1. **Comment critically:**   
   The idea that the sole objective in business should be to maximize shareholder value is simply wrong. First, shareholder value” is ill-defined without a time horizon.  Wall Street demands performance in quarterly terms.  So there is a very important question of what time horizon or horizons matter.  Managers must be concerned about value in the short term because of pressures of analysts, as well as the long term for sustainability.  This introduces a multi-objective optimization setting, which is characteristic of all real-world decisions.  These are generally handled through “satisficing” (e.g., achieving an acceptable level of short term profit while maximizing long-term returns).  How to handle this in realistic settings is another complexity that is not captured by the simple “maximize shareholder value” characterization of business.
2. **Consider three call options on the same underlying stock and same expiration date. You buy the call with X=40, buy the call with X=30, and sell two calls with X=35. What is the payoff from your position if the stock prices ends at $32?**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Long Calls: | | Short Calls: | Payoff at Maturity: |
| X | $30 | $40 | $35 |  |
| Payoff | $2 | $0 | $0 | $2 |

1. **Same question as in 2. What is the highest payoff from this position? What is the lowest payoff from this position?**

The maximum payoff for this position is $5, when S=$35. When S=$35, you can exercise your long call (X=30) for a $5 payoff. Alternatively, the short call you sold is at-the-money, and the other long call (X=$40) is out-of-the money. Hence, they would not be exercised.

The lowest payoff from this position is $0.

1. **Same question as in 2. When would you engage in such a position?**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | S<30 | 30<S<35 | 35<S<40 | S>40 |
| X=30 | 0 | S-30 | S-30 | S-30 |
| X=40 | 0 | 0 | 0 | S-40 |
| X=35 | 0 | 0 | 2(S-35) | 2(S-35) |

You would engage in such a position when you expect to profit from a moderate price increase in the underlying asset. This strategy is known as a “bull spread.” Best case scenario, the option will mature with a stock price $35>S>$30.

1. **Comment critically:**“Speaking of the right way to maximize shareholder value, I’m sure that when you say “maximize shareholder value”, you do not propose doing so Mafia style by selling illicit drugs or engaging in murder.  Presumably you implicitly add a constraint “subject to the law”.  But is anything legal allowable?  What about making huge profits selling completely legal mortgage backed securities that you know are imposing intolerable risks on people without their knowledge?  Unless we believe the law is comprehensive and perfectly enforced, it is not sufficient to say that managers should maximize shareholder value subject to the law.  To cope with inevitable imperfections in the law, there must be some form of more binding constraint of the type “subject to proper behavior”.  I think that this argues that business must have a moral component to it.  What “moral” means, however, is open to varying interpretations.”
2. **Consider two call options on the same underlying stock and same expiration date. You buy the call with X=40, and sell the call with X=50. What is the payoff from your position if the stock prices ends at $32? What is the highest payoff from this position? What is the lowest payoff from this position? When would you engage in such a position?**

|  |  |
| --- | --- |
|  | Payoff: |
| Long Call (X=40) | max(0,32-40)=$0 |
| Short Call (X=50) | max(0,32-50)=$0 |
| Payoff at Maturity | =$0 |

The payoff from the position ending at S=$32 is zero (shown above). The maximum payoff from this position is $10, when S>=$50. The lowest payoff from this position is $0, when S<$40.

You would engage in a bull spread when you expect to profit from an increase in the value of the underlying asset. In this case, as long as the S>$40 when the option expires, you will expect a profit.

1. **Is a long put the same as a short call? Explain.**

No. A long put position gives the owner the right to sell the underlying asset at the exercise price. A short call position obligates the writer to sell the underlying asset at the exercise price.

1. **On January 11, I purchased a call option on Exxon at a premium of $14.5, exercise price of $50 and March 15, maturity. On January 21, I decide to close my position by buying a put option on Exxon at a premium of $8.5, exercise price of $50 and March 15, maturity. Is my original position closed? Comment critically.**
2. **On January 11, I purchased a straddle on Exxon with exercise price of $50 and March 15, maturity when Exxon was selling for $55 at a total cost of $11. On January 21, Exxon falls to $45 and I decide to close my position by exercising my options. Compute my profit/loss.**

S=$45

X=$50

Premium=$11

|  |  |  |
| --- | --- | --- |
| **Long Call:** | **Long Put:** | **Total Payoff:** |
| Payoff=max(0,s-x) | Payoff=max(0,x-s) |  |
| max(0,45-50)=0 | max(0,50-45)=5 | =$5 |

Profit=Payoff-Premium

Profit=5-11=$-6

1. **Explain why managers might want to hedge less if they are compensation by stock options (holding everything else the same).**
2. **Suppose that you noticed the following prices: P(X=45)=$0.5; P(X=50)=$6.0:   
   P(X=$55)=$10. Is there a profit opportunity here? Yes or no? If yes, how would you exploit it? If no, explain why not.**

There is a profit opportunity here. Since the convexity conditions are violated, you could take advantage of the initial cash flows from the option premiums.

|  |  |
| --- | --- |
|  | Initial Cash Flow |
| Buy 1 Call at X=$45 | -$0.50 |
| Sell 2 Calls at X=$50 | +$12 |
| Buy 1 Call at X=$55 | -$10 |
| Total Initial Cash Flow | +$1.50 |

1. **Suppose that you noticed the following prices: S=$48; P=$4; X=$50, for a one year European put option. The simple risk-free interest rate is 10% per year. Is there an arbitrage profit opportunity here? Yes or no? If yes, how would you exploit it? If no explain why not.**

This is not an arbitrage opportunity (shown below), because the lower bound is not violated. For the lower bound of a European put option to be violated, P<PV(X)-S.

|  |
| --- |
| P>PV(X)-S |
| 4>(50/1.1)-48 |
| 4>45.45-48 |
| 4>-2.55 |

1. **Suppose that you noticed the following prices: C=$12; S=$60; X=$50, for a one year European call option. The simple risk-free interest rate is 10% per year. Is there an arbitrage profit opportunity here? Yes or no? If yes, how would you exploit it? If no explain why not.**

This is an arbitrage opportunity (shown below), because the lower bound of the call option is violated. For the lower bound of a European call option to be violated, C<S-PV(X).

|  |
| --- |
| C>S-PV(X) |
| 12>60-(50/1.1) |
| 12>60-45.45 |
| 12>14.55 |

To exploit the opportunity:

|  |  |
| --- | --- |
| Buy the Call | -$12 |
| Short the Stock | +$60 |
| Lend $50 at Rf Rate | -45.55 |
| Immediate Cash | +$2.55 |

1. **Suppose that I expect the stock price of IBM to decline by about 5% over the next two months from $100 to $95. To monetize my view, I sell a put option on IBM with 2 months to maturity with X=100 and buy a put option again with 2 months to maturity on IBM and X=95. Is this a proper strategy for me? Explain.**

This is not the proper strategy. Since you believe the stock will decline in value, you want to replicate a bear spread. A bear spread requires buying and selling a put on the same underlying asset. The exercise price of the long put must be less than the exercise price of the short put. In the case mentioned above, this condition is not followed.

1. **You work for an importer of lumber. Your company buys lumber from Canadian loggers, priced in Canadian dollars. You would like to protect your company against exchange rate risk. What do you need to do? Explain.**

As an importer of Canadian lumber, you are worried about the Canadian dollar strengthening against your currency. In order to limit your exposure, buy call options on the Canadian dollar in short-term maturity intervals.

1. **Explain the terms strip, strap, risk reversal, and collars. Explain when you would want to use a strip, strap, risk reversal, or a collar.**

Strip: one call and two puts. Use a strip when the value of the underlying asset is expected to fall.

Strap: two calls and one put. Use a strap when the value of the underlying asset is expected to rise.

Risk Reversal:

Collar: buy a call option, sell a put. Zero initial out of pocket cost. Use the premium from selling the put to buy the call. This strategy limits price fluctuations to a certain acceptable range.

1. **I** **have $1 million to invest. The risk-free interest rate is 5%. I am very risk averse, and I definitely do not want to lose more than 10% of my money under any circumstances since I have a payment due of $900,000 exactly one year from now. Explain how you would construct a portfolio that keeps all the upside of the stock market and still satisfies my objective.**

Go long on the S&P spot index and purchase a long put on the same index. You participate in the upside of the market and limit downside risk to $900,000.

1. **Suppose that I expect the stock price of GM to increase by about 15% over the next two months from $50 to $57.50. To monetize my view, I sell a put option on GM with 2 months to maturity with X= $57.50 and buy a put option again with 2 months to maturity on GM and X=50. Is this a proper strategy for me? Explain.**
2. **Suppose that you noticed the following prices: C=$14; S=$60; X=$50, for a one year European call option. The simple risk-free interest rate is 10% per year. Is there an arbitrage profit opportunity here? Yes or no? If yes, how would you exploit it? If no explain why not.**

This is an arbitrage opportunity (shown below), because the lower bound of the call option is violated. For the lower bound of a European call option to be violated, C<S-PV(X).

|  |
| --- |
| C>S-PV(X) |
| 14>60-(50/1.1) |
| 14>60-45.45 |
| 14>14.55 |

To exploit this opportunity:

|  |  |
| --- | --- |
| Buy the Call | -$14 |
| Short the Stock | +$60 |
| Lend $50 at Rf Rate | -45.55 |
| Immediate Cash | +$0.55 |

1. **Our company produces gold, which is currently trading at $290 an oz. In trying to protect ourselves from gold price fluctuations, we sell a 1-year European call option on gold with exercise price $310 for $10 and buy a 1 year European put option with an exercise price $280 for $9. One year later, the price of gold drops to $250 an oz., at which time we deliver all of our gold and exercise and settle any options that are in the money. What is our net revenue from gold (per oz.) including the premiums we paid for the options?**

The net revenue from the gold is $281. The net difference between the premiums is $1 ($10 received-$9 spent). The short call expires worthless and the long call is in-the-money. Therefore, your net revenue is $281 ($280 gold + $1 premium spread).

1. **Our company uses jet fuel, which we purchase at the spot prices (currently $0.50 a gallon). In trying to protect ourselves from jet fuel price fluctuations, we sell a 1year European call option on jet fuel with exercise price $0.55 a gallon for $0.04 and buy a 1 year European put option with an exercise price $0.45 for $0.06. One year later, the price of jet fuel averages $0.55 a gallon for the whole year and ends up at $0.60 a gallon, at which time we exercise and settle the options that are in the money. What is net cost for the jet fuel purchases over the year including the premiums we paid for the options?**

The net cost of jet fuel purchases over the year per gallon is $0.62. The put option will expire worthless. The call option written is in-the-money. The net cost of jet fuel per gallon is listed below:

|  |  |
| --- | --- |
| Premium Spread | =$-0.06+$0.04=$-0.02 |
| Loss on Call Contract | =$0.55-$0.60=-0.05 |
| Our Company Cost Per Gallon | =$-0.55 |
| Net Cost of Jet Fuel Per Gallon | =$-0.62 |

1. **Our company buys corn to make corn flakes, which we purchase at the spot prices (currently $3 a bushel). In trying to protect ourselves from corn price fluctuations, we buy a 1-year European call option on corn with exercise price $3.50 a bushel for $0.12 and sell a 1 year European put option with an exercise price $2.50 for $0.12. (This is known as a zero-cost collar). One year later, the price of corn averages $2.35 a bushel for the whole year and ends up at $2.05 a bushel, at which time we exercise and settle any options that are in the money. What is net cost for our corn purchases over the year including the premiums we paid for the options?**

The net cost of corn over the year is $2.50. The call option expires worthless. The put obligation expires in-the-money and you are obligated to buy corn at $2.50 per bushel. The premium spread is $0.00.