Output Analysis

We have conducted multiple short runs by changing the arrival rates and keeping the thin rate constant at 0.5. After which, the confidence interval for the steady state mean is found for different confidence level of 90%,95% and 99%.

	Average time in supermarket	Average time in queue
Average	241.5022348	13.39666842
STD	165.0916318	1.074570883
90 % confidence interval		
LOWER	177.6702404	12.98119005
UPPER	305.3342292	13.81214679
95 % confidence interval		
LOWER	164.2369728	12.89375377
UPPER	318.7674969	13.89958308
99% confidence interval		
LOWER	135.8890855	12.70923918
UPPER	347.1153842	14.08409766

Arrival rate = 0.05, thin rate = 0.5

	Average time in supermarket	Average time in queue
Average	870.205	260.58
STD	152.6862744	21.10449191
90 % confidence interval		
LOWER	811.1694855	252.4200358
UPPER	929.2405145	268.7399642
95 % confidence interval		
LOWER	798.7456239	250.7027937
UPPER	941.6643761	270.4572063
99% confidence interval		
LOWER	772.5278608	247.078941
UPPER	967.8821392	274.081059

Arrival rate = 0.15, thin rate = 0.5

Finally, we conducted a sensitivity analysis to investigate the effects of the arrival rate on the average time in supermarket.

For the sensitivity analysis, we apply a two-sample t-test at 90% confidence level to compare the average time in supermarket when the arrival rate is 0.05 and 0.15.

The two sample t-test formula are as of below:

H0 : u1 = u2, H1:u1≠u2

$$T = \frac{\overline{X} - \overline{Y} - (\mu_1 - \mu_2)}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}.$$

w1	7.999730263
w2	1165.65492
Degree of freedom	19.26077652
t.int.2t	1.729132812
T	**-15.56045268**

where $w_1 = s_1^2/n_1, \omega_2 = s_2^2/n_2.$

Then T approximately follows a t-distribution with ν degrees of freedom where

$$\nu = \frac{(\omega_1 + \omega_2)^2}{\omega_1^2/(n_1 - 1) + \omega_2^2/(n_2 - 1)}$$

Since the t statistic =-15.56045<-1.729, there is sufficient evidence to reject H0. There is significant difference between the two average.