Homework 3 GSBA 545 by Chengjun Liu

1. Answers:
   1. We estimate the variation from sample mean is . So the interval is .
   2. The estimation is nearly correct. Because it’s in 90% confident interval, we are 90% sure the true average is in the interval and 1300 is an option in the interval.
   3. The variation for sample mean is within 10$ for 95% confidence, so , so . That mean 865 days.
2. We roughly estimate in a binomial model the acceptance probability is . So we estimate mean to be , the variation from mean to be . The interval is . That means the acceptance rate ranges between 10.7% and 14.9%.
3. We estimate the variation from sample mean is  . So the 95% confidence interval is . The whole interval is over 800, so we are 95% sure true average is over $800 the historical average.
4. We estimate the variation from sample mean is . So the 95% confidence interval is . That means the average account balance is between $1158.97 and $1341.03 on a 95% confidence.
5. Answers:
   1. We roughly estimate in a binomial model the probability of purchasing Android is . So we estimate mean to be , the variation from mean to be . The interval is . That means the rate of purchasing Android ranges between 37.12% and 50.88%. Because 50% is still in the interval, we cannot exclude the true average of 50% in 95% confidence.
   2. We have to make upper bound to be below 50%, so , we get .
6. Answers:
   1. The null hypothesis: the average income of households in the area is below $24000.

The alternative hypothesis: the average income of households in the area is at least $24000.

* 1. Because the samples are roughly normal distributed, for its sample mean, use z test statistics .
  2. The statistics is , while the 95% one-side p-value is 1.645. , not exceeding 95% confidence, so we cannot reject the null hypothesis on 95% confidence. That means we are not sure the average income in the area is over $24000. Better not try opening in this area.

1. Answers:
   1. The null hypothesis: the monthly return of IBM Stock is no higher than T-Bills.

The alternative hypothesis: the monthly return of IBM Stock is higher than T-Bills.

* 1. There are 408 samples for IBM Stock. For large sample, it’s okay to use z test statistics:
  2. The corresponding p-value is , below the 90% one-side confidence. We are 90% confident the IBM stock average return is above T-Bills. So the trader should switch to IBM Stock, but I think for higher confidence (95% or more) it is not so persuasive to invest in IBM Stock.

1. Answers:
   1. The null hypothesis: Escalade buyers are no younger on average than Cadillac buyer.

The alternative hypothesis: Escalade buyers are younger on average than Cadillac buyer.

* 1. Type I error: while Escalade buyers are no younger on true average than Cadillac buyer, you reject the hypothesis that Escalade buyers are no younger, concluding that Escalade buyers are younger.

Type II error: while Escalade buyers are younger on true average than Cadillac buyer and we should reject the idea that Escalade buyers are no younger, you don’t reject the hypothesis that Escalade buyers are no younger, accepting that Escalade buyers are no younger.

* 1. We calculate z test statistics for large samples: The corresponding p-value is well below 0.001. So for we can reject the null hypothesis and say that Escalade buyers are younger on true average than Cadillac buyer.

1. Answers:
   1. The null hypothesis: The average difference earned between IT and Biostatistics doesn’t exceed additional cost of $1200.

The alternative hypothesis: The average difference earned between IT and Biostatistics exceeds additional cost of $1200.

* 1. Type I error: while the average difference earned between IT and Biostatistics doesn’t exceed additional cost of $1200, you reject the hypothesis and believe that the average difference earned between IT and Biostatistics exceeds additional cost of $1200.

Type II error: while the average difference earned between IT and Biostatistics exceeds additional cost of $1200, you don’t reject the idea that the average difference earned between IT and Biostatistics doesn’t exceed additional cost of $1200.

* 1. We calculate z test statistics for large samples: The corresponding p-value is 0.352 well above 0.1. So for we cannot reject the null hypothesis but rather say that the average difference earned between IT and Biostatistics doesn’t exceed additional cost of $1200. We’d better not go into IT industry.