Econ 102 (Analysis of Economic Data): Cameron Spring 2016
Solutions to First Midterm Exam

Version A

1.(a) The three observations are missing, 2 and 4.
(e.g. $x_1 = 2$ in period 1 becomes $x_{2,-1} = 2$ in period 2).

(b) 18 years. The investment has doubled. At 4% per annum this takes $72/4 = 18$ years.

(c) (w−52)/2 since in general $(w - \bar{w})/s = (w - 52)/\sqrt{4} = (w - 52)/2$.

(d) 46.1%. The support was 7.0 percentage points higher (not 7.0% higher) so we can simply add 39.1+7.0.

(e) $\Delta \ln x = (7.29 - 7.15) = 0.14$. But $\Delta \ln x \simeq \Delta x/x$. So $\Delta x/x = 0.14$. A 14% percent increase.

(f) $\sum_{i=1}^{3} \left(2 + \frac{6}{i}\right) = \left(2 + \frac{6}{1}\right) + \left(2 + \frac{6}{2}\right) + \left(2 + \frac{6}{3}\right) = 2 + 6 + 2 + 3 + 2 + 2 = 17$.

2.(a) Yes. This can be a judgement call but it is pretty clear it is symmetric.
Mean .666 ≃ median = .68 OR skewness = −.17 ≃ 0.0.

(b) 95% lie in approximately $\bar{x} \pm 2 \times s = 0.6663 \pm 2 \times 0.1602 = 0.6663 \pm 0.3204 = (0.3459, 0.9867)$.
Or more precisely $\bar{x} \pm 1.96 \times s = 0.6663 \pm 1.96 \times 0.1602 = 0.6663 \pm 0.3136 = (0.3527, 0.9979)$.

(c) A 90 percent confidence interval is $56257 \pm t_{.05;193} \times 14536/\sqrt{194} =$
$= 56257 \pm 1.653 \times 1043.6 = 56257 \pm 1725 = (54532, 57982)$.

(d) Use command `mean earlycareer, level(90)`. Command `mean` is enough for credit. Or `ci mean`.

(e) $H_0 : \mu = 60000$ against $H_0 : \mu \neq 60000$ at level 0.10.
$t = (56257 - 60000)/(14536/\sqrt{194}) = -3743/1043.6 = -3.586$.
Since $|t| = 3.586 > t_{.05;193} = 1.653$ reject H_0.
We reject $H_0 : \mu = 60000$ at significance level .10.

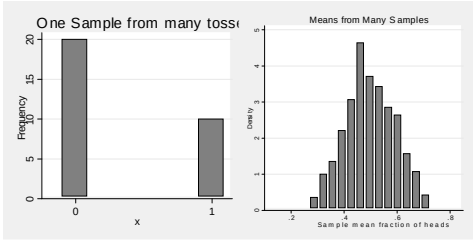
(f) Do not reject as $p = 0.06 > 0.05$.

3.(a) $\bar{x} = (12 + 15 + 13 + 12)/4 = 52/4 = 13$.
$s^2 = \frac{1}{n-1} \sum_{i=1}^{n} (x_i - \bar{x})^2 = \frac{1}{3}[(-1)^2 + (2)^2 + (0)^2 + (-1)^2] = \frac{1}{3}[1 + 4 + 0 + 1] = 6/3 = 2$.

(b) $\mu = \mathrm{E}[X] = 0.6 \times 10 + 0.3 \times 20 + 0.1 \times 30 = 6 + 6 + 3 = 15$.
$\sigma^2 = \mathrm{E}[(X - \mu)^2] = 0.6 \times (10 - 15)^2 + 0.3 \times (20 - 15)^2 + 0.1 \times (30 - 15)^2$
$= 0.6 \times 25 + 0.3 \times 25 + 0.1 \times 225 = 15 + 7.5 + 22.5 = 45$.
$\sigma = \sqrt{45} = 6.71$.

(c) Mean of $\bar{x} \simeq 200$ since $\mathrm{E}[\bar{X}] = \mathrm{E}[X] = 200$.
Standard deviation of $\bar{x} = 2.0$ since $\mathrm{SD}[\bar{X}] = \mathrm{SD}[X]/\sqrt{n} = 10/\sqrt{25} = 2.0$.

(d)



(e) Yes. We expect the confidence interval to include true values 95% of the time.
Here 350/400 = 0.875 is only 87.5% of the time.

Multiple Choice for Versions A and B

Question	**1.**	**2.**	**3.**	**4.**	**5.**
Answer Version A	*a*	*b*	*b*	*c*	*c*
Answer Version B	*a*	*d*	*c*	*a*	*c*

For 4. t = (estimate - hypothesized value) / standard error = $(4 - 2)/2 = 1$.

Version B

1.(a) The three observations are missing, 2 and 4.
(e.g. $x_1 = 2$ in period 1 becomes $x_{2,-1} = 2$ in period 2).

(b) 24 years. The investment has doubled. At 3% per annum this takes $72/3 = 24$ years.

(c) (w−88)/2 since in general $(w - \bar{w})/s = (w - 88)/\sqrt{4} = (w - 88)/2$.

(d) 48.1%. The support was 9.0 percentage points higher (not 9.0% higher) so we can simply add 39.1+9.0.

(e) $\Delta \ln x = (6.27 - 6.15) = 0.12$. But $\Delta \ln x \simeq \Delta x/x$. So $\Delta x/x = 0.12$. A 12% percent increase.

(f) $\sum_{i=1}^{3} \left(3 + \frac{12}{i}\right) = \left(3 + \frac{12}{1}\right) + \left(3 + \frac{12}{2}\right) + \left(3 + \frac{12}{3}\right) = 3 + 12 + 3 + 6 + 3 + 4 = 31$.

2.(a) Yes. This can be a judgement call but it is pretty clear it is symmetric.
Mean .726 ≃ median = .71 OR skewness = .31 ≃ 0.0.

(b) 95% lie in approximately $\bar{x} \pm 2 \times s = 0.7264 \pm 2 \times 0.0954 = 0.7264 \pm 0.1908 = (0.5356, 0.9172)$.
Or more precisely $\bar{x} \pm 1.96 \times s = 0.7264 \pm 1.96 \times 0.0954 = 0.7264 \pm 0.1870 = (0.5394, 0.9172)$.

(c) A 95 percent confidence interval is $80714 \pm t_{.025;35} \times 15027/\sqrt{36} =$
$= 80714 \pm 2.0301 \times 2504.5 = 80714 \pm 5084 = (75630, 85798)$.

(d) Use command `mean earlycareer`. Command `mean` is enough for credit. Or `ci mean.`

(e) $H_0 : \mu = 75000$ against $H_0 : \mu \neq 75000$ at level 0.10.
$t = (80714 - 75000)/(15027/\sqrt{36}) = 5714/2504.5 = 2.2815$.
Since $|t| = 2.282 > t_{.05;35} = 1.689$ reject H_0.
We reject $H_0 : \mu = 75000$ at significance level .10.

(f) Reject as $p = 0.08 < 0.10$.

3.(a) $\bar{x} = (11 + 13 + 17 + 11)/4 = 52/4 = 13$.
$s^2 = \frac{1}{n-1} \sum_{i=1}^{n} (x_i - \bar{x})^2 = \frac{1}{3}[(-2)^2 + (0)^2 + (4)^2 + (-2)^2] = \frac{1}{3}[4 + 0 + 16 + 4] = 24/3 = 8$.

(b) $\mu = \mathrm{E}[X] = 0.6 \times 20 + 0.3 \times 40 + 0.1 \times 60 = 12 + 12 + 6 = 30$.
$\sigma^2 = \mathrm{E}[(X - \mu)^2] = 0.6 \times (20 - 30)^2 + 0.3 \times (40 - 30)^2 + 0.1 \times (60 - 30)^2$
$= 0.6 \times 100 + 0.3 \times 100 + 0.1 \times 900 = 60 + 30 + 90 = 180$.
$\sigma = \sqrt{180} = 13.42$.

(c) Mean of $\bar{x} \simeq 50$ since $\mathrm{E}[\bar{X}] = \mathrm{E}[X] = 50$.
Standard deviation of $\bar{x} = 1.0$ since $\mathrm{SD}[\bar{X}] = \mathrm{SD}[X]/\sqrt{n} = 20/\sqrt{400} = 1.0$.

(d) See answer to Version A 3(d) on previous page.

(e) Yes. We expect the confidence interval to include true values 95% of the time.
Here 490/500 = 0.98 is 98% of the time.

Multiple Choice for Version B: See previous page.

The course grade will be based on a curve from the combined scores of midterm 1 (22.5%), midterm 2 (22.5%), final (45%) and assignments (10%). **The curve for this exam is only a guide**. Suggested average GPA for this course is 2.7. Curve below has average GPA 2.69 for this exam.

Scores out of	35
75*th* percentile	29 (83%)
Median	26 (74%)
25*th* percentile	22.5 (64%)

A+	35 and above	C+	23 and above
A	30 and above	C	22 and above
A-	28.5 and above	C-	20.5 and above
B+	27 and above	D+	19 and above
B	26 and above	D	18 and above
B-	24.5 and above	D-	16.5 and above