €720,942.50$ in five months time.

Strategy 4:

Simply enter into a forward contract to buy \$1m in five months. For comparison purposes value the cost of this strategy in terms of borrowing the Euro equivalent today

As we saw with strategy 2 we will need to purchase \$1m in five months time. The three month buying rate is \$1.4050 and the annual rate is \$1.4000 hence the implied five month rate is: $\$1.4050 + \{(\$1.4000 - \$1.4050)/12 \times 5\} = \1.402083333 approximately.

Hence we could fix at $\$1m / 1.402083333 = €713,224.37$ approximately in five months time.

Thus if Pet-Fit-Walkers Ltd. do not have the required funds at hand then the money market hedge at $€720,942.50$ in five months time is more expensive than the forward contract at $€713,224.37$ approximately in five months time.

So overall the choice of strategy will depend on how Pet-Fit-Walkers Ltd. finances the payment.

This example shows us both the advantages and disadvantages of a forward market hedge. If we have the funds to hand and low opportunity costs for the funds then we can get the benefit of the saving rate. The money market hedge can be used both as a measuring stick to compare with alternative means of hedging and also it can be used for negotiating the best rates should you need to use an alternative method.

However if you do not have the funds at hand then borrowing can increase the cost versus alternative means of hedging. Unlike purchasing the forward contract there is a requirement to purchase the foreign currency today and ends funds are required today. With the forward contract payment is only required in the future.

In addition:

Forward cover's limitations:

- generally only available for short periods
- not available for all markets and currencies, and
- relatively inflexible as you must complete the transaction, (unlike currency options)

Money market cover limitations:

- you take on credit risk
- involves higher transaction costs.

Question 1 Part b)

1 mark for showing understanding of currency options and currency futures, 3 marks for outlining the advantages and disadvantages of using currency options, 3 marks for outlining the advantages and disadvantages of using currency futures = 7 marks in total.

A foreign currency option, also called a foreign exchange option or FX option for short, is a derivative financial instrument where the owner has the right but not the obligation to exchange money denominated in one currency into another currency at a pre-agreed exchange rate on a specified date. To purchase this right, a premium is paid to a broker. This premium will vary depending on the number of factors.

Unlike an FX option when you buy an FX future contract you **MUST** either take delivery of the underlying asset upon expiration or settle in cash. While an FX option may be customised and dealt with through non-exchange counterparties, FX futures are always standardised and always dealt through an exchange.

FX options and FX futures can be used to hedge against adverse movements in exchange rates. An FX option is usually individually tailored to a client's needs but it can also be traded like those FX options on the International Securities Exchange, Philadelphia Stock Exchange, or the Chicago Mercantile Exchange for options on futures contracts. Individually tailored FX options are referred to as "Over The Counter" or OTC and are lightly regulated unlike those traded on exchanges. Of all the option markets, the FX options market is the deepest, largest and most liquid.

The main use of FX options is to hedge **UNCERTAIN** future cash flows in a foreign currency. The general rule is if the future foreign currency cash flow is certain use FX forwards but if it is uncertain use FX options.

While an FX future has similarities to an FX forward contract it is different. They are both contracts to deliver an asset on a future date at a prearranged price. However they are different in two main respects, futures are always exchange-traded, while a forward is OTC. Thus futures have significantly less credit risk, and have different funding.

Thus they also differ in terms of risk. Ignoring counterparty risk, with an FX option the purchaser's risk is limited to the option premium. Unlike an FX option, an FX future contract **MUST** be undertaken, so there is exposure to potential losses as well as gains.

As an FX future is exchange traded the counterparty is the exchange and hence counterparty risk is considered negligible. However due to counterparty risk the risk of an FX option is not just limited to the option premium. With an FX option, just like with a Forward, all the gains and losses are realised upon settlement. This exposes the potential winner to significant counterparty risk.

Buying futures contracts also requires the deposit of an "initial margin" upfront that can be much larger than an option premium, which fluctuates on a variety of factors. The initial margin also earns interest whereas an option premium doesn't - the option premium is paid to the seller, who earns the interest on the amount paid.

Other disadvantages of using FX options include:

- Standardised size of contract and date of contract, (only four delivery dates a year) may result in an imperfect hedge.

Other disadvantages of using FX options include:

- Using options can be quite non intuitive

With an FX option you are not either selling or buying a currency you are doing both simultaneously. You exchange a put on units of one currency for a call on units of another currency.

FX options requires us to stop thinking as if we are buying an apple for cash but to think of the seller as buying cash for apples. Thus when constructing an option strategy from FX options, you must be careful

to match the foreign currency amounts, not the local currency amounts. Otherwise the amount of foreign currency to be received and delivered will not equalise and you would be left with residual risk.

- The problem of the numéraire

With an FX option on a rate, you must be careful which currency is the underlying and which is the numéraire. This is because inverting a rate has the effect of $x \rightarrow 1/x$, which is non-linear. Similarly because of the non-linearity of $x \rightarrow 1/x$, the implied volatility of an FX option will depend on the numéraire of the purchaser of the FX option.

The following is an example of how instead of a money market or forward hedge Pet-Fit-Walkers Ltd. in the example above, could use currency options or currency futures. However no examples or calculations are required in this question.

A currency option would allow Pet-Fit-Walkers Ltd. to exchange Euro for USD in five months time at a rate agreed today. This would involve a contract giving Pet-Fit-Walkers Ltd. the right but not the obligation to sell €714,285.71 and buy \$1,000,000 in November. In this case the pre-agreed exchange rate, or strike price, is 1.4000 USD per Euro. This type of contract is both a put on dollars and a call on Euro.

Unlike a currency option, a currency future would oblige Pet-Fit-Walkers Ltd. to exchange Euro for USD even when this would result in a situation where Pet-Fit-Walkers Ltd. would have been better off to have used the spot market rates in November.

As Pet-Fit-Walkers Ltd. expect to need to purchase the USD a forward or money market hedge might seem appropriate. But if the cash flow is uncertain, (say the goods were faulty and had to be returned) Pet-Fit-Walkers Ltd. might wish they had used options. An FX option could yield a profit if the expected cash is not received but FX rates move in its favour. Had they entered into a forward FX contract and the expected USD cash was not needed, then the forward, instead of hedging, exposes them to FX risk.

Question 1 Part c)

1 mark each for discussion on exchange rate risk, transaction risk, translation risk and 3 marks for discussion on competitor's economic exposure = 6 marks in total.

Economic exposure can be both difficult to predict and measure but is extremely significant and can be the difference between success and failure for any firm. Therefore the competitor is incorrect to say "... we have no foreign exchange risk exposure".

For example should the Euro appreciate then relative to other firms from outside the Euro zone then this firm will find that its products will become uncompetitive as:

"all our supplies come from ... the Euro zone", (non Euro made products now cheaper)

"all our sales are in the Euro zone", (non Euro made products now cheaper)

"all our costs ... are in Euro", (non Euro made products now cheaper)

"all our ... revenue are in Euro", (foreign suppliers will be happy to accept less Euro hence non Euro made products now cheaper).

Currency risk or exchange rate risk is a form of financial risk that arises from the potential change in the exchange rate of one currency in relation to another. It arises when the present value of a firm's cash flow is altered due to a change in exchange rates. For example investors or businesses face an exchange rate risk when they have assets or operations across national borders or if they have loans or borrowings in a foreign currency.

An exchange rate risk can result in an exchange gain as well as a loss. To neutralize the risk of a loss (but at the same time forgoing any potential exchange gain), some businesses hedge all their foreign exchange exposure or exposure beyond some predetermined comfort level, which is a way of transferring the risk to another business prepared to carry the risk or which has a reverse risk exposure.

A currency risk exists regardless of whether investors invest domestically or abroad. If they invest in the home country, and the home currency devalues, investors have lost money. All stock market investments are subject to a currency risk, regardless of the nationality of the investor or the investment, and whether they are in the same or different currency.

There are three basic types of currency risk:

- Transaction risk is the risk that an exchange rate will change unfavourably over time.
- Translation risk is an accounting concept. It is proportional to the amount of assets held in foreign currencies. Changes in the exchange rate over time will render a report inaccurate, and so assets are usually balanced by borrowings in that currency.
- Economic exposure is the risk due to unexpected changes in future exchange rates which could reduce the present value of all future cash flows and or make the firm less competitive against other firms who source their goods, labour and /or materials in currencies which have devalued relative to its currency.

Economic exposure is hard to hedge against particularly as currency movements are unpredictable. If it was to become a major worry the firm could consider diversifying its production, supplies and even its financing.

Question 2 Part a)

2 marks for E(r) and St. Dev and 2 marks for discussion = 4 marks in total

The weighted average expected return of the merged group.

AML = A and BGL = B

$$E(R_{\text{Group}}) = (X_A \cdot r_A) + (X_B \cdot r_B)$$

Where: $X_A = .6$ and $X_B = .4$; $r_A = 11\%$ and $r_B = 15\%$

$$\text{Thus } E(R_{\text{Group}}) = (0.6 \times 11) + (0.4 \times 15) = 6.6 + 6 = \mathbf{12.6\%}$$

The standard deviation of the merged group (= the total risk of the merged group) =

$$\sigma_P = \sqrt{\{(X_A^2 \cdot \sigma_A^2) + (X_B^2 \cdot \sigma_B^2) + 2(X_A \cdot X_B \cdot \rho_{AB} \cdot \sigma_A \cdot \sigma_B)\}}$$

Where: $X_A = 0.6$ $X_B = 0.4$ $\sigma_A = 12$ $\sigma_B = 18$ and $\rho_{AB} = 0$

$$\text{Thus } \sigma_P = \sqrt{\{(0.6)^2 \times 12^2\} + \{(0.4)^2 \times 18^2\} + 2\{(0.6 \times 0.4 \times 0 \times 12 \times 18)\}} = \mathbf{10.2}$$

Before the merger BGL has a return of 15% and a St. Dev. of 18

The merged group would have a return of 12.6% and a St. Dev. of 10.2

Thus the merged group has a lower risk but a lower return than BGL.

Therefore one can not say unambiguously that the merged group is superior to BGL.

But since the management of BGL would consider the merger a success if the groups expected return and risk was similar to what AML enjoys now, (it has fallen from 15% to 12.6% as opposed to AML's 11%), thus it exceeds the expectations of AML management and could be recommended to them.

Before the merger AML has a return of 11% and a St. Dev. of 12

The merged group would have a return of 12.6% and a St. Dev. of 10.2

Thus the merged group has a higher return and a lower risk than AML.

Therefore one can say unambiguously that the merged group is superior to AML.

Therefore it meets the objectives of AML and could be recommended to its management.

Question 2 Part b)

3 marks for the E(r)'s and 2 marks for discussion = 5 marks in total

$$\beta_p = (X_A \cdot \beta_A) + (X_B \cdot \beta_B)$$

$$= (0.6 \times 0.7) + (0.4 \times 1.2) = 0.42 + 0.48 = 0.9$$

$$\begin{aligned} \text{CAPM: } E(R_{\text{Group}}) &= rf + \beta_p (E(rm) - rf) \\ &= 5 + 0.9(15 - 5) = 5 + 0.9(10) = 5 + 9 = 14\% \end{aligned}$$

$$\begin{aligned} E(R_{\text{AML}}) &= rf + \beta_A (E(rm) - rf) \\ &= 5 + 0.7(15 - 5) = 5 + 0.7(10) = 5 + 7 = 12\%. \end{aligned}$$

$$\begin{aligned} E(R_{\text{BGL}}) &= rf + \beta_B (E(rm) - rf) \\ &= 5 + 1.2(15 - 5) = 5 + 1.2(10) = 5 + 12 = 17\% \end{aligned}$$

Using the CAPM the merged group would have an expected return of 14% and a beta of 0.9

Using the CAPM before the merger AML has an expected return of 12% and a beta of 0.7.

Using the CAPM before the merger BGL has an expected return of 17% and a beta of 1.2

Unlike using the standard deviation to calculate risk, with the CAPM the group beta is a simple weighted average of the individual betas. Hence there is no "benefit" to diversification as investors are assumed diversified anyway.

With the merger, shareholders in AML will trade a higher return (14 instead of 12) for a higher risk (0.9 instead of 0.7). So we cannot say unambiguously whether the merger is beneficial or not to AML.

With the merger, shareholders in BGL will trade off a lower return (14 instead of 17) for a lower risk (0.9 instead of 1.2). So similarly for BGL, we cannot say unambiguously whether the merger is beneficial or not.

Question 3 Part c)

4 marks for discussion and 6 marks for diagram = 10 marks in total

CAPM: $E(R_{AML}) = 12\%$. But expected return for AML = 11%

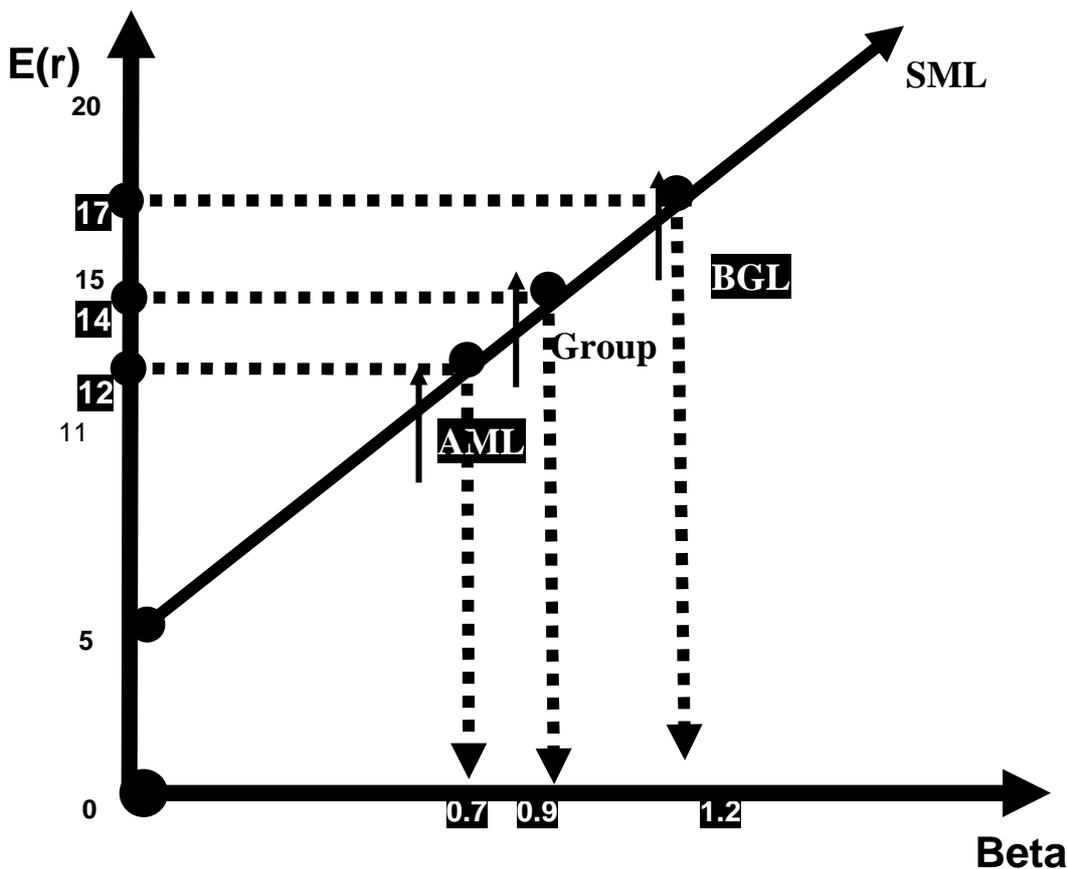
Using beta as a measure of risk, the return AML are receiving is too low. AML has an expected return of 11% but given their risk CAPM would expect a return of 12%. Hence according to CAPM it is overvalued. If CAPM holds in the long run, AML's price should fall and its return should rise.

CAPM: $E(R_{BGL}) = 17\%$. But expected return for BGL = 15%

Using beta as a measure of risk, the return BGL are receiving is too low. AML has an expected return of 15% but given their risk CAPM would expect a return of 17%. Hence according to CAPM it is overvalued. If CAPM holds in the long run, BGL's price should fall and its return should rise.

CAPM: $E(R_{Group}) = 14\%$ But expected return for the Group = 12.6%

Using beta as a measure of risk, the return in the combined group is too low. The combined group has an expected return of 12.6% but given its risk CAPM would expect a return of 14%. Hence according to CAPM the combined group is overvalued. If CAPM holds in the long run, the combined group's price should fall and its return should rise.



Question 2 Part d)

2 marks each for discussion of Modern portfolio theory, risk and diversification = 6 marks in total

Portfolio theory deals with the value and risk of portfolios rather than individual securities. It is often called modern portfolio theory or Markowitz portfolio theory. The key result in portfolio theory is that the volatility of a portfolio is less than the weighted average of the volatilities of the securities it contains.

Volatility is important, as in modern portfolio theory we measure risk as the volatility of returns in that portfolio. As investors are assumed to be risk averse then for a given return the lowering of the volatility in a portfolio is preferred.

While it is possible for investors to avoid risk by only investing in risk free investments e.g. short term Government paper the expected returns will be low. Generally it is accepted that investors need a higher reward to take on higher levels of risk. Similarly, investors accept that the higher the return they can expect, the higher the level of risk they will have to bear, and vice versa. So it is important that we know what is meant by risk and how we measure it.

In modern portfolio theory we measure volatility and hence total risk of a portfolio by using standard deviation. This is the square root of the weighted average deviation of the returns on the individual stocks in a portfolio from the mean return, E.g. for a two asset portfolio, the standard deviation (= "the total risk of the portfolio") = $s_p = \sqrt{\{x_1^2 s_1^2 + x_2^2 s_2^2 + 2 x_1 x_2 r_{12}\}}$

Covariance (r_{12}) is a statistical measure of how 1 investment moves in relation to another. If 2 investments tend to be up or down during the same time periods, then they have positive covariance. If the highs and lows of 1 investment move in perfect coincidence to that of another investment, then the 2 investments have perfect positive covariance. If 1 investment tends to be up while the other is down, then they have negative covariance. If the high of 1 investment coincides with the low of the other, then the 2 investments have perfect negative covariance. If there is no discernable pattern to the up and down cycles of 1 investment compared to another, then the 2 investments have no covariance.

Because covariance numbers cover a wide range, the covariance is normalized into the correlation coefficient, which measures the degree of correlation, ranging from -1 for a perfectly negative correlation to +1 for a perfectly positive correlation. An uncorrelated investment pair would have a correlation coefficient close to zero. Note that since the correlation coefficient is a statistical measure, a perfectly uncorrelated pair of investments will rarely, if ever, have an exact correlation coefficient of zero.

Assuming that the covariance is less than one (invariably true), the standard deviation of the portfolio will be less than the weighted average of the standard deviation of the expected returns of the securities. This is why diversification reduces risk.

The most diversified portfolio consists of securities with the greatest negative correlation. A diversified portfolio can also be achieved by investing in uncorrelated assets, but there will be times when the investments will be either both up or both down, and thus, a portfolio of uncorrelated assets will have a greater degree of risk, but it is still significantly less than positively correlated investments. However, even positively correlated investments will be less risky than single assets or investments that are perfectly positively correlated.

Question 3 Part a)

5 marks for workings and 1 mark for recommendations = 6 marks in all.

The PV of a growing perpetuity may be found using the following formula: $PV = C_1 / r - g$.
 NPV = PV of the benefits – PV of the costs, (in this case the initial investment).

| Investment | Maximum allowed Investment | Expected return in Year 1 | Expected annual growth | Appropriate discount rate | PV | NPV |
|--------------|----------------------------|---------------------------|------------------------|---------------------------|-------------|------------|
| A | € 9,000,000 | €400,000 | 11.0% | 15% | €10,000,000 | €1,000,000 |
| B | € 7,500,000 | €350,000 | 10.0% | 15% | € 7,000,000 | -€ 500,000 |
| C | € 7,000,000 | €300,000 | 8.0% | 12% | € 7,500,000 | € 500,000 |
| D | € 3,500,000 | €300,000 | 8.0% | 14% | € 5,000,000 | €1,500,000 |
| E | € 2,500,000 | €150,000 | 6.0% | 10% | € 3,750,000 | €1,250,000 |
| Total | €22,000,000 | | | | | €4,250,000 |

According to finance theory a firm with positive NPV projects will be able to get all the financing it needs. In theory lenders and equity investors should be willing and able to invest in all positive NPV projects. Thus Max Phibbs should invest in ALL four POSITIVE projects, (A and C to E), at a cost of €22m and his total NPV will be €4,250,000. As Project B is a negative NPV project it should be rejected. Any surplus funds are better invested in a zero NPV project than a negative one.

Question 3 Part b)

2 marks for PI and rankings and 2 marks for (i) and 1 mark for (ii) = 5 marks in all.

| Investment | Maximum allowed Investment | Expected return in Year 1 | PV | NPV | PI | Rank by NPV | Rank by PI |
|--------------|----------------------------|---------------------------|-------------|------------|-------|-------------|------------|
| A | € 9,000,000 | €400,000 | €10,000,000 | €1,000,000 | 1.111 | 3 | 3 |
| B | € 7,500,000 | €350,000 | € 7,000,000 | -€ 500,000 | 0.933 | 5 | 5 |
| C | € 7,000,000 | €300,000 | € 7,500,000 | € 500,000 | 1.071 | 4 | 4 |
| D | € 3,500,000 | €300,000 | € 5,000,000 | €1,500,000 | 1.429 | 1 | 2 |
| E | € 2,500,000 | €150,000 | € 3,750,000 | €1,250,000 | 1.500 | 2 | 1 |
| Total | €22,000,000 | | | €3,250,000 | | | |

As noted above as project B is a negative NPV project it is ignored and should never be selected. Any surplus funds are better invested in a zero NPV project than a negative one.

As the total required to invest in all projects is €18.5m and funds are only €14m then we have so called Capital rationing.

In (i) investments are “divisible” so using the PI, choose projects in the profitability index order E, D, A then C until funds are spent.

So invest in projects E and D and 88.89% (€8.0m / €9.0m) of A.
 i.e. €14m – (€2.5m + €3.5m) = €8.0m

We do not have the funds to invest in Project C even though it is a positive NPV project,

Thus the total expected payoffs (NPV) of our €14m investment =
 = €1.25m + €1.5m + (88.89% of €1m) =
 = €2.75m + (€888,888.88) = €3,638,888.88

In (ii) if projects are non-divisible, linear programming could be used to choose the appropriate combination. Or more simply, since the budget of €14m here will allow us to invest in at most three but only three of the projects, choose projects E and D as they have the lowest investment requirement and highest NPV, the project A while having the next highest NPV is not obtainable as the remaining investment funds are only €8m but A requires €9m. So Project C is the final choice.

All remaining funds, i.e. €1m, to be invested in the NPV = 0 projects.

$$€14m - (€2.5m + €3.5m + €7.0m) = €1.0m$$

$$\begin{aligned} \text{Thus the total expected payoffs (NPV) of our €14m investment} &= \\ &= €1.25m + €1.5m + €0.5m = €3.25m \end{aligned}$$

Question 3 Part c)

1 mark for capital rationing, 1 mark for PI and 1 mark for reasons = 3 marks in all.

A situation, in which one is constrained by the availability of funds and cannot invest in every project with a positive NPV, is called capital-rationing. While in theory all positive NPV projects should be accepted in reality, many firms are capital rationed. They cannot get sufficient funds to finance all of their positive net present value projects. Having given out a loan or purchasing a bond, lenders can be unenthusiastic to lend more to the firm. Alternatively the firm may not wish to agree to a downgrade in its bond rating which might accompany more debt. Again, in theory, issuing new equity to invest in positive NPV projects should increase share price. However often this is often not the case. Firms may be reluctant to issue new equity because of the negative signal sent. The firm could be seen as signalling that its stock price is too high, and often experience a decline in market value when they announce a new secondary equity offering.

When one has to choose from a set of possible investments one should choose a combination of projects that maximises shareholder wealth, subject to the constraint of limited funds. A firm facing capital rationing can use profitability index, PI, to select projects. PI adjusts for scale, or size of the initial investment. Firstly all projects are ranked. The decision criteria is to take the project with the highest PI first. If any funds remain, then invest in the project with the second-highest PI, and so on until no more funds are left. This system will allow one to select a portfolio of projects that in aggregate generates a higher NPV than any other combination of projects.

The profitability index assumes that:

- Projects cannot be deferred to a subsequent time.
- Projects are divisible (i.e. portions of a project can be undertaken).
- Capital is rationed in the initial period only.

$$\text{Profitability index} = \frac{\text{Present value of future cash flow}}{\text{Value of initial investment}}$$

All projects with an index value > 1 are acceptable (i.e. they have a positive NPV).

If projects are divisible:

1. Rank projects from highest to lowest profitability index values
2. Choose the projects with the highest index values until available funds are depleted.

If candidates have not already done so in part (b), they should show their workings here of how they chose their selections.

In (i) investments are “divisible”. Using the PI, choose projects in the order E, D, A then C until funds are spent. So invest in projects E, D and 88.89%, (€8m / €9m) of A.

In (ii) as projects are indivisible, choose the combination of projects that gives the highest NPV within the budget. Since the budget of €14m here will allow us to invest in at most three but only three of the projects, choose projects E and D as they have the lowest investment requirement and highest NPV, project A while having the next highest NPV is not obtainable as the remaining investment funds are only €8m but A requires €9m. So Project C requiring only an investment of €7m is the final choice.

All remaining funds, i.e. €1m, to be invested in the NPV = 0 projects.

Even though project A is more “profitable” per euro invested than project C, $PI_A = 1.111$ vs. $PI_C = 1.071$ we still choose project C over A as its smaller scale makes it possible to invest in it within our budget compensating for its lower return giving a higher NPV than not investing the surplus €8m.

Question 3 Part d)**3 marks for the three key assertions, 3 marks for discussion of implications = 6 marks in all.**

The theorem by the American economist Irving Fisher, who first proposed this idea, that given efficient capital markets, firms (in effect, profit making companies) should concentrate on maximising their NPV rather than taking into account the cash flows that investors (shareholders) need.

The theorem can be broken down into three key assertions.

1. A firm's investment decisions are separate from the preferences of the firm's owners.
2. A firm's investment decisions are separate from a firm's financing decisions.
3. The value of a firm's investments is separate from the mix of methods used to finance the investments.

This is because an investor who needs cash can sell an investment, or part of it and an investor to whom an investment pays more cash than needed can re-invest it. This means that maximising investor's utility means maximising the NPV of their investments.

Thus, the attitudes of a firm's owners are not taken into consideration during the process of selecting investments, and the goal of maximizing the firm's value is the primary consideration for making investment decisions. Fisher's separation theorem concludes that a firm's value is not determined by the way it is financed or the dividends paid to the firm's owners.

In other words, we may also say that according to this theorem, the value of the business is independent from the strategy of financing the projects and also from the firm's decision on paying the dividends. This simplifies investment decisions because we can value investments without regard to investors' need for cash. Therefore we can use valuation models such as CAPM and APT to make investment decisions.

Section B: Two of the following three questions to be attempted, (30 marks in Total).

Question 4 Part a)

7 marks for outlining possible motives = 7 marks in all.

There are numerous possible motives, these would include:

Economic Justifications

1. Economies of Scale

- Reducing capacity (consolidation in the number of firms in the industry)
- Spreading fixed costs (increase size of firm so fixed costs per unit are decreased)
- Geographic synergies (consolidation in regional disparate operations to operate on a national or international basis)

2. Economies of Scope

3. Elimination of inefficient management

4. Entry to new markets

5. To provide critical mass

6. As a means of providing growth

7. Market power and share

8. Complementary Strengths

Financial Justifications

1. Financial synergy. Combination of two activities reduces costs.

Combining the different relative strengths of the two firms creates a firm with both strengths that are complementary to one another.

2. Target undervaluation

3. Tax consideration

4. Increasing EPS

Question 4 Part b)

6 marks for discussing failures in takeovers, 2 for discussing actual empirical examples / empirical studies = 8 marks in all.

It is widely reported that the level of failures in corporate acquisitions is high. Candidates are required to discuss the reasons for such a high failure rate and their answer should refer to examples of such 'failed' mergers and acquisitions.

Based on the most recent survey in this area, the leading reasons that so many deals in the past have failed are now widely known

Point should include the following:

- Not anticipating foreseeable events
- Paying too much for the acquisition
- Principal agent reasons, (managerial empire building)
- Not achieving the synergies anticipated
- General economic conditions or external events
- Incompatible cultures.

Question 5 Part a)

4 marks for discussing long term sources of finance, 4 marks for discussing strategic point of view = 8 marks in all.

In terms of strategy the reasons for needing long term finance are generally different to those relating to short term finance. From a strategic point of view long term finance may be needed to fund expansion projects. Examples of such a need would be:

- If a firm is considering establishing a new division.
- Purchase of a new premises
- A new product that they want to develop and launch
- Purchase of another company.

The financing of these projects can be quite complex and can involve substantial sums of money and hence large risks for the firm. Candidates are required to discuss the long term sources of finance and their answer should be from a strategic point of view. Long term sources of finance are those that are needed over a longer period of time - generally over a year.

- Issue new shares / increase owner's capital
- Retained profit
- Get venture capital
- Obtain a bank loan / Take on a mortgage / Issue bond
- Sell existing assets
- Obtain a government grant / Lottery funding

Question 5 Part b)

7 marks for discussing renewed emphasis on companies paying dividends = 7 marks in all.

In finance theory there are arguments both for and against the importance of dividend POLICY. While no one is arguing the importance of dividends in themselves, their timing (assuming unpaid dividends are reinvested back into the company) can be argued to be irrelevant under certain conditions.

The typical arguments AGAINST paying dividends, (not necessarily that dividend policy is irrelevant) is based on the idea that investors have the ability to create "homemade" dividends.

The second argument AGAINST paying dividends points out that taxation of dividends is higher than on capital gains. Therefore a low or no dividend payout is better for income tax paying investors.

That currently firms appear to be adopting a policy of paying / increasing dividends says more about the current economic situation than a major change in financial policy / financial theory.

Candidates are required to discuss why firms currently are paying / increasing dividends

There are numerous reasons put forward of which the following is probably the most important, currently there is much uncertainty in financial markets hence investors are looking for reassurance that the company is doing both well now and expects to do so in the future.

This therefore is saying that paying / increasing dividends is sending a signal to investors and the wider capital markets. The signalling theory of dividends discusses how managers use dividend policy to send signals about the firm's future earnings (Bhattacharya, 1979; Miller and Rock, 1985; and John and Williams, 1985). Thus the current policy of paying / increasing dividends is important for investors because:

- Dividends provide certainty about the company's current and financial well-being.
- Dividends are attractive for investors looking to secure current income.
- The change in dividend distribution can affect the price of a security.
- Currently companies that have a long-standing history of stable dividend payouts would be negatively affected by lowering or omitting dividend distributions.
- Currently companies would be positively affected by increasing dividend payouts or making additional payouts of the same dividends.
- Currently companies without a dividend history are generally viewed favourably when they declare new dividends.

Question 6 Part a)

5 marks for discussing difference between Internal Rate of Return (IRR) and Return on Capital Employed (ROCE).

Internal rate of return (IRR) is a profit objective used to determine the level annual return over the life of an investment of capital.

Return On Capital Employed (ROCE) measures the annual return of the investment over each accounting period.

IRR has been viewed as a statutory concept; that is, it is the expected level annual return over the life of an investment of statutory capital.

The term ROCE, is sometimes referred to as return on equity (ROE), return on capital (ROC), return on total capital (ROTC) and return on investment (ROI)

ROCE is a measure of how effectively the company is using its capital. The formula to measure the return on all the assets the company is using: Profit before interest and tax (PBIT) / (total assets - current liabilities)

ROCE is one of the most commonly employed metrics used by many business firms today. In simple terms it shows in percentage terms whether an investment has grown or shrunk within a specific period of time. Computing the ROCE involves two values, namely, the initial investment, and the resulting value of the investment (whether it grew or not). Thus if you have value A as the initial investment, and B as the resulting investment, your formula is simply: $ROI = (B - A) / A * 100/1$.

IRR is calculated as the interest rate that makes the present value of the cash flows from all the sub-periods in an evaluation period plus the terminal market value of the portfolio equal to the initial market value of the portfolio.

Compared to the ROCE, the IRR is a more complicated to calculate. This is because the IRR takes into consideration not just the increase of the investment value, but also the timing of the cash flow. This increase in mathematical difficulty is negated by the fact that most financial computer packages have built in IRR formulas.

IRR is said to be the more accurate metric compared to the ROCE because it can incorporate multiple variables or values in its equation.

Question 6 Part b)

5 marks for discussing difference between earnings yield and dividend yield as company valuation methods.

Earnings yield is the amount of earnings per share divided by the share price. It is the reciprocal of the P/E ratio. The earnings yield is quoted as a percentage, and is useful in comparing a stock, sector, or the market's valuation relative to bonds.

The earnings yield is also the cost to a publicly traded company of raising expansion capital through the issuance of stock. It is computed as (Earnings Per Share / Market Price Per Share). The earnings yield is quoted as a percentage, allowing an easy comparison to going bond rates.

The dividend yield or the dividend-price ratio on a company stock is the company's annual dividend payments divided by its market cap, or the dividend per share, divided by the price per share. It is often expressed as a percentage.

The reciprocal of the dividend yield is the Price/Dividend ratio. The dividend yield is related to the earnings yield via:

Earnings yield = dividend yield * dividend cover, and
Dividend yield = earnings yield * dividend payout ratio.

Unlike preferred stock, there is no stipulated dividend for common stock. Instead, dividends paid to holders of common stock are set by management, usually in relation to the company's earnings. There is no guarantee that future dividends will match past dividends or even be paid at all.

Due to the difficulty in accurately forecasting future dividends, the most commonly-cited figure for dividend yield is the current yield which is calculated using the following formula:

Current Dividend Yield = most recent full-year dividend / current share price.

Rather than using last year's dividend, some try to estimate what the next year's dividend will be and use this as the basis of a future dividend yield. Such a scheme is used for the calculation of the FTSE UK "Dividend+" Index. Estimates of future dividend yields are by definition uncertain.

Question 6 Part c)

5 marks for discussing difference between a bond with a warrant and a convertible bond.

In finance, securities known as "Convertible Securities" are instruments that can be converted into other securities.

A warrant is such a security as it gives the holder the option but not the obligation to buy stock of the company that issued it at a specified price, which is much lower than the stock price at time of issue. A call option also gives its holder the right to buy a share at a predetermined price, during a limited period of time. The main difference between warrants and call options is that warrants are issued and guaranteed by the company, whereas options are financial securities that are not issued by the company.

Warrants are frequently attached to bonds or preferred stock as a sweetener, allowing the issuer to pay lower interest rates or dividends. They can be used to enhance the yield of the bond, and make them more attractive to potential buyers.

A warrant is a convertible security that grants the holder the right to purchase securities (usually shares) from their issuer at a specific price within a certain time frame (usually one to four years). The warrant allows the purchase of securities in two instalments: when buying the warrant and when converting it. The share that the warrant holder receives upon exercise is a new one that the company issues. Similar types of warrants can be converted into securities other than stocks, such as bonds.

A convertible bond is a bond that can be converted into a predetermined amount of the company's equity at certain points during its lifetime, usually at the discretion of the bondholder, within a certain time frame. Essentially, it can be considered as a bond and a warrant bundled together in a single instrument. However, while the conversion feature is built into the price of a convertible bond, it is a separate component of a bond with a warrant attached.

With a convertible bond, at or before the maturity date the bondholder either receives the face value of the bond or the number of shares into which the bond is convertible. For a bond issued with warrants, the bondholder gets a straight bond, and also receives warrants giving the right to purchase shares at a given price. These warrants are usually detachable from the bond, meaning they can be sold separately if the bondholder no longer wants the option.

Issuing convertible bonds is one way for a company to minimize negative investor interpretation of its corporate actions. For example, if an already public company chooses to issue stock, the market usually interprets this as a sign that the company's share price is somewhat overvalued. To avoid this negative impression, the company may choose to issue convertible bonds, which bondholders will likely convert to equity anyway should the company continue to do well. Thus, convertible bonds have a built in value-added component from the investor's perspective. On the other hand, they tend to offer lower interest.

Question 6 Part d)

5 marks for discussing difference between exchange traded options versus Over The Counter (OTC) options.

In finance, an option is a derivative financial instrument that specifies a contract between two parties for a future transaction on an asset at a reference price. The buyer of the option gains the right, but not the obligation, to engage in that transaction, while the seller incurs the corresponding obligation to execute the transaction. In return for granting the option, called writing the option, the originator of the option collects a payment, the premium, from the buyer. The writer of an option must make good on delivering (or receiving) the underlying asset or its cash equivalent, if the option is exercised.

Exchange-traded options (also called "listed options") are a class of exchange-traded derivatives. Exchange traded options have standardised contracts, and are settled through a clearing house with fulfilment guaranteed by the credit of the exchange. Since the contracts are standardised, accurate pricing models are often available. Exchange-traded options include stock options, commodity options, bond options and other interest rate options, stock market index options or, simply, index options and options on futures contracts and finally callable bull/bear contracts.

Over The Counter (OTC) options

Over-the-counter options (OTC options, also called "dealer options") are traded between two private parties, and are not listed on an exchange. The terms of an OTC option are unrestricted and may be customised ad hoc to the desires of the buyer to meet any business need. In general, at least one of the counterparties to an OTC option is a well-capitalised institution, usually an investment bank.

Option types commonly traded over the counter include interest rate options, currency cross rate options and options on swaps or swaptions.

For exchange-traded options the exchanges play the key role of acting as the counterparty to all trades. This means you are not buying the options directly from the seller but instead from the exchange. The fact that the exchange stands on the other side of all trades in exchange traded markets is one of their key advantages as this almost completely removes counterparty risk, or the chance that the person who you are trading with will default on their obligations relating to the trade, (assuming the exchange itself does not default).

A second key advantage of exchange traded options is that as all trades flow through one central place, the price that is quoted for a particular instrument is always the same regardless of the size or sophistication of the person or entity making the trade. This in theory should create a more level playing field which can be an advantage to the smaller and less sophisticated trader.

Lastly, because all firms that offer exchange traded options must be members and register with the exchange, there is greater regulatory oversight which can make exchange traded markets a much safer place for individuals to trade options.

The downside that is often cited about exchange traded option markets is cost. As the firms who offer exchange traded options must meet high regulatory requirements to do so, this makes it more costly for them to offer these options, a cost that is inevitably passed along to the end user.

Secondly, as all trades in exchange traded options must flow through the exchange this gives these for profit entities immense power when setting things such as exchange fees which can also increase transaction costs for the end user.

The biggest advantage to over the counter markets is that because there is no centralised exchange and little regulation, there is heavy competition between different providers to attract the most traders and trading volume to their firm. This being the case transaction costs are normally lower in over the counter markets when compared to similar option products that trade on an exchange.

As there is no centralised exchange the firms that make prices in the instrument that is trading over the

counter can make whatever price they want, and the quality of execution varies from firm to firm for the same instrument. While this is less of a problem in liquid markets such as FX options where there may be multiple price reference sources, it can be a problem in less highly traded instruments.

While the lack of regulation can be seen as an advantage in the above sense it can also be seen as a disadvantage, as the low barriers to entry and lack of heavy oversight also make it easier for firms offering trading to operate in a dishonest or fraudulent way.

Lastly, as there is no centralised exchange the firm that you trade with when you trade in an over the counter option market is the counterparty to your trade, so if something happens to that firm you are in danger of losing not only the trades you have with that firm but also your account balance.

Question 6 Part e)

5 marks for discussing difference between the approaches to corporate governance in the UK, (same as Ireland) and the US.

Corporate governance is a means to an end and not an end in itself. Good corporate governance promotes economic activity and prosperity by inspiring trust in companies and corporations so that people have confidence to do business and invest.

As a subject, corporate governance is the set of processes, customs, policies, laws, and institutions affecting the way a corporation is directed, administered or controlled. Corporate governance also includes the relationships among the many stakeholders involved and the goals for which the corporation is governed.

It is widely believed that the US and the UK (and Ireland) share an Anglo-American approach to corporate governance. Indeed common language, similar ownership structures, high levels of transparency and unitary board models would seem to justify such an assumption.

However in the UK and Ireland the approach to corporate governance tends to be one of rules with which firms must “comply or explain” if not. In other words these rules are not legally binding. Failure to observe them may result in issues with the financial markets but not with the law.

In the United States the approach to corporate governance tends to be legal. US corporations are directly governed by state laws, while the exchange (offering and trading) of securities in corporations (including shares) is governed by federal legislation.

There has been much interest in corporate governance, particularly due to the high-profile collapses of a number of large corporations, most of which involved accounting fraud. Corporate scandals of various forms have maintained public and political interest in the regulation of corporate governance. In the U.S., these include Enron Corporation and MCI Inc. (formerly WorldCom). Their demise is associated with the U.S. federal government passing the Sarbanes-Oxley Act in 2002, intending to restore public confidence in corporate governance. In the UK since the establishment of the Cadbury Committee in 1991, there have been many reports on and developments in corporate governance area.

Many U.S. states have adopted the Model Business Corporation Act, but the dominant state law for publicly-traded corporations is Delaware, which continues to be the place of incorporation for the majority of publicly-traded corporations. Individual rules for corporations are based upon the corporate charter and, less authoritatively, the corporate bylaws. Shareholders cannot initiate changes in the corporate charter although they can initiate changes to the corporate bylaws.

In the UK, board directors are responsible for directing the affairs of the company and are accountable to shareholders for the stewardship of their investment. The fact that UK shareholders have the authority to appoint or remove a director encourages an environment where the use of such power is rarely needed. The threat alone is sufficient to ensure that boards take shareholders' concerns seriously and are

sensitive to shareholder opinion on governance matters.

In contrast, US shareholders can do little to influence board composition except to withhold votes to signify their dissatisfaction. In fact, shareholders in the US have little redress in holding boards to account save for resorting to litigation or, provided that their portfolios are not index-linked, selling their shares.

There is a higher concentration of shareholding among fewer institutions in the UK compared with the US, which has led to unique engagement behaviour. Close proximity of institutions facilitates an organised and generally cohesive approach to engagement. The UK regulatory environment supports shareholder collegiality by permitting dialogue between boards and investors and not presuming that such dialogue represents privileged disclosure, which is restricted by fair disclosure regulation in the US; allowing dialogue among investors without triggering concert party issues; and it is free of the divisive threat of class action litigation.

In contrast, the sheer size of the US markets and the greater number of institutions mean that mobilising shareholders to defend collective interests is more difficult.

Question 6 Part f)

5 marks for discussing difference between Beta and Standard Deviation as measures of risk in a portfolio.

While it is possible for investors to avoid risk by only investing in risk free investments e.g. short term Government paper the expected returns will be low. Generally it is accepted that investors need a higher reward to take on higher levels of risk. Similarly, investors accept that the higher the return they can expect, the higher the level of risk they will have to bear, and vice versa. So it is important that we know what is meant by risk and how we measure it.

Standard deviation, or total risk, is the square root of the weighted average deviation of the returns on the individual stocks in a portfolio from the mean return, E.g. for a two asset portfolio, the Standard Deviation (= "the total risk of the portfolio") = $s_p = \sqrt{\{x_1^2 s_1^2 + x_2^2 s_2^2 + 2 x_1 x_2 r_{12}\}}$

Beta measures the sensitivity of a stock's return to the return on the market portfolio. It is the slope of a regression line, and it equals the covariance of the return on a security with the return on the market divided by the variance of the market return i.e. $\text{Beta}_i = \text{Cov}_{im} / s_M^2$

For an investor with an undiversified portfolio, it is total risk or standard deviation which is the most appropriate measure of risk.

For an investor with a diversified portfolio, it is the beta not the standard deviation of the portfolio which is the most appropriate measure of risk.

The risk-return relationship an investor will be willing to accept will be a personal decision, influenced to a great extent by their attitude to risk i.e. their degree of risk aversion.

The standard deviation or total risk of so called 'risky investments' can be broken down into two forms, namely: unsystematic risk which is diversifiable and systematic risk which is undiversifiable.

While standard deviation includes both unique risk and systematic risk, the market only compensates for systematic risk. There is no return for taking on unique risk that is diversifiable.

Only the systematic risk of a security is incorporated into the beta term of the capital asset pricing model.

The systematic risk remaining in a portfolio reveals how that portfolio responds to changes in the value of the market portfolio. Some shares will be more cyclical and hence more responsive to changes in the value of the market portfolio. These are considered inherently more risky than other portfolios. Any investor wishing to invest in such shares must accept the associated level of risk which is undiversifiable.

The market portfolio is a portfolio of all assets in the economy. In practice a broad stock market index, such as the S&P Composite, is used to represent the market. By definition the Beta of the market portfolio is one and that of the risk free asset is zero. While beta does not directly measure risk, it is a crucial risk indicator, reflecting the extent to which the returns on the single asset move with the market.

CAPM states that $E(r_i) = r_f + \{E(r_m) - r_f\} \cdot \beta_i$

Unlike standard deviation, Beta is not a measure of total risk but a measure of relative risk, the risk of an asset relative to the market. Beta is also a measure of market risk. Market risk accounts for most of the risk of a well-diversified portfolio.

**(3 x 5 marks)
(15 marks in total)**