Explain 2 methods by which foreign project can be evaluated?

1st method: -take foreign CF as given.
-discount that foreign CF with foreign interest rate.
-calculate NPV.
-convert NPV to domestic currency at current spot rate.

2nd method:

-working out the forward exchange rate for each year of the project (using spot rate& interest rate that exist between 2 countries).
-converting foreign CF into domestic CF using forward rate.
-the domestic CF are discounting with domestic WAAC.
-calculate NPV

Companies prefer the 1st method, because they are worried about unpredictability of exchange rate over time.

Why would you not exercise an option early? When might you exercise early?

The option price is made up of exercise value and time value during its life. At expiry it will only have exercise value. If you exercise early you will lose the time value (which has a value up to the point of expiry, because potentially anything could happen to the share even one day before expiry – a bid might come along, an accounting black hole may be discovered).

Early exercise may be worthwhile if the company announces a special dividend (shares at 500p announces a 100p special dividend, which would reduce the share price to 400p). The option holder does not receive the special dividend, the shareholder does, by exercising their option the option holder becomes a shareholder.

With regard to foreign assets, what should a company hedge?

Foreign assets will either be real assets (land, buildings etc) or financial assets (cash flows). Real assets will be protected in that they will rise with any inflation in the foreign country so they don't need to be hedged. Financial assets will be affected if the foreign currency weakens – resulting in less £ when converted back, so businesses need to hedge their cash flows in overseas markets.

Forwards, Futures, Swaps & Options (derivative instruments)

-Their value is derived from the price performance of an underlying asset.
-Forwards, futures and swaps are terminal instruments, meaning that there has to be a closing transaction to the contract (it is a legal obligation).
-With options, the holder has the choice of whether they want to complete the transaction.

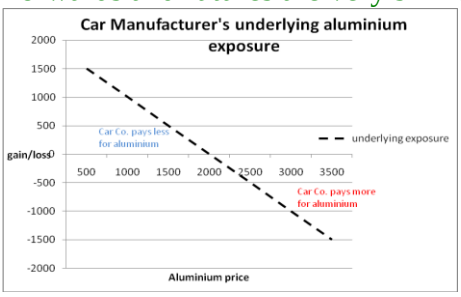
1-Forwards:

They do not require any up front premium.
They are settled at expiry with the selling bank.
They are most suited to smaller companies.
They do not require any cash flows before expiry, unlike futures where there may be intermediate cash flows.

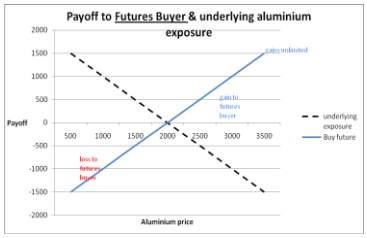
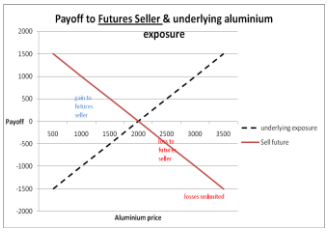
2- Futures:

-They are exchange-traded derivatives (over-the-counter instruments)
-They require an **up-front margin payment** and often **further payments** during the life of the contract.
-The product is standardized and there is no credit risk.
-Fund managers could use the futures market to gain access to the stock market if they wanted to invest but were still waiting for funds to come through.
-The futures' purchase involves a fractional payment for exposure to the underlying asset.

Forwards and futures are very similar in nature, so the payoff diagrams are the same.



Imagine a situation where you have a user of aluminium, say a car manufacturer, and the producer of aluminium, a large steel company. The aluminium price has been volatile over the past few years.

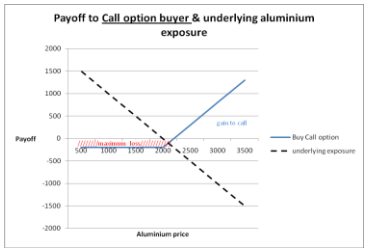
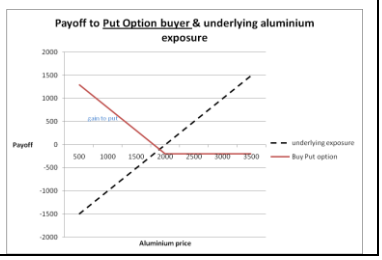
A car manufacturer	The producer of aluminium
Like to buy when price is low	Like to sell when price is high
Worried about having to buy higher &higher price, which will eat their profit.	Worried if the price fall, so they failing to generate enough cf to serve their obligation.
To remove risk, they could buy future contracts; say the three month futures price for aluminium is $2000 per tonne. This will lock them in at $2000. - If the price of aluminium goes up to $3000, then they will have to pay $3000 per tonne in the market place, but they could then sell their futures contract for $3000. They will have lost $1000 relative to the aluminium price today on the underlying aluminium, but they will have made $1000 on the futures contract, which they have just closed by selling it. They have a fixed price of $2000. Buy futures contract payoff  	To remove risk, they could sell the futures contract. If the price of aluminium had fallen by the time they have to sell the product, then the future could be closed out (bought back) for less than it was sold for. The producer would make a profit on the futures contract, but a relative loss on the cash aluminium sale. For example, if the price of aluminium was $2000 and the producer sold a three month futures contract for $2000 and the price in three months was $1500, then they could buy the future at $1500. They would make a profit of $500 on the future, but lose $500 on the cash aluminium sale. There net price would be $2000. Payoff to Future contract seller 

They have eliminated price risk from that part of their operation. But what happens to the car manufacturer if they had bought the future and the price had gone down? They would be locked in to the $2000 price, but they might regret the decision, especially if the price had fallen to $1500. And even more so if their rivals had not hedged.

There is a way for the car manufacturer to protect themselves against rising aluminium prices, but retaining the ability to benefit from falling aluminium prices. They could buy an option.

3- Options:

- are insurance products; you pay a premium.
- they give the holder the right but not the obligation to perform the contract.

A car manufacturer	The producer of aluminium
-they bought a call option -you are protected against the adverse move(high price), but you can take advantage of a favourable move(low price) in your direction. 	-They would buy a put option. -If the price falls you use your insurance contract,if the price rises, you let it lapse. 

4-Swaps:

-The main types of swap are interest rate swaps and foreign currency swaps.
-A swap is an over the counter contract, ie, a purchaser of the interest rate swap might be a business seeking longer term protection over interest rates(to achieve a lower cost of borrowing) and the seller is likely to be a bank.
-Interest rate swap is effectively a package of sequentially dated forward contracts for an agreed period of time. This time period might be 5 years or 10 years, whereas the single forward contract might just be six months in the future. So, one of the benefits of the swap is that it gives the company entering the transaction certainty over a longer period of time, and they don't need to negotiate a new forward contract every six months.

What exactly happens when a company enters a swap contract?
-The company and the bank agree a notional sum of money, which may match a borrowing requirement from the company.
-The company may be able to enter into a swap agreement whereby they swap their floating interest rate cash payments for fixed payments. The agreement might state that the company has to pay the fixed rate and the bank will pay floating, LIBOR -0.5%.
-After six months, the bank will pay floating interest of LIBOR -0.5% to the company and the company will pay the bank the fixed rate.

-The actual amounts are not paid, only the net difference between the fixed and the floating rates. So, sometimes the bank will pay the company some money (if interest rates rise) and sometimes the company will pay the bank (if interest rates fall).
-This means the company has removed its exposure to fluctuating interest rates and it will be better off than if it had simply borrowed at a fixed rate originally – this is because they would be paying a higher rate based on their standing and reputation in the market, what the swap does is it allows them to lower that effective borrowing rate by entering into the swap arrangement with the bank or other financial institution.
-In the swap only the interest rates are swapped, no capital is swapped.

*Real option:

-Call & put option are financial option.
- Real options are different,They are options that companies can have that might be activated at some point in the future.
-It could be an option to expand, an option to delay an investment, an option to abandon.
-Because of the nature of real options, conventional capital budgeting is not appropriate for their evaluation.

**option to expand:*
- a company might have an existing project, which has a negative NPV. It might be a strategically important, so the company are looking for some way of justifying the investment. This is where real options comes in. By doing the first project, this may give the company an entry into a second project at some time further in the future.
- Examples are some of the **early investments** *in the* **internet** *& a* **new drug.**
- These were loss making for parent companies but allowed the company to have a presence in that market which made it easier to expand when that market had grown sufficiently. To have not invested would have meant the company would have to do an awful lot of catching up.
-The exercise price will be the investment required at some point in the future.
- The stock price is the present value of the follow on investment's cash flows at the point of investment.
- This requires you to estimate the possible size of the market for a product that doesn't exist yet at some point in the future(standard diviation).
- The time to expiry is the time until the company no longer has an exclusive option.

** **The option to abandon** a project. These are effectively put options.*
-You would reevaluate the project at different time points and if alternative strategies have more value, they would be adopted, e.g. selling the project, or switching the project.
-The abandonment (and switching) option gives the company more flexibility.

Another real option is the timing option.
- This gives the holder the option to wait a period of time before taking up the investment.
- It may be an option on an oil field and you wait to see what happens to oil prices.
- It may be a development plot of land when you wait and see what happens to residential prices and commercial prices before you exercise the option.
***The NPV of the first project would be calculated, and then the value of the real option would be calculated using the binomial or Black-Scholes option pricing model.*

-The value of the real option will be added to the NPV of the first project (which is negative) to give an overall NPV, which the company would like to be positive.
-The higher the volatility of the future project, the more valuable the option.
Of course, with the real option, it is only an option. When the time comes to invest in the second project, if the outlook is unattractive you can let the option lapse.

31. If you owned a business and needed to borrow £1m in 3 months time and there was considerable uncertainty over the direction of the next moves in interest rates, what would you do?

You would take out an interest rate option, this would enable you to benefit if interest rates went down (in your favour), while protecting you if interest rates went up. With forwards and futures you would be locked into the set rate whether rates went up or down. So you would not benefit if rates went down.

32. What are the arguments against hedging?

It can be costly in terms of the expertise needed to manage the hedging over time. If the underlying asset moves favourably for you, you will not be able to take advantage because you are locked in. This can give rivals who do not hedge an advantage over your company.

33. Who are most happy for a company to hedge, bankers, shareholders, bondholders, managers? How does a hedge work?

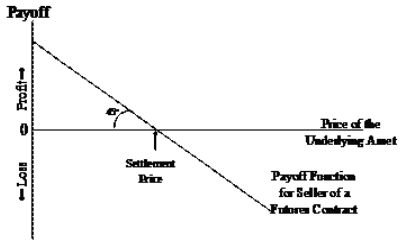
Bondholders and bankers would be most happy. *They would see certainty over the cash flows that the company generates. If the company was unhedged they may be lucky or they might be unlucky. It makes for a riskier company. Shareholders would prefer it when the company is lucky and unhedged, they will be angry if it is the other way round.*
Manager jobs *will be safer if there are no big mistakes, but they may lag behind companies that do not hedge at times.*

Hedging will lock in a fixed price for the hedger. It may be an airline that is worried about the price of aviation fuel. It is exposed to the rising oil price. If they do nothing they pay the higher oil price. If they hedge they take a position that will have the opposite effect to their exposure. With the rising oil price they face a loss, so the position they take would result in a profit, so they would buy oil futures. If the oil price rises, they lose out on the underlying, but they gain on the futures contract, locking in a fixed price.

Similarly, if you have a company that sells a product and they want to protect the selling price they can use the futures market to lock in a fixed price. Eg. Rio Tinto Zinc (RTZ) may want to hedge its copper output. RTZ is exposed to falling copper prices. If the copper price falls they will lose money. To hedge they take a position that would gain when there is a price fall, *so RTZ should **sell futures contracts**. If they sell the future and the price falls they will be able to close out the contract (by buying the future) and they will make a profit (eg, sell future at $1000 and then later buy the future at $900 closing the transaction, making a profit of $100. They have locked in a price of $1000 – they have lost $100 on the underlying, but gained $100 on the future). The future sale is shown below. This gives firms more certainty over their cash flows.*

28. What does it mean when you 'exercise' an option?

When you exercise an option you are buying the underlying asset at the exercise price you fixed at the outset. Eg take the case of Tesco (from Q.31), if the company was facing a take over bid for say 500p, you might decide that you want to own the shares – the bidding might go on past the June expiry, there might be another bidder. Your original option purchase gave you the right to buy Tesco shares at 430p each (– you paid 9.5p for that right), by exercising you will be able to buy Tesco shares at 430p even though they are trading at 500p in the market place (this means a call option seller has lost out as a result).



Most of the time options are not exercised – they are simply traded in the market place.

27. Give examples where you might encounter options in your everyday life

Insurance policies are put options. When you buy a put option, your option will gain in value if the underlying falls in value. If your car crashes its value goes down, you exercise your option and you get a car to the value of your insurance policy. The difference is that with financial options (American) you can exercise at any time, with European options you exercise at expiry. With an insurance policy you would exercise when the unexpected event happens. A deposit on a new house is like a call option. You have the first right to buy that house, you can let your option lapse or you can sell it on to someone else for a higher price if you can. The exercise price is the price offered to you by the house builder. If the housing market is rising, then the value of that new house will rise too. If it is currently being built, it may well be worth a lot more than your exercise price by the time it is finished.

The equity in a geared company is like a call option. The amount of debt the firm has is the exercise price(X), the value of the assets is the underlying asset value (S0), the interest rate is the coupon on the debt, etc.

19. Ford wants to build a car plant in Spain; does it make sense for Ford to raise debt finance in euros? Explain your answer.

Yes. Ford can hedge some of the risk on the project by matching the financing cash flows with the cash flows of the project. If the euro fell against the dollar from current levels the factory will be worth less, but so will be the loan (in $ terms) used to finance it. If the loan had been financed in $ and the euro fell, there would be less cash flow coming in (once converted into $) to service the debt.

Exam June 2008

1. Describe and explain when you would be likely to use (i) options, (ii) forwards, (iii) futures, and (iv) swaps. Clearly differentiate as to where you would use each particular product and explain why that product is suited to that situation.
(8 marks)

(i) Options are insurance products; you pay a premium for protection and if the bad event happens, you are protected. If the underlying moves favorably for you, you do not need to fulfill the option contract, you can take advantage of the good move. An example would be taking out **a foreign exchange option** *which protected you against a fall in the dollar. If the dollar goes up, an option allows you to take advantage of that move.*

(ii) Forwards are tailor made terminal products. They do not require any up front premium. They are settled at expiry with the selling bank. They are most suited to smaller companies, to markets that maybe do not have coverage in the futures market. They do not require any cash flows before expiry, unlike futures where there may be intermediate cash flows.

(iii) Futures are exchange-traded derivatives. They require an up-front margin payment and often further payments during the life of the contract. The product is standardized and there is no credit risk. Entry into the market is quick and usually anonymous. Fund managers could use the futures market to gain access to the stock market if they wanted to invest but were still waiting for funds to come through. The futures' purchase involves a fractional payment for exposure to the underlying asset.

(iv)Swaps are like a series of forward contracts without the need to continually renew the contract.
Companies will use swaps to try and achieve a lower cost of borrowing in either the fixed or floating market. ***Currency swaps*** *can also be used where you borrow at reasonable terms in your home market and then arrange a swap into the foreign currency at a much better rate than if you borrowed directly from that foreign market*

June 2009

2. Draw and clearly label the payoff diagram for a seller of a put option.
(4 marks)
3. Identify the five variables that go into the Black-Scholes option pricing model and explain how movements in these variables affect the price of a put option.
(8 marks)
The five variables are: share price, exercise price, interest rate, time to expiry and volatility.
The put price will rise as the share price falls (S0); the put price will rise as volatility (v) and time (t) to expiry increase. The put price will rise as the exercise price rises (X). The put price will fall as the interest rate (r) rises because you are effectively delaying the

sale (and receipt of funds that would earn interest) (£2.2m), and the area of gain would be the payoff if the project were successful £500000 (£2.7m – £2.2m). This would result in a near 150% gain on the original investment in the option.

June 2008

(c)Draw a payoff diagram for the original option strategy in part (a).

(d)Identify and discuss examples of the main categories of real options and explain how you would use and analyse real options.

(7 marks)

Real options are options to alter, abandon, or extend a project's cash flows at some future point. Because of the nature of real options, conventional capital budgeting is not appropriate for their evaluation.

Companies sometimes undertake projects that appear to have negative NPVs. The project is often undertaken because the company sees a future opportunity to expand the project which would make it much more valuable. So the company is willing to put up with early losses until the point in time comes when they have the option to expand the business. Examples are some of the early investments in the internet. These were loss making for parent companies but allowed the company to have a presence in that market which made it easier to expand when that market had grown sufficiently. To have not invested would have meant the company would have to do an awful lot of catching up.

There is also the option to abandon a project. These are effectively put options. You would reevaluate the project at different time points and if alternative strategies have more value, they would be adopted, e.g. selling the project, or switching the project. The abandonment (and switching) option gives the company more flexibility.

Another real option is the timing option. This gives the holder of the option the option to wait a period of time before taking up the investment. It may be an option on an oil field and you wait to see what happens to oil prices. It may be a development plot of land when you wait and see what happens to residential prices and commercial prices before you exercise the option.

The NPV of the conventional project would be calculated, then the value of the real option(s) would be calculated using the binomial or Black–Scholes option pricing model. The values for the options would then be added to the basic NPV of the project to give a true indication of the NPV of the project.

(e) It is often said that the equity in a geared company resembles a call option. Using the Black–Scholes variables discuss how the model works in general.

(6 marks)

If you have equity in a geared company, it is like a call option. The nominal value of the debt is the exercise price (X), the value of the underlying assets of the company is the S0 value, the time until the expiry of the debt, the maturity is the time (t) of the option, the variability of the cash flows of the company is the volatility (v) of the asset, and the interest rate on the debt, the coupon, is the (r) in the model.

If the value of the underlying assets is greater than the value of the debt at maturity, then the shareholders will buy the company back off the bondholders. If it is less than the value of the debt, the shareholders will let the option lapse, as is their right under limited liability. For the shareholders to buy the company back, S0/X must be greater than 1.0.

The longer the maturity of the debt, *the more valuable the company will be as there is more time for something beneficial happening.*
The more volatile the cash flows, *the more valuable the company will be.*
If interest rates are higher, *the equity value will be higher as the present value of the debt is lowered, due to the higher interest rate.*

(f) Your company also uses large amounts of cocoa in producing chocolate products. Describe how you could use the futures market to protect yourself as a buyer of cocoa and draw the payoff diagram for your futures strategy.
(4 marks)
If you were a buyer of cocoa, you would be worried that the price of the commodity would rise before you could buy it. You could buy futures contracts that would lock in a fixed price for your company. If the commodity rises in value, you will have to pay more than you did if the price had stayed the same, so you have a loss at this point. The future that you bought will rise in value offsetting the loss you suffer on the underlying as a result of the price rise. You will have hedged your commodity price risk. The payoff diagram is shown below. The buyer has to take a position opposite to the position he has at the time of inception. At inception, the cocoa buyer is effectively short because he needs to make a purchase at some point in the future. So the opposite of the short transaction is to take a long (buy) position.
The dotted line represents the payoff to the underlying as the market price of cocoa rises. The buyer loses out as the price rises. The solid line represents the payoff to the future. It gains as the cocoa price rises. The net effect is to cancel each other out and fix the price that the buyer will pay for cocoa, no matter what happens to the underlying price.

Dec 2009
(c) The company may have the opportunity of extending this project and the firm is able to test and research new equipment on site. The finance director says the project NPV is actually higher because there is a real option attached to the project. Explain what a real option is and how it works. Give two examples of situations where you could use real options.
The discounted cash flow (DCF) analysis is in a way quite rigid. It cannot adapt to build in changing information of the ability of managers to alter their minds as the business environment evolves. A company will have options to make strategic changes to a project during its life. This might be a decision to abandon the project, or to delay the project, to expand the project, to alter the levels of production, or to suspend a project. These options are ignored in traditional discounted cash flow analysis. DCF will produce a figure for the NPV; if that is negative the project will usually be rejected.
However, that project may contain one or more of these real options. In doing real options analysis it allows you to reject the unfavourable course of action and avoid the losses that are associated with that action. So a real options analysis can uncover extra value in a project and maybe make a negative NPV project into a worthwhile project.

June2012

2. Discuss how a large company would make use of an interest rate swap, and explain how the swap works. (6 Marks)

-The interest rate swap is an agreement between two parties to exchange interest payments in the same currency on an agreed amount of principal for a set period of time.
- One party is exchanging a stream of cash flow with a counterparty that provides the other cash flow.
-One party may want to swap fixed interest payments (which it may be able to borrow at an attractive rate) for floating rate payments. This situation may better suit the cash flows of its business. The other party may have an advantage in borrowing in the floating rate market.
-A bank is likely to act as the middleman in this arrangement for a fee.
- This arrangement has an advantage over conventional derivative products in the length of time that it can run for.
- Forwards and futures are for the relatively short term, where as swaps will run for years.
-There is counterparty risk in that you need to be sure that the other party will keep up the payments on the interest rate obligation that you have swapped with them.
-Using the swap can give companies a better match between their revenues and liabilities.

3. In this example, the equity has been valued as if it were a call option. Explain your understanding of the concept of equity being regarded as a call option in a geared company. Try and explain what the option variables are in the company and how they affect the value.

(6 Marks)

If you have equity in a geared company, it is like a call option. The nominal value of the debt is the exercise price (X), the value of the underlying assets of the company is the S0 value, the time until the expiry of the debt, the maturity is the time (t) of the option, the variability of the cash flows of the company is the volatility (v) of the asset, and the interest rate on the debt (the coupon) is the (r) in the model.
If the value of the underlying assets is greater than the value of the debt at maturity, then the shareholders will buy the company back off the bondholders. If it is less than the value of the debt, the shareholders will let the option lapse. This is their right under limited liability. For the shareholders to buy the company back, S0/X must be greater than 1.0. The longer the maturity of the debt, the more valuable the company will be as there is more time for something beneficial to happen.
The more volatile the cash flows, the more valuable the company.
The lower the interest rate, the more valuable the company will be.
Higher interest rates will lower the value.

Dec2012

(a) What advice would you give to the German company regarding hedging this investment? Justify your answer.

The German company is building a manufacturing plant in Russia, and as such will be subject to a number of risks associated with doing business in Russia. The company will face amongst others foreign exchange risk.

When hedging forex risk the company should look at the nature of the assets it is hedging. Real assets in the foreign country, such as the plant, machinery and real estate need not be hedged since they will rise in value along with local assets. Financial assets, such as the cash flow from the operations, if it is being repatriated back to Germany, do need to be hedged. There is a risk that cash flows that are due out of Russia may be worth less than expected if the exchange rate weakens against the euro.

- If the company had borrowed to make this investment, there is a danger that the translated cash flows may not be sufficient to service the debt, if the Russian Ruble were to weaken.

So the financial assets need to be hedged, to protect their value.

(b) Advise the company on the appropriateness of the different hedging products available. Explain why you would use certain products and not others.

(8 Marks)

The company can use Forward Rate Agreements (FRA), Futures contracts, swaps and Options. The first three are similar, but options are quite different.

FRAs involve the company setting the price now for delivery at some point in the future of an amount of currency. There is no cash flow to set the contract up, only a cash flow at expiry when the contract will be closed out at the agreed rate. If the currency moves up or down, the company is protected as they have fixed the exchange rate for that date in the future.

Any potential gains are sacrificed, but the company is covered against losses.

Futures are similar in that they fix a rate that you are willing to exchange at in the future.

-With futures, however, there may be intervening cash flows, as the contracts are exchange traded (FRAs are over-the-counter instruments) and a margin may have to be paid in to cover losses.

-Currency swaps are like long term forward contracts. These allow the company to effectively lock in long term exchange rates over the life of the project.

Each of these products are contractual obligations, the contracts must be fulfilled.

-Options are different; they involve the payment of a premium up front (which is like an insurance payment). They will protect the holder against an adverse movement. If there is an adverse movement in the option, it does not need to be fulfilled and the holder can walk away from the contract. The purchaser of the option contract will only lose as much as they pay for it at inception. This is not the case with futures and FRAs.

Options are much more expensive than the first set of products, so it is likely that the company would favour futures, forwards or swaps. If the exchange rate was particularly volatile, there may be times when it would have been very advantageous not to have hedged, but if the exchange rates are volatile, then the currency options would be very expensive to buy.