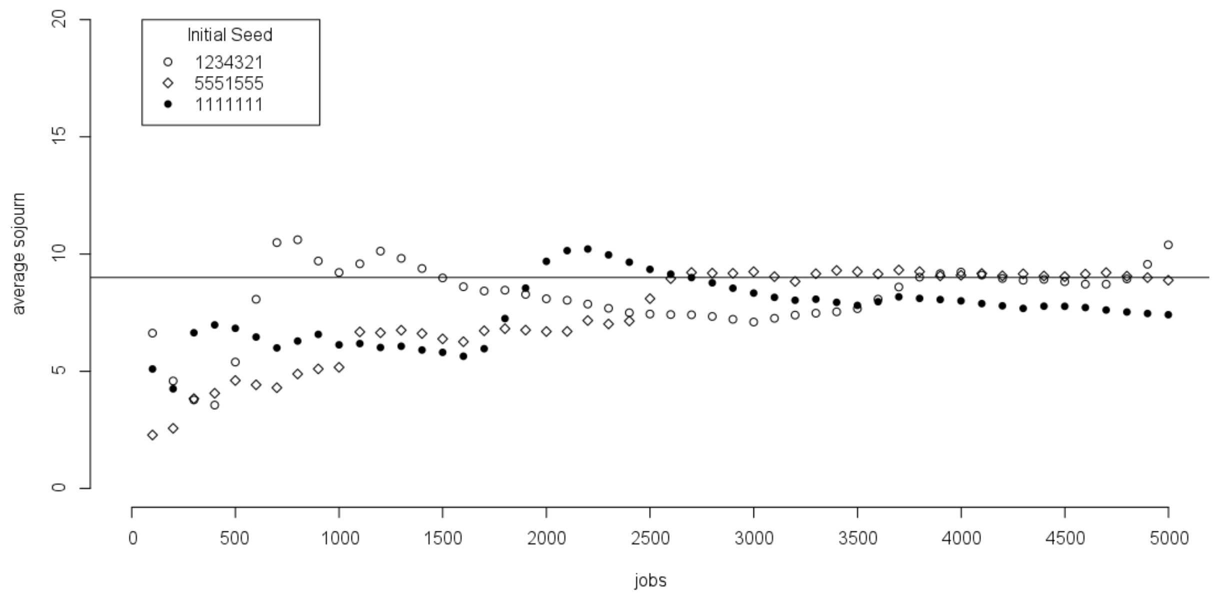
System Service Queue Experimentation

M/M/1 Queue:



Theoretical Sojourn Value:

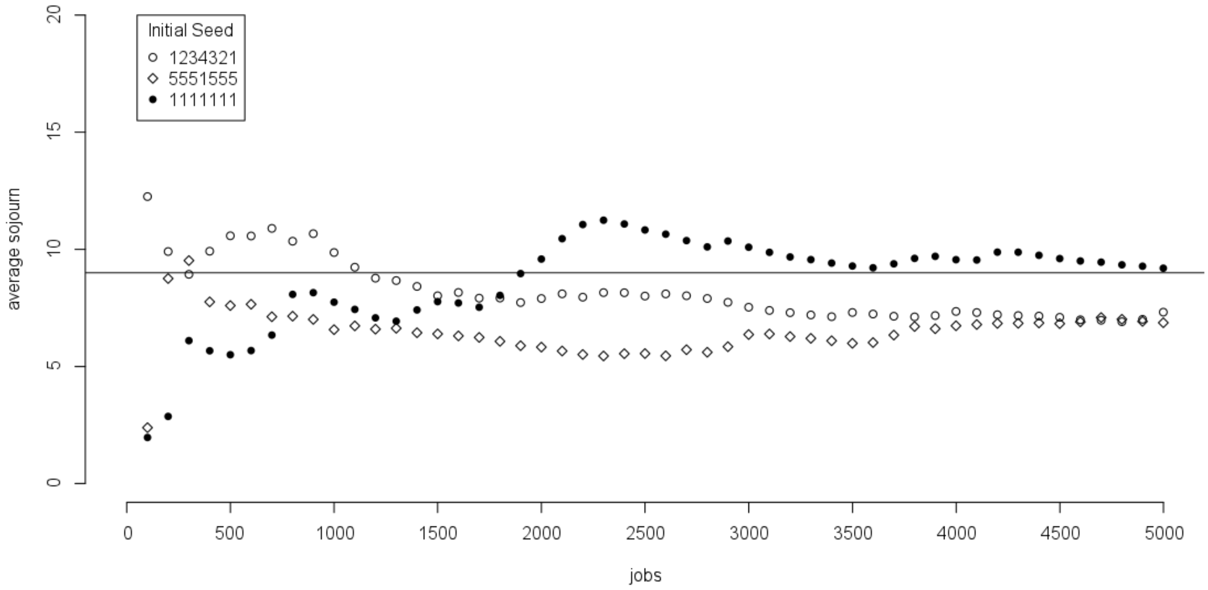
$$\therefore \mu = \frac{10}{9}$$

$$\frac{1}{\mu - 1} \Rightarrow \frac{1}{\frac{10}{9} - 1} = 9$$

At a service rate of approximately 1.1, as the number of jobs/arrivals increases, the average sojourn time or the time spent by an object in the system converges on the theoretical sojourn time albeit slowly and erratically.

As the arrival rate increases, the service time also increases erratically but converges on the mean sojourn time.

M/G/1 Queue with Gamma Function 1:



Theoretical Sojourn Value:

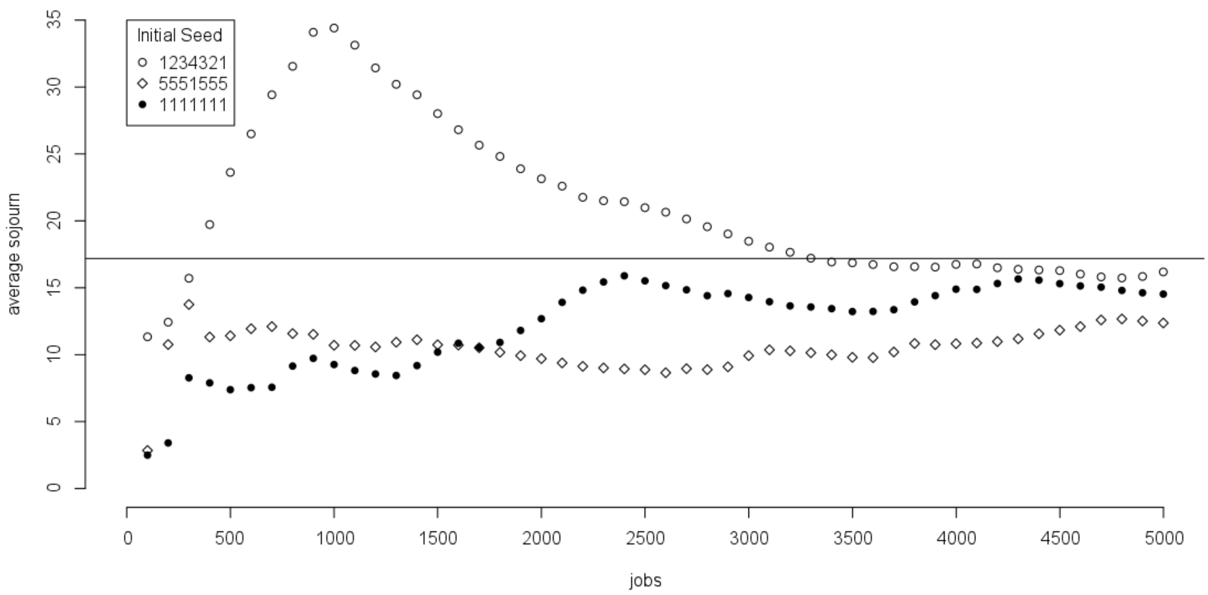
$$\therefore k = 1.0 \quad \therefore \theta = 0.9$$

$$\frac{1}{\frac{1}{k\theta} - 1} \Rightarrow \frac{1}{\frac{1}{(1.0)(0.9)} - 1} = 9$$

At a service rate of approximately 0.9, as the number of jobs/arrivals increases, the average sojourn time or the time spent by an object in the system increases and the sojourn times of the individual seeds almost converge on the theoretical sojourn.

As the arrival rate increases, the mean service time decreases overtime and slowly converges on the mean sojourn.

M/G/1 Queue with Gamma Function 2:



Theoretical Sojourn Value:

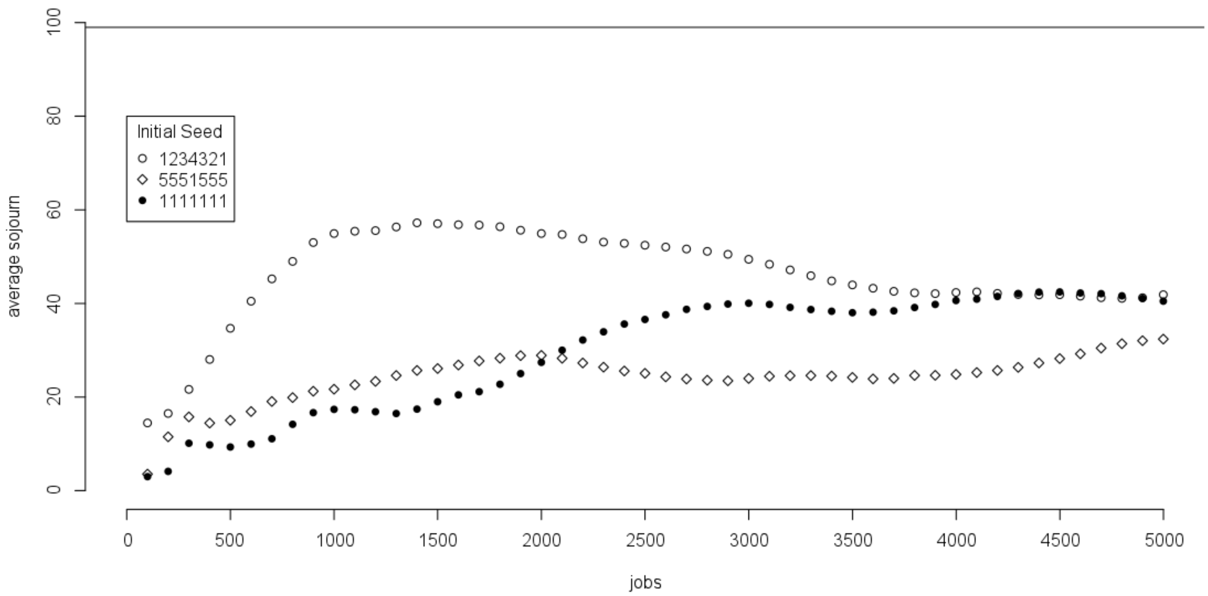
$$\therefore k = 1.05 \ \therefore \theta = 0.9$$

$$\frac{1}{\frac{1}{k\theta} - 1} \Rightarrow \frac{1}{\frac{1}{(1.05)(0.9)} - 1} = \frac{189}{11} \approx 17.18181818$$

At a service rate of approximately 0.9 and as the number of jobs/arrivals increases, the average sojourn time or the time spent by an object in the system increases and the sojourn times of the individual seeds almost converge on the theoretical sojourn.

As the arrival rate increases, the service time increases and decreases erratically trying to converge on the increased mean sojourn.

M/G/1 Queue with Gamma Function 3:



Theoretical Sojourn Value:

$$\therefore k = 1.1 \quad \therefore \theta = 0.9$$

$$\frac{1}{\frac{1}{k\theta} - 1} \Rightarrow \frac{1}{\frac{1}{(1.1)(0.9)} - 1} = 99$$

At a service rate of approximately 0.9 and as the number of jobs/arrivals increases, the average sojourn time or the time spent by an object in the system increases and the sojourn times of the individual seeds do not converge on the mean sojourn.

As the arrival rate increases, the service time increases drastically and the time spent in the system does not converge on the exponentially increased mean sojourn.