University of Waterloo STAT 332 – W. H. Cherry

Tutorial 5

T5 – 1. The following data are the 1994 net sales (in millions of dollars) of a population of 35 U.S. firms (numbered 1 to 35 in alphabetical order by name) which manufacture computer equipment:

Number	Sales	Number	Sales	Number	Sales	Number	Sales	Number	Sales
01	42.881	08	196.320	15	17.326	22	17.661	29	29.502
02	43.357	09	193.342	16	7.960	23	17.472	30	20.521
03	9.076	10	18.988	17	7.942	24	7.304	31	8.428
04	40.937	11	30.895	18	5.210	25	4.585	32	58.084
05	80.715	12	35.520	19	6.581	26	6.029	33	35.520
06	253.197	13	21.221	20	8.751	27	29.925	34	21.128
07	103.194	14	90.477	21	39.982	28	21.639	35	29.834.

The task is to use equiprobable selecting with n = 15 to estimate $\overline{\mathbf{Y}}$, the *average* 1994 net sales of the 35 companies. [The respective sum and sum of squares for the sales data are 1,561.504 and 185,483.526 712.]

(a) Obtain 15 firms by equiprobable selecting (EPS): describe *in point form* the steps you take to do the selecting.

(b) Calculate the sample average ($\overline{y}$) and sample (data) standard deviation (s) from the 15 sales figures you selected in (a).

(c) On the basis of the values in (b), find the estimated standard deviation of $\overline{Y}$ and an approximate 95% confidence interval for $\overline{\mathbf{Y}}$. Comment briefly on your findings.

(d) For n = 15, calculate the *true* standard deviation of $\overline{Y}$: $s.d.(\overline{Y}) = \mathbf{S}_{\mathbf{Y}}\sqrt{\frac{1}{\mathbf{n}} - \frac{1}{\mathbf{N}}}$.

(e) Comment briefly on the magnitude of the standard deviation of $\overline{Y}$ in (d) in view of the *high* sampling fraction ($^3/_7 \simeq 0.43$) used here. Also, compare the value with that of the *estimated* standard deviation in (c).

(f) Suppose that a number in the interval 1 to 35 had been selected equiprobably and the number *one* was obtained; then, starting at the *first* firm, the 15 firms in the first three rows of the table above were selected as the sample. Explain briefly whether this selecting procedure:

- *is* EPS;
- could reasonably be considered as *equivalent to* EPS.

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