FOR 373: Assignment 5 – Regression Estimators and PPP Sampling [60 points]

Notes: 2-pages of notes can be attached to this assignment and you are encouraged to use your calculator or Excel where necessary. You must show your work to receive any credit (e.g., the equation you use and any assumptions you make). Doing so also indicates whether you understand the method and help you receive partial credit, even if your final answer is incorrect.

Given the following information from a preliminary sample complete question 1 & 2.
　　　Mean　　**637.4 cu ft**/Acre　　　Variance　　**1291.86**　　　CV　　**0.119**

1. Calculate how many $1/20^{th}$ acre plots you would need in order to estimate the mean volume per acre within the stand to within 5%. Assume the stand is infinitely large and use a 95% confidence level.

2. Calculate how many $1/20^{th}$ acre plots you would need in order to estimate the mean volume per plot within the stand to within 20 cu ft. The stand is 80 acres and use a 95% confidence level.

3. After sampling a 110 acre stand you come up with the following estimators:
　　　Mean　　**582 cu ft/Acre**　　　Standard Deviation　　**42 cu ft/Acre**　　　# of plots　**24**
With 95% confidence, what is the maximum profit for selling the stand at $280/mbf?

4. You are tasked to do a 3P inventory, where preliminary data states that the variation of board feet in a stand is 30% and the contract specifies the 95% confidence interval is to be ± 15% of the mean. Given this information calculate your expected 3P sample size.

5. Through remote sensing of a 300 acre stand, and get a basal area population mean of 90 ft^2/ acre. In addition you take basal area and volume measurements on 20 plots. Calculate the regression gradient for the given data, and then estimate the population mean volume/acre

6. Ten samples of DBH and height yield the data below. Calculate the ratio of means estimator. Assume the population mean for height is 68 and population N is 350.

7. Using the ten samples in question #6, calculate the mean of ratios estimator. Assume the population mean for height is 68 and population N is 350.

8. Given what we know about the conditions needed to use regression estimators, how appropriate do you think this technique is for the stand data in question #6? Why? (*hint: it may be helpful to plot out the points from question #6.*)

9. Describe four different potential applications of PPP sampling.

10. Estimate the total cubic-foot volume and its associated variance from this 3P cruise data provided in the Excel dataset. You must print out and attach any Excel Formulas used.

11. You harvest the stand in question #10, which is high quality Cyprus, for $41/cubic foot and the harvest is done for $225/load (load = 5,000 bf) and the mill is 54 miles each way at a cost of $0.23/mile. What is your 90% confidence interval for potential profit?

Extra Credit: Using the provided Excel dataset of 1/20th acre plots, calculate the BA/Acre, Tree/Acre, and the mean volume (MBF)/acre for each species in each stand: [10 points]

- Tree volume (bf) = BA*0.85*Height*0.75

Stand	BA/Acre	TPA	MBF Volume/Acre		
			PIPO	PSME	THPL
1					
2					
3					

You decide to harvest the stands and receive a contact with the following specifications,

Stand 1 – 63 acres and is 40 miles from THPL mill & 32 miles from pine and fir mill
Stand 2 – 51 acres and is 28 miles from THPL mill & 36 miles from pine and fir mill
Stand 3 – 46 acres and is 65 miles from THPL mill & 52 miles from pine and fir mill

- Log trucks can haul 5,000 bf/load and cost $225/load and $0.23/mile
- THPL sells for $360/MBF & PIPO sells for $280/MBF & PSME sells for $310/MBF

Calculate your maximum potential profits for each of the stands at the 95% confidence level: