

Transient States for MM1

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- 1 f_X vs. $f_{\bar{X}(n)}$
- 2 Transient-State vs. Steady-State
- 3 Histogram for $W_Q(i), i = 1, 10, 50, 100$

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

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

Transient-State vs. Steady-State

- **Steady-state, stationary:**

$X(t_1), X(t_2), \dots, X(t_n)$ and $X(t_1 + h), X(t_2 + h), \dots, X(t_n + h)$ have the same joint distribution for any n, h, t_1, \dots, t_n .

implies that $X(t_1), \dots, X(t_n)$ follow the same distribution, say f_X

- **Covariance stationary:**

If $E[X(t)] = c$ and $\text{Cov}(X(t), X(t + h))$ 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) $\text{Cov}(X(t), X(t + h))$ depends only on h

- **Transient-state:**

The distributions of $X(t_1), X(t_2), \dots, X(t_n)$ 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 10th Customer

Simulation Experiment Control

Scenarios Performance Measures Experiment Run Advanced

Name: **W_Q-10**

Label for: Value

Performance: Global table value

Global Table - W_Q_Table

Name: W_Q_Table Row: 5000.0 Column: 3.00 Clear on Re:

	enter Queue	left Queue	wait time in Queue
Row 1	0.00	0.00	0.00
Row 2	0.00	0.00	0.00
Row 3	0.00	0.00	0.00
Row 4	0.00	0.00	0.00
Row 5	0.00	0.00	0.00
Row 6	0.00	0.00	0.00
Row 7	0.00	0.00	0.00
Row 8	0.00	0.00	0.00
Row 9	0.00	0.00	0.00
Row 10	0.00	0.00	0.00
Row 11	0.00	0.00	0.00
Row 12	0.00	0.00	0.00
Row 13	0.00	0.00	0.00
Row 14	0.00	0.00	0.00

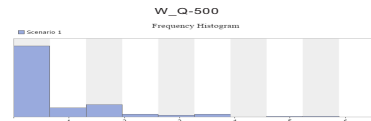
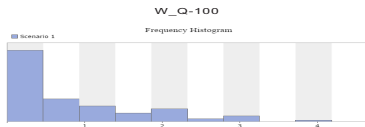
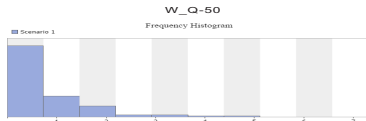
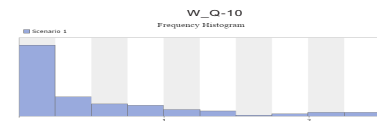
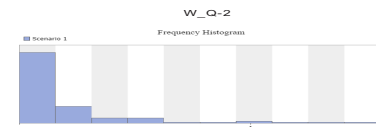
code_stat - Performance Measure*

```

1 treenode datanode = parnode(1);
2 /**Global table value*/
3 return gettablename(
4 /** \nTable: */ /** "W_Q_Table"/**,
5 /** \nRow: */ /** 10/**,
6 /** \nColumn: */ /** 3/**
7 );
8

```

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



Observations and Discussion

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