Question

According to the credit rating agency Equifax, credit limits on newly issued credit cards increased between January 2011 and May 2011. Suppose that random samples of 400 credit cards issued in January 2011 and 500 credit cards issued in May 2011 had average credit limits of $2635 and $2887, respectively. Suppose that the sample standard deviations of these two samples were $365 and $412, respectively.

(a) Construct an appropriate 95% confidence interval for the difference in mean credit limits of all credit cards issued in January 2011 and in May 2011. Interpret your results. Be sure to justify your choice of the interval.

(b) Perform an appropriate 5% level test to see if the mean credit limit of all credit cards issued in May 2011 is greater than the same in January 2011. Be sure to specify the hypotheses you are testing, and justify the choice of your test. State your conclusion.

Report:

(a)

From the question I get several information and load them into R as below:

```
alpha=0.05
maymean<-2887
janmean<-2635
maysd<-412
jansd<-365
m<-500
n<-400
```

In this question, there are two samples with different sample standard deviation. So I will calculate CI for u_x-u_y with two independent samples.
Same with Exercise 1,question (c), I use Satterthwaite's approximation.

$$\nu = \frac{\left(\frac{S_X^2}{n_X} + \frac{S_Y^2}{n_Y}\right)^2}{\frac{S_X^4}{n_X^2(n_X-1)} + \frac{S_Y^4}{n_Y^2(n_Y-1)}} \qquad \bar{X} - \bar{Y} \pm t_{\alpha/2}\sqrt{\frac{s_X^2}{n} + \frac{s_Y^2}{m}}$$

```
v<-( maysd^2 /m+jansd^2/n) ^2/(maysd^4/(m^2*(m-1))+jansd^4/(n^2*(n-1)))
maymean-janmean+c(1,-1)*qt(alpha/2,v)*sqrt(maysd^2/m+jansd^2/n)
```

The answer is 201.1018   302.8982

We also constructed one-sided confidence interval and arrived at the upper bound at 2677.701 with the null hypothesis that the mean is $2635, we can see that the mean of May 2011 is 2887 and is greater than the upper bound, so we can conclude that the credit limit of May is greater than the credit limit of Jan.

In two-side confidence interval test, because 0 is not in [201.1018, 302.8982], so that these

two samples have different mean value.

Finally we can say that they are not equal and May is greater than the credit limit of Jan.

(b)

Same as exercise 1 question (d), the function of getting value of t is:

    D<-0

    T<-(maymean - janmean-D)/sqrt(maysd ^2/m+ jansd ^2/n)

The answer of T is 9.717132.

    v<-(maysd^2 /m+jansd^2/n) ^2/(maysd^4/(m^2*(m-1))+jansd^4/(n^2*(n-1)))

    Pvalue<-2*(1-pt(abs(T)，v))

The answer of P-value is [1] 2.844214e-10