**Introduction to Mathematical Finance**

**Problem Sheet 2 Answer**

1. Which of the following is **most accurate** regarding a distribution of returns that has a mean greater than its median?

**A. A distribution with a mean greater than its median is positively skewed, or skewed to the right. The skew pulls the mean. Kurtosis deals with the overall shape of a distribution, not its skewness.**

2. A distribution of returns that has a greater percentage of small deviations from the mean and a greater percentage of extremely large deviations from the mean compared with a normal distribution:

**B. A distribution that has a greater percentage of small deviations from the mean and a greater percentage of extremely large deviations from the mean will be leptokurtic and will exhibit excess kurtosis (positive). The distribution will be more peaked and have fatter tails than a normal distribution.**

3. Which of the following types of data would most likely be organized as a two-dimensional array?

**A. Panel data combine time series data with cross-sectional data and are typically organized as data tables, which are two-dimensional arrays.**

4. The harmonic mean of 3, 4, and 5 is:

**B**. 

5. Given the following observations:

2, 4, 5, 6, 7, 9, 10, 11

The 65th percentile is **closest** to:

**C With eight observations, the location of the 65th percentile is:**

**(8 + 1) x 65/100 = 5.85 observations**

6. A stock doubled in value last year. Its continuously compounded return over the period was **closest** to:

**ln(2) = 0.6931**

A. XYZ Corp. Annual Stock Returns

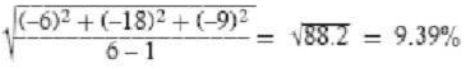
Assume an investor has a target return of 11% for XYZ stock. What is the stock’s target downside deviation?

**Deviations from the target return:  
22% -11% = 11%  
 5% - 11% = -6%  
-7% - 11% = -18%**

**11%-11% = 0%**

**2% - 11% = -9%**

**11%-11% = 0%**

**Target downside deviation = **

B. A study of hedge fund investors found that their annual household incomes are normally distributed with a mean of $175,000 and a standard deviation of $25,000. How much is the percentage of hedge fund investors that have incomes greater than $150,000?

**(150-175)/25 = -1 so z value is 0.8413.**

**1 – F(–1) = F(1) = 0.8413. There is an 84.13% probability that a randomly chosen income is not more than one standard deviation below the mean**

C. Given a threshold level of return of 0% and 4%, use Roy’s safety-first criterion to choose the optimal portfolio

**SFR = (18 – 4) / 40 = 0.35 is the largest value.**

D. Use the following table to answer:

- What is the cdf of 5, or F(5)?

**(0.04 + 0.11 + 0.18 + 0.24 + 0.14 + 0.17) = 0.88**

- What is the probability that *X* is greater than 3?

**(0.14 + 0.17 + 0.09 + 0.03) = 0.43**  
- What is ?

**(0.18 + 0.24 + 0.14 + 0.17) = 0.73**  
- What is The expected value of the random variable *X* ?

**0 + 1(0.11) + 2(0.18) + 3(0.24) + 4(0.14) + 5(0.17) + 6(0.09) + 7(0.03) = 3.35**

E. A recent study indicated that 60% of all businesses have a fax machine. What is the probability that exactly four businesses will have a fax machine in a random selection of six businesses?

**Success = having a fax machine.**

**[6! / 4!(6 – 4)!](0.6)4(0.4)6 – 4 = 15(0.1296)(0.16) = 0.311.**