

## Seminar 2

### Statistical concepts and market returns

- Which of the following groups *best* illustrates a sample?
  - The set of all estimates for Exxon Mobil's FY2015 EPS
  - The FTSE Eurotop 100 as a representation of the European stock market
  - UK shares traded on 13 August 2015 that also closed above £120/share on the London Stock Exchange
- Published ratings on stocks ranging from 1 (strong sell) to 5 (strong buy) are examples of which measurement scale?
  - Ordinal
  - Interval
  - Nominal
- A mutual fund has the return frequency distribution shown in the following table.

Return Interval (%)	Absolute Frequency
-10.0 to -7.0	3
-7.0 to -4.0	7
-4.0 to -1.0	10
-1.0 to +2.0	12
+2.0 to +5.0	23
+5.0 to +8.0	5

Which of the following statements is correct?

- The relative frequency of the interval "-1.0 to +2.0" is 20%.
- The relative frequency of the interval "+2.0 to +5.0" is 23%.
- The cumulative relative frequency of the interval "+5.0 to +8.0" is 91.7%.

1.

#### Example: Chebyshev's inequality

What is the minimum percentage of any distribution that will lie within  $\pm 2$  standard deviations of the mean?

2.

**Example: Coefficient of variation**

You have just been presented with a report that indicates that the mean monthly return on T-bills is 0.25% with a standard deviation of 0.36%, and the mean monthly return for the S&P 500 is 1.09% with a standard deviation of 7.30%. Your unit manager has asked you to compute the CV for these two investments and to interpret your results.

3.

**Example: The Sharpe ratio**

Assume that the mean monthly return on T-bills is 0.25% and that the mean monthly return and standard deviation for the S&P 500 are 1.30% and 7.30%, respectively. Using the T-bill return to represent the risk-free rate, as is common in practice, compute and interpret the Sharpe ratio.

4.

Use the following frequency distribution for Questions 2 through 4.

<i>Return, R</i>	<i>Frequency</i>
-10% up to 0%	3
0% up to 10%	7
10% up to 20%	3
20% up to 30%	2
30% up to 40%	1

2. The number of intervals in this frequency table is:  
A. 1.  
B. 5.  
C. 16.
3. The sample size is:  
A. 1.  
B. 5.  
C. 16.
4. The relative frequency of the second interval is:  
A. 10.0%.  
B. 16.0%.  
C. 43.8%.

5.

Use the following data to answer Questions 5 through 13.

**XYZ Corp. Annual Stock Prices**

<i>2003</i>	<i>2004</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>
22%	5%	-7%	11%	2%	11%

5. What is the arithmetic mean return for XYZ stock?  
A. 7.3%.  
B. 8.0%.  
C. 11.0%.

6. What is the median return for XYZ stock?
  - A. 7.3%.
  - B. 8.0%.
  - C. 11.0%.
  
7. What is the mode of the returns for XYZ stock?
  - A. 7.3%.
  - B. 8.0%.
  - C. 11.0%.
  
8. What is the range for XYZ stock returns?
  - A. 11.0%.
  - B. 22.0%.
  - C. 29.0%.
  
9. What is the mean absolute deviation for XYZ stock returns?
  - A. 5.20%.
  - B. 7.33%.
  - C. 29.0%.
  
10. Assuming that the distribution of XYZ stock returns is a population, what is the population variance?
  - A.  $6.8\%^2$ .
  - B.  $7.7\%^2$ .
  - C.  $80.2\%^2$ .
  
11. Assuming that the distribution of XYZ stock returns is a population, what is the population standard deviation?
  - A. 5.02%.
  - B. 8.96%.
  - C. 46.22%.
  
12. Assuming that the distribution of XYZ stock returns is a sample, the sample variance is *closest* to:
  - A.  $5.0\%^2$ .
  - B.  $72.4\%^2$ .
  - C.  $96.3\%^2$ .

13. Assuming that the distribution of XYZ stock returns is a sample, what is the sample standard deviation?
- A. 9.8%.
  - B. 72.4%.
  - C. 96.3%.
14. For a skewed distribution, what is the minimum percentage of the observations that will lie between  $\pm 2.5$  standard deviations of the mean based on Chebyshev's Inequality?
- A. 56%.
  - B. 75%.
  - C. 84%.

6.

Year-end prices and dividends for Nopat Mutual Fund for each of six years are listed below along with the actual yield (return) on a money market fund called Emfund.

<i>Year</i>	<i>Nopat Fund Year-End Price</i>	<i>Nopat Fund Year-End Dividend</i>	<i>Nopat Annual Holding Period Return</i>	<i>Emfund Return for the Year</i>
2004	\$28.50	\$0.14		3.00%
2005	\$26.80	\$0.15	?	4.00%
2006	\$29.60	\$0.17	?	4.30%
2007	\$31.40	\$0.17	?	5.00%
2008	\$34.50	\$0.19	?	4.10%
2009	\$37.25	\$0.22	?	6.00%

Average risk-free rate over the five years 2005–2009 is 2.8%. Risk-free rate for 2004 is 2.8%.

- A. Calculate the annual holding period returns for a beginning-of-year investment in Nopat fund for each of the five years over the period 2005–2009 (% with two decimal places).
- B. What is the arithmetic mean annual total return on an investment in Nopat fund shares (dividends reinvested) over the period 2005–2009?
- C. What is the average compound annual rate of return on an investment in Nopat fund made at year end 2004 if it were held (dividends reinvested) until the end of 2009?
- D. What is the median annual return on an Emfund investment over the 6-year period 2004–2009?
- E. What is the sample standard deviation of the annual returns on money market funds over the 6-year period, using the Emfund returns as a sample?
- H. What would have been the 1-year holding period return on a portfolio that had \$60,000 invested in Nopat Fund and \$40,000 invested in Emfund as of the beginning of 2009?
- I. What is the coefficient of variation of the Nopat Fund annual total returns 2005–2009 and of the Emfund annual returns for the six years 2004–2009? Which is riskier?
- J. What is the Sharpe ratio for an investment in the Nopat Fund over the five years from 2005–2009? What is the Sharpe ratio for an investment in the Emfund over the six years 2004–2009? Which Sharpe ratio is more preferred?
- K. Calculate the range and mean absolute deviation of returns for an investment in the Emfund over the 6-year period 2004–2009.
- L. What is the annual growth rate of dividends on Nopat Fund over the period from 2004–2009?