Transient States for MM1

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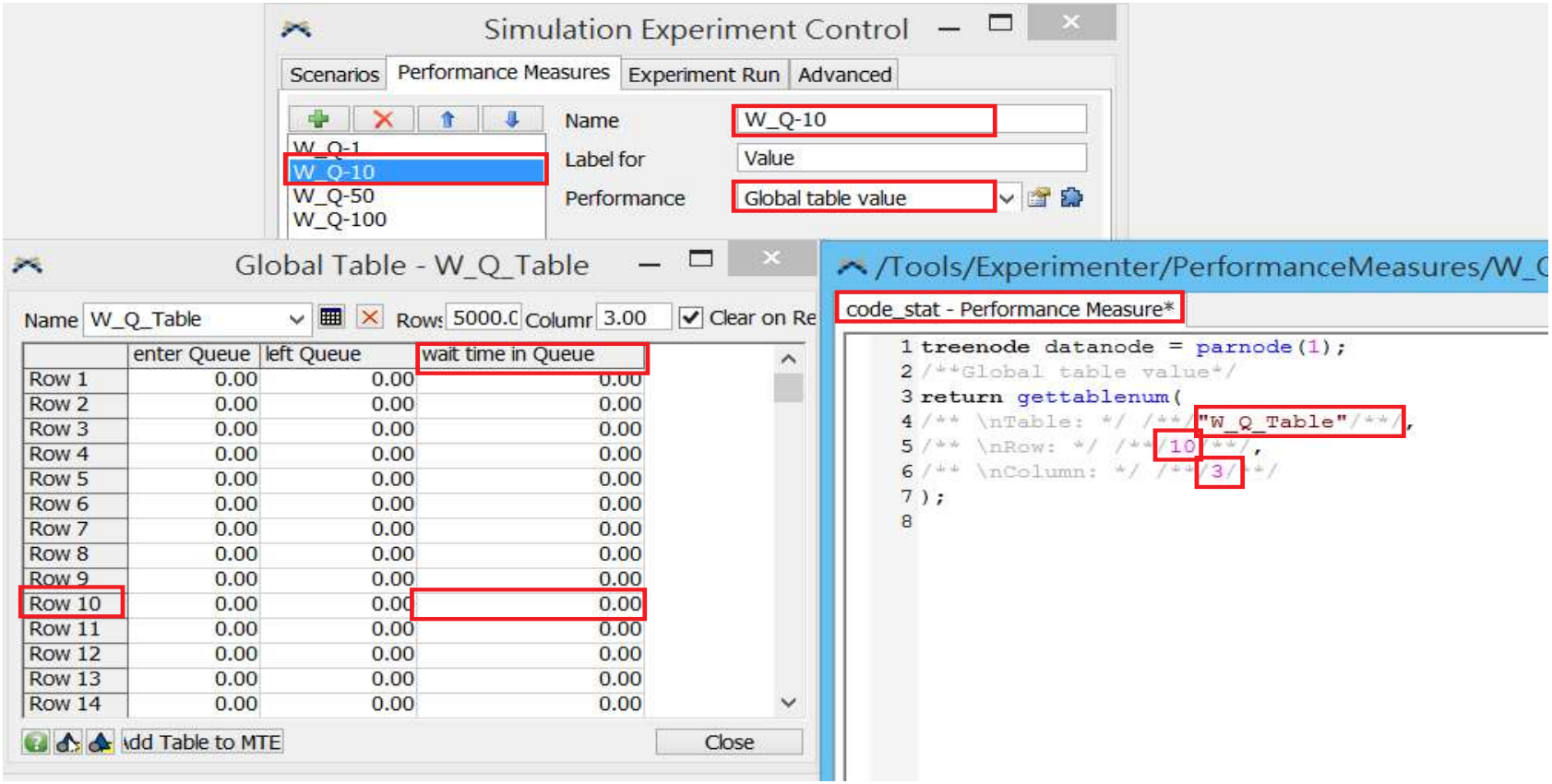
f_X vs. $f_{\overline{X}(n)}$

- Model: 模型, 模式
- Distinguish f_X and $f_{\overline{X}(n)}$
- Distinguish Population parameters and sample parameters
- $X_1, X_2, \ldots X_n$, a random sample; that is, they are iid (independent identically distributed) random variables

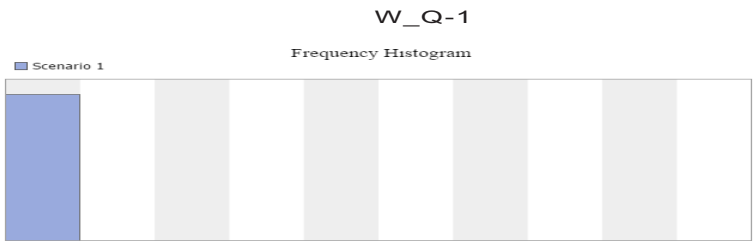
Transient-State vs. Steady-State

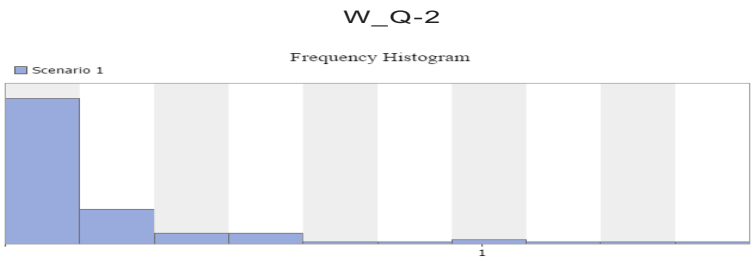
- Steady-state, stationary:
  $X(t_1), X(t_2), \ldots, X(t_n)$ and $X(t_1 + h), X(t_2 + h), \ldots, X(t_n + h)$ have the same joint distribution for any $n, h, t_1, \ldots, t_n$.
  implies that $X(t_1), \ldots, X(t_n)$ follow the same distribution, say f_X
- Covariance stationary:
  If $\mathrm{E}[X(t)] = c$ and $\mathrm{Cov}(X(t), X(t + h))$ only depends on h, independent of t.
  i.e., (1) The first two moments of $X(t)$ are the same for all t,
  and (2) $\mathrm{Cov}(X(t), X(t + h))$ depends only on h
- Transient-state:
  The distributions of $X(t_1), X(t_2), \ldots, X(t_n)$ differ.
- Via simulation software (such as Flexsim) to run MM1, we need to delete "some warm-up time" to collect steady-state data.

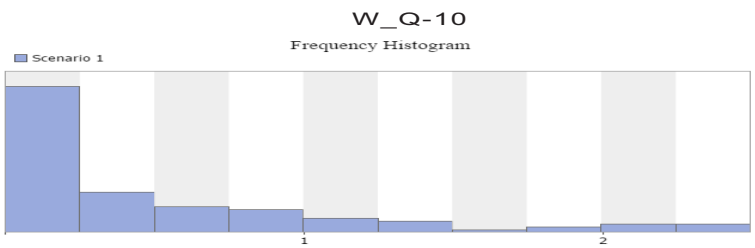
$W_Q(10)$ - Wait Time in Queue for the 10^{th} Customer

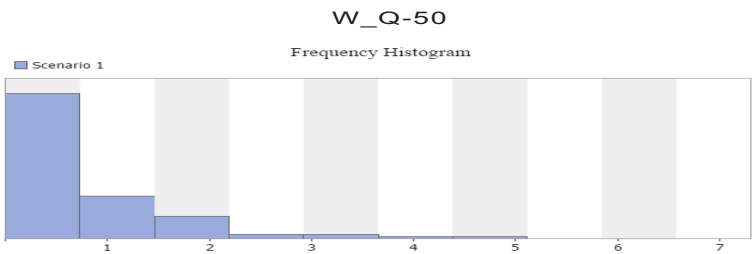


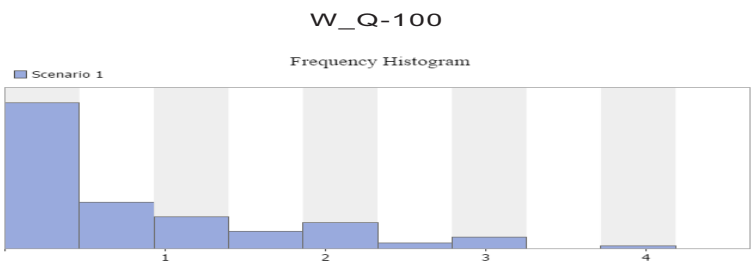
Histogram for $W_Q(i), i = 1, 10, 50, 100$

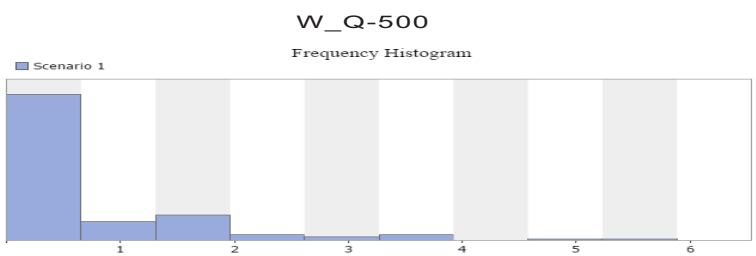












Observations and Discussion

- Generate $\overline{X}^{(1)}(n), \overline{X}^{(2)}(n), \ldots, \overline{X}^{(m)}(n)$ for $m = 30, 100, 10000$
- Observe the histograms for $W_Q(i)$ for $i = 1, 2, 3, 4, 5, 30, 40, 50$