Week 2 Questions

**CH4,Q14. You are faced with the probability distribution of the HPR on the stock market index fund given**

**in Spreadsheet 4.1. Suppose the price of a put option on a share of the index fund with exercise**

**price of $110 and maturity of one year is $12.**

**a. What is the probability distribution of the HPR on the put option?**

The probability distribution of the HPR on the put option consists of four things – the mean, the variance, the skewness and the kurtosis:

Mean: The mean is also the expected value of the HPR. Therefore, the expected value of the put option consists of two portions – the change in value of HPR plus the value of the put option, $12. Therefore, if we wanted to determine the mean of the HPR, we would have to find the expected value and then add the cost of the put option. Before we can determine what the equation will look like, we must determine what the possible outcomes may be:

|  |  |  |
| --- | --- | --- |
| ***Outcome*** | ***Option Exercised?*** | ***Net Outcome*** |
| Excellent | No | -$12 |
| Good | No | -$12 |
| Poor | Yes | 110 - 93.25 = $16.75 |
| Crash | Yes | 110 – 48 = $62 |

Therefore, if we were to purchase the option for $12, the expected net value of the option would be:

Because the put option gives us the chance to sell HPR in the future for a premium, any gains we realize from the sale will be balanced out with a repurchase of the same stock. Therefore, the influx of $110 is a gain realized and the expected value of the stock is an outflux of capital. Also, what makes this put option a bad decision is that, with the premium of $12, the expected value results in a loss.

Variance: We must also determine the spread of possibilities around the mean of 109.8625; the variance. To determine this, we must use the formula that determines variance:

The variance indicates that 66.67% of the potential possibilities lie between 100 ± 19.02, or in other words, between $80.98 and $119.02 and that 95% of the potential outcomes lie between $61.96 and $138.04.

**b. What is the probability distribution of the HPR on a portfolio consisting of one share of the**

**index fund and a put option?**

Mean: To begin, we must outline the potential outcomes that may arise from having one share and one put option

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcome | Option Exercised | Gain / Loss Realized on Stock | Gain / Loss realized on Option | Net Gain / Loss |
| Excellent | No | 131 – 100 = $31 | -$12 | 31 – 12 = $19 |
| Good | No | 114 – 100 = $14 | -$12 | 14 – 12 = $2 |
| Poor | Yes | 93.25 – 100 = -$6.75 | 16.75 – 12 = $4.75 | -6.75 + 4.75 = -$2 |
| Crash | Yes | 100 – 48 = -$52 | 62 – 12 = $50 | -52 + 50 = -$2 |

Therefore, the mean output / expected value of the portfolio is:

Therefore, we are expected to earn a mean of $5.46 on the portfolio.

Variance: to determine the variance, we will use the potential outcomes in the variance equation

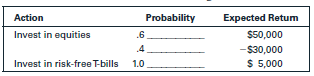
As can be seen, it is much less volatile and produces a positive expected value when diversifying using the put option and the stock option

**c. In what sense does buying the put option constitute a purchase of insurance in this case?**

The put option constitutes “insurance” in the sense that, if there is a loss associated with the long position with the share, the loss can be eliminated for the most part by purchasing the option to sell the stock at 110 in the future, $10 more than what the share was bought at originally. This option reduces the risk of losses down to a max of $2.

**CH4,Q20. Given $100,000 to invest, what is the expected risk premium in dollars of investing in equities**

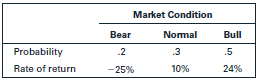
**versus risk-free T-bills based on the following table?**



The premium based on taking risk would be summarized by the difference between the difference in expected values of investments in equities and investments in T-bills. Therefore, the risk premium is as follows:

Therefore, the premium of holding risky shares is $13,000

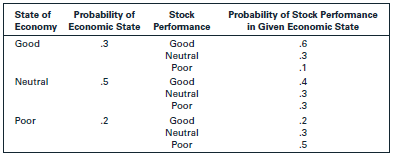
**CH4,Q21. Judging from the scenarios below, what is the expected return for a portfolio with the following return profile?**



The expected return would be a weighted average of the probabilities and the returns. Therefore, the expected return would be:

Therefore, the expected return for the portfolio would be 10%.

**CH4,Q23. Probabilities for three states of the economy, and probabilities for the returns on a particular stock in each state, are shown in the table below.**



**What is the probability that the economy will be neutral and the stock will experience poor performance?**

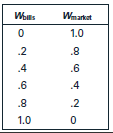
The probability that the economy will be neutral AND the stock will experience poor performance will result in the product of the two probabilities. Therefore, the probability of both the economy being neutral and the stock performing poor is:

Therefore, out of all the possibilities, there is a 15% chance that the stock will perform poorly while the economy is neutral.

**CH5,Q7, The expected return on T-bills is 5 percent and the same on the Composite index is 9.24 percent.**

**Calculate the expected return and standard deviation of portfolios invested in T-bills and the**

**Composite index with weights as follows:**



To produce a sensitivity analysis of the potential mean and standard deviation of the different combinations of the two bills, we will use excel and apply the equations of mean and standard deviation to the data. The following is an excerpt of the different weights:



**CH5,Q8, Calculate the utility levels of each portfolio of problem 7 for an investor with A=3. What do you conclude?**

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Because the market provides a greater return for the same variance in returns relative to the T-Bill, an investor with A=3 will be more attracted to investing into a portfolio with greater weights of the composite index.

**You manage a risky portfolio with an expected rate of return of 18 percent and a standard**

**deviation of 28 percent. The T-bill rate is 8 percent. Use these data for problems 10–19.**

**CH5,Q10. Your client chooses to invest 70 percent of a portfolio in your fund and 30 percent in a T-bill**

**money market fund. What is the expected value and standard deviation of the rate of return on**

**your client’s portfolio?**

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**CH5,Q11. Suppose that your risky portfolio includes the following investments in the given proportions:**

**Stock A: 27 percent**

**Stock B: 33 percent**

**Stock C: 40 percent**

**What are the investment proportions of your client’s overall portfolio, including the position in T-bills?**



Where W(Stock i) is the product of the weight of the given stock and the weight of the portfolio in the investor’s overall portfolio (70%)

**CH5,Q12, What is the reward-to-volatility ratio (S) of your risky portfolio? Your client’s?**

Reward-to-volatility is Risk Premium/Standard Deviation

Our reward-to-risk = (18-8)/28 = 0.3571

Client reward-to-risk = (15-8)/19.6 = 0.3571

**CH5,Q13, Draw the CAL of your portfolio on an expected return–standard deviation diagram. What is the slope of the CAL? Show the position of your client on your fund’s CAL.**

**CH5,Q14, Suppose that your client decides to invest in your portfolio a proportion y of the total investment budget so that the overall portfolio will have an expected rate of return of 16 percent.**

**a. What is the proportion y?**

0.16 = (W(t-bill)\*0.08) + (W(portfolio)\*0.18)

0.16 = ((1-w(portfolio))\*0.08) + (w(portfolio)\*0.18)

0.16 = 0.08-0.08x + 0.18x

0.08 = 0.10x

x = 80%

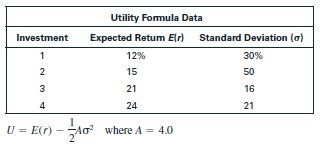
**b. What are your client’s investment proportions in your three stocks and the T-bill fund?**



**c. What is the standard deviation of the rate of return on your client’s portfolio?**

22.4%

Use the following data in answering problems 29, 30, and 31.



The following problems are based on questions that have appeared in past CFA examinations.

**CH5,Q29, On the basis of the utility formula above, which investment would you select if you were risk-averse?**

Investment 3 as it has the lowest SD

**CH5,Q31, The variable A in the utility formula represents the**

**a. Investor’s return requirement**

**b. Investor’s aversion to risk**

**c. Certainty-equivalent rate of the portfolio**

**d. Preference for one unit of return per four units of risk**

Answer: b

**CH5,Q35**

Answer: A