Sam Donnermeyer Stat 451: Hand-In HW #7

1a)

The probability distribution is: a binomial distribution where

Binom(10,000, .002029).

~~$E(X) = -100,000(.002029 \cdot 10,000) + 250(10,000)$~~
~~$= 471,000$~~

$E(X) = n \cdot p$

$= 10,000 \cdot .002029$

$= 20.29$

$SD(X) = \sqrt{Var(X)} = \sqrt{-100,000(.002029) + 0(1-.002029)}$

$= \sqrt{-20.29} = 4.504442$

$SD(X) = 4.504$

b) $P(X) = -100,000(x) + 250(10,000)$

$E(P) = -100,000(E(x)) + 2,500,000$

$= -100,000(20.29) + 2,500,000$

$E(P) = \$471,000$

$VAR(P) = -100,000^2 (VAR(X))$

$VAR(P) = -100,000^2 (-20.29)$

$SD(P) = \sqrt{Var(P)}$

$= \sqrt{100,000(20.29)}$

$= 100,000\sqrt{20.29}$

$SD(P) = \$450,444.2$

c) The distribution of P is approximately normal because np > 10 and nq > 10. (np = 20.29)(nq = 9979.1). Therefore the success/failure condition is met.

d) in R

$t^* = qt(.975, 9999)$

$= 1.960201$

get ME

$= t^* \cdot SE$ where $SE = \frac{s}{\sqrt{n}} = \frac{450444.2}{\sqrt{10,000}}$

$ME = 88317.95$

95% Confidence interval

$= \bar{y} \pm ME$

~~= (396,883.3, 545116.7)~~

$= (382682.1, 559,317.9)$

e) w/ 100,000 economics of scale. $ME = 27,925.55$

(44,3074.5, 498925.5)

2)

$n = 47$, $\bar{y} = 7.72$, $s = 2.5$

a)

in R:

get the t^*

$= qt(.95, 46) = 1.67866$

get the ME

$= t^* \cdot SE$ where $SE = \frac{2.5}{\sqrt{47}} = \frac{s}{\sqrt{n}}$

$= .6121445$

90% Confidence Interval $= \bar{y}$ +/- ME

$= (7.1078, 8.3321)$

$\boxed{\text{We are 90\% confident that the mean number of hamsters in a litter is between 7.1078 and 8.3321 hamsters.}}$

b) By making the confidence level higher (90-98%), it would require a larger interval to account for more variation in where the population's mean could be.

c) Estimated Sample size w/ ME = .6121445

$$n = \left(\frac{z^* s}{ME}\right)^2 = \left(\frac{1.645(2.5)}{.6121445}\right)^2$$

$\boxed{= 45.13401}$

3) a) A skewed model makes sense because there are lots more smaller fish than large fish because the small ones are released and the large ones kept (taken out of population).

b) because the distribution is not normal.

c) No, because a sample of 5 is not large enough to satisfy the minimum success qulification.

d)