# ECO 261-Fall 2009

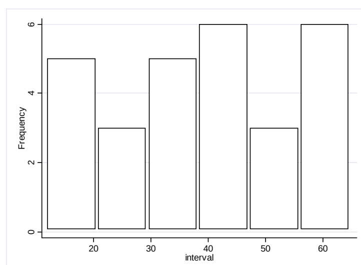
## Solutions for Problem Set 1

1) Since the number of observations are less than 50, the number of intervals must be chosen as 5 or 6.

If the number of intervals is chosen as 6$\Longrightarrow width = \frac{(65-12)}{6} \approx 9$

| Intervals | # of Observations |
|---|---|
| 12-21 | 6 |
| 22-31 | 2 |
| 32-41 | 9 |
| 42-51 | 3 |
| 52-61 | 4 |
| 62-71 | 4 |

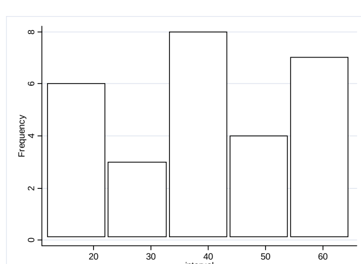
and the corresponding histogram is




If the number of intervals is chosen as 5$\Longrightarrow width = \frac{(65-12)}{5} \approx 10$

| Intervals | # of Observations |
|---|---|
| 12-22 | 6 |
| 23-33 | 3 |
| 34-44 | 10 |
| 45-55 | 3 |
| 56-66 | 6 |

and the corresponding histogram is



2) $\bar{X} = \frac{\sum_{i=1}^{n} X_i}{n} = Sample\ Mean = \frac{35}{10} = 3.5,\ Median = \frac{3.5+3.6}{2} = 3.55,\ Mode = 3.7$

3) a) $\bar{X} = \frac{\sum_{i=1}^{n} X_i}{n} = Sample\ Mean = \frac{375}{7} = 53.57,\ Median = 55$. No unique mode exists in the distribution.

b) Since the mean is slightly less than the median, the distribution is slightly negatively skewed or very close to symmetric distribution.

4) a) $\bar{X} = \frac{\sum_{i=1}^{n} X_i}{n} = Sample\ Mean = \frac{695.04}{24} = 28.96$

b) $s^2 = \frac{\sum_{i=1}^{n} (X_i - X)^2}{n-1} = Variance = \frac{(23-28.96)^2+(35-28.96)^2+(14-28.96)^2+\ldots\ldots(66-28.96)^2}{23} = 184.13$

$StandardDeviation = \sqrt{Variance} = \sqrt{184.13} = 13.57$

c) $Coefficient\ of\ Variation = CV = \frac{s}{\bar{X}} * 100\% = \frac{13.57}{28.96} * 100 = 46.86$

5) a) Use Chebychev's theorem. $+/-2$ standard deviations: proportion must be at least $100 * [1 - \frac{1}{k^2}] = 75\%$

b) Use the empirical rule. $+/-2$ standard deviations: Approximately 95% of the observations.

6) a) $+/-3$ standard deviations: proportion must be at least $100 * [1 - \frac{1}{k^2}] = 88.9\%$

b) $+/-2$ standard deviations: proportion must be at least $100 * [1 - \frac{1}{k^2}] = 75\%$

c) $+/-1$ standard deviations: Inconclusive based on Chebychev's theorem

7) a) $\mu_{Stocks} = \frac{\sum_{i=1}^{N} X_i}{N} = Population\ Mean = \frac{57.12}{7} = 8.16$

$\mu_{Tbills} = \frac{\sum_{i=1}^{N} X_i}{N} = Population\ Mean = \frac{40.502}{7} = 5.786$

The mean annual return on stocks is higher than the return for U.S. Treasury bills.

b) $\sigma_{Stocks} = \sqrt{\sigma^2_{Stocks}} = \sqrt{\frac{\sum_{i=1}^{N} (X_i - \mu_{Stocks})^2}{N}} = \sqrt{\frac{(4.0-8.16)^2+(14.3-8.16)^2+\ldots\ldots+(23.8-8.16)^2}{7}} = 20.648$

$\sigma_{Tbills} = \sqrt{\sigma^2_{Tbills}} = \sqrt{\frac{\sum_{i=1}^{N} (X_i - \mu_{Tbills})^2}{N}} = \sqrt{\frac{(6.5-5.8)^2+(4.4-5.8)^2+\ldots\ldots+(5.1-5.8)^2}{7}} = 1.362$

The variability of the U.S. Treasury bills is much smaller than the return on stocks.

c) As expected, the coefficient of variation for Treasury bills (23.5%) is much smaller than the coefficient of variation for stocks (253%).

8) Based on the empirical rule:

a) Since approximately 68% of the observations are within 1 standard deviation from the mean, approximately 84% of the observations will be greater than 425.

b) Approximately 97.5% of the observations will be less than 500.

c) Since all or almost all of the distribution is within 3 standard deviations from the mean, approximately 0% of the observations will be greater than 525.

9) a) $Cov(X,Y) = \frac{\sum_{i=1}^{n} (X_i - \bar{X})(Y_i - \bar{Y})}{n-1} = 2.333$. $X$ and $Y$ are positively correlated.

b) $Corr(X,Y) = \frac{Cov(X,Y)}{s_x * s_y} = \frac{2.333}{1.914 * 1.345} = 0.905$ Since $Corr(X,Y) > 0.5$, there is a strong correlation between $X$ and $Y$.