Service Engineering

Sergey Zeltyn

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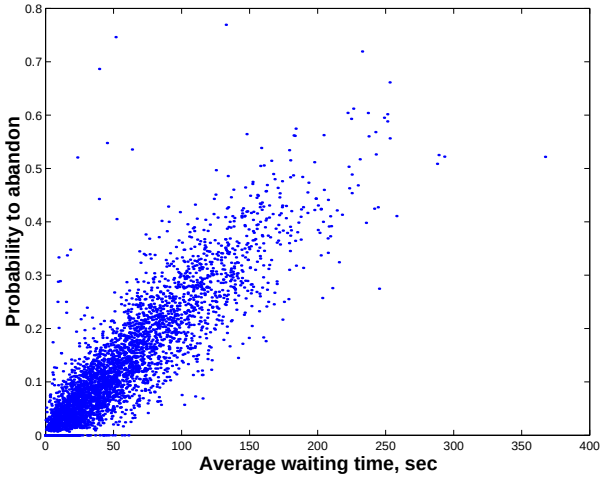
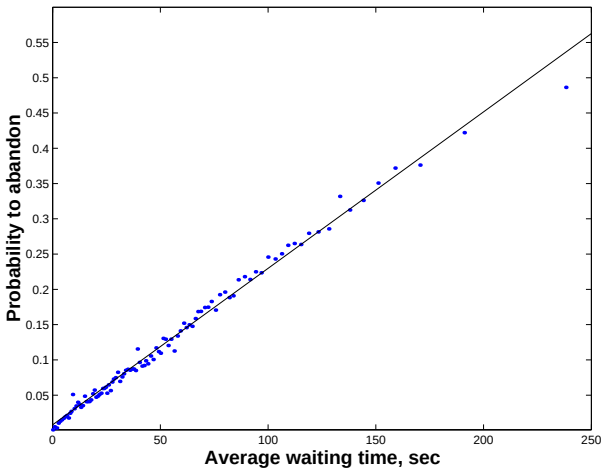
On the Relation between the Probability to Abandon and Average Wait

Empirical Relations (at a Call Center)

Yearly Call Center data: linear pattern

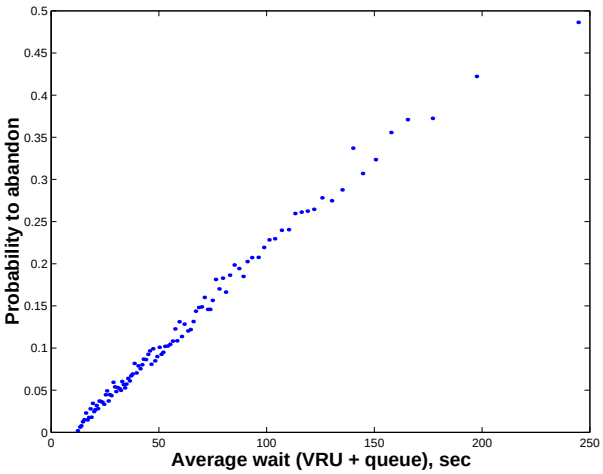




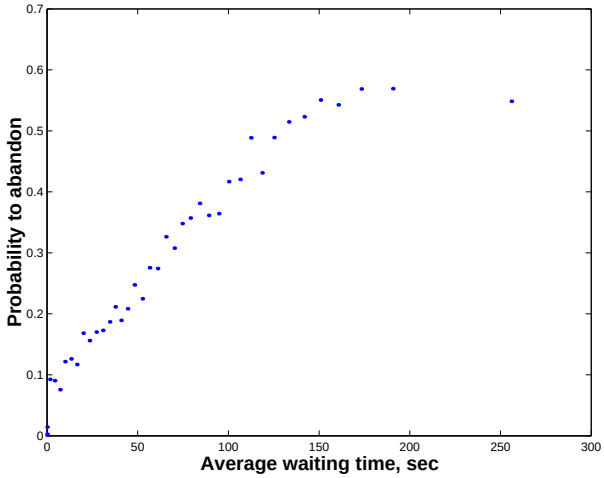
The graphs are based on 4158 hour intervals.

Linear patterns with non-zero intercepts

VRU-time included in wait



New customers

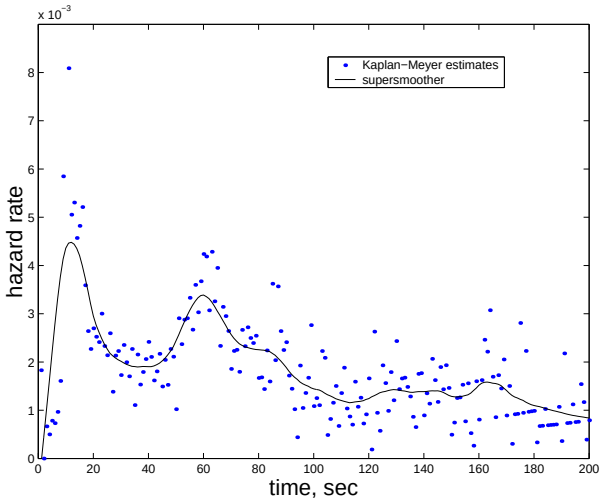


Recall: If Impatience is $\exp(\theta)$, then

$$P_{ab} \;=\; \theta \cdot \mathrm{E}W_q\,.$$

(Proof: based on Little's Law + conservation $\lambda P_{ab} = \theta \cdot \mathrm{E}L_q$.)

Hazard rate of regular customers



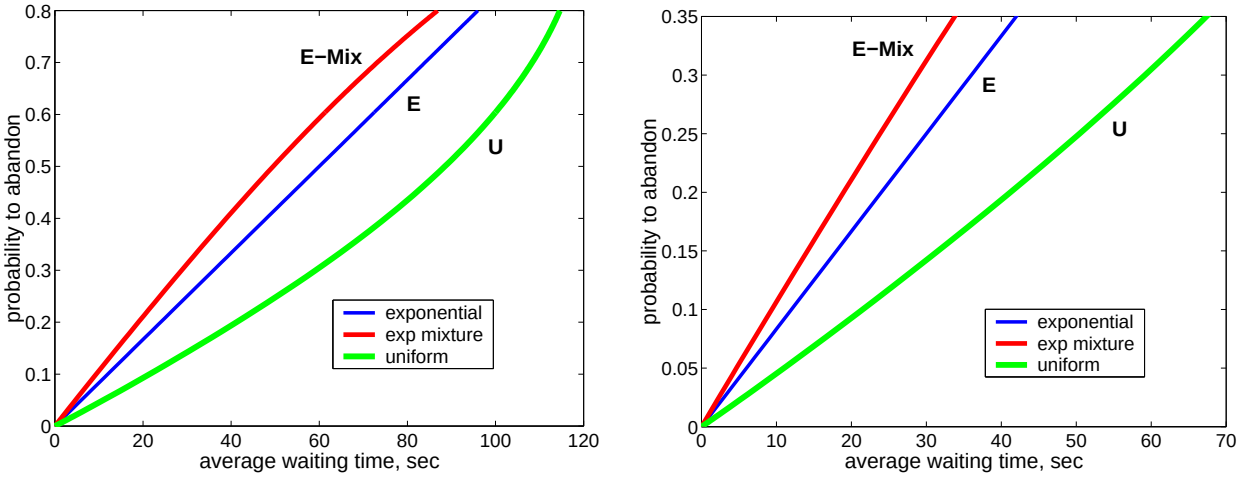
Recall: Peaks of abandonment occur after announcements.

Theoretical Relations

Consider M/M/n+G queues with service rate $\mu = 1$ and $n = 10$ agents.
The arrival rate λ varies from 3 to 50, in step 0.25.

Examples of linear relations

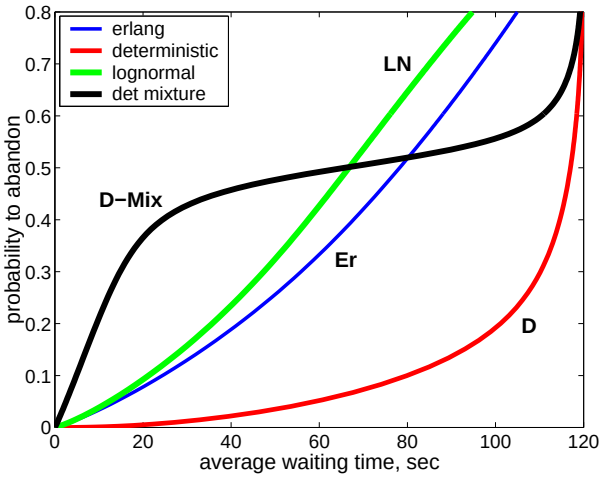
moderate loads



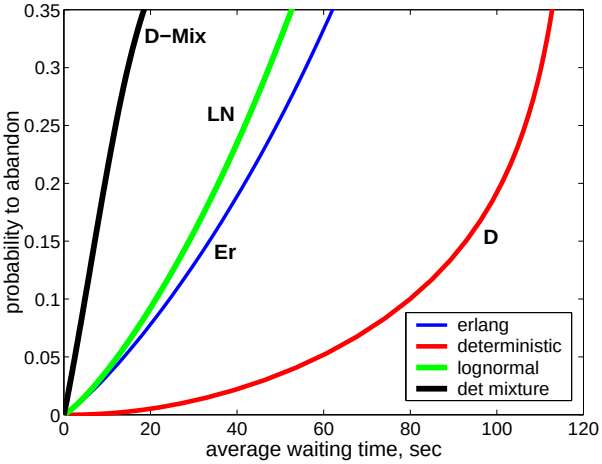
Patience distributions:

- **E**: Exponential (mean=2);
- **U**: Uniform on (0,4);
- **E-Mix**: Hyperexponential: 50=50% mixture of exp(mean=1) and exp(mean=3).

Examples of non-linear relations



moderate loads



Patience distributions:

- **D**: Deterministic: 2 minutes exactly;
- **Er**: Erlang with two exp(mean=1) phases;
- **LN**: Lognormal, both average and standard deviation equal to 2;
- **D-Mix**: 50-50% mixture of two constants: 0.2 and 3.8.