The Value of Observability in Dynamic Pricing

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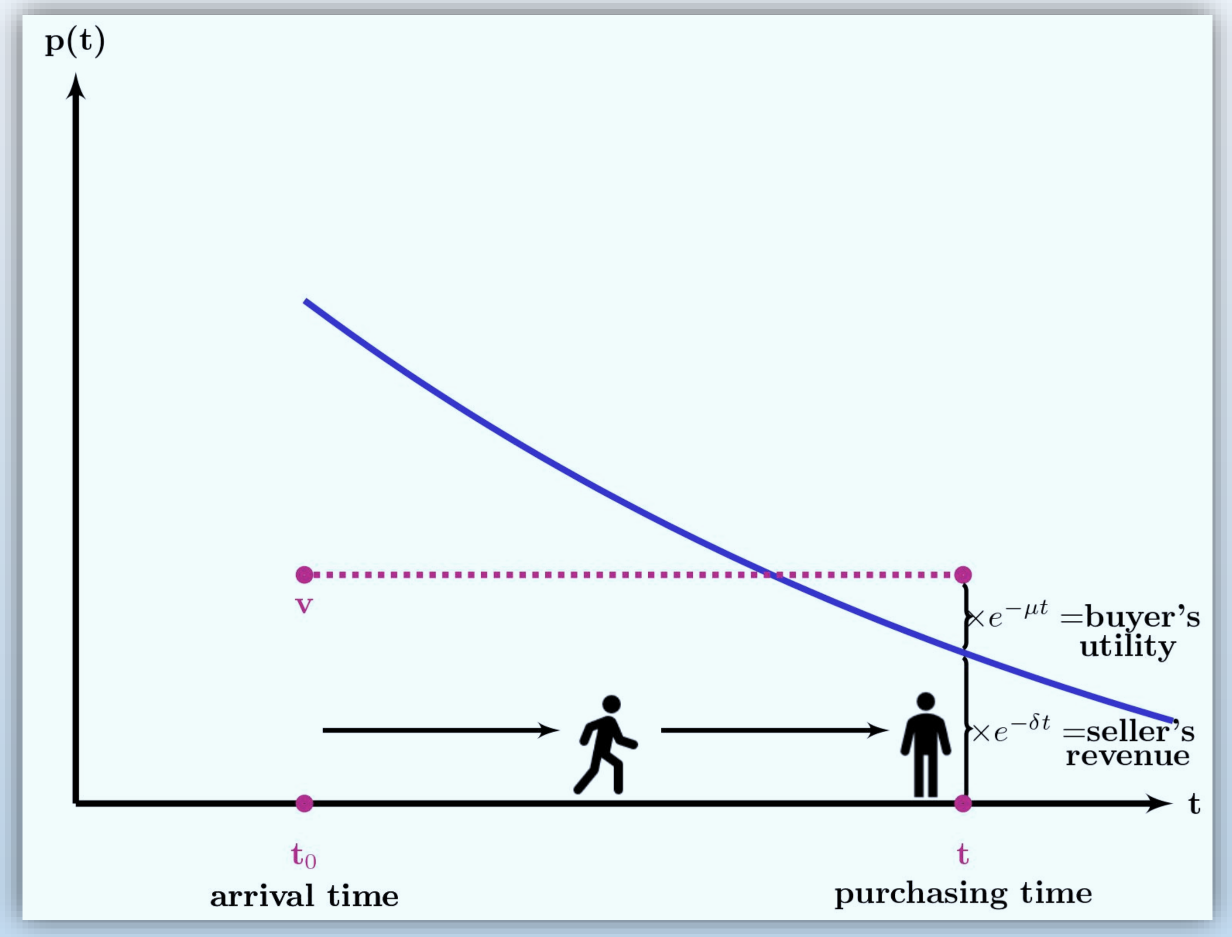
Bound the **additional rent** a seller can obtain **customizing** the price curve upon the **arrival of a customer**.

Consider a dynamic pricing problem…

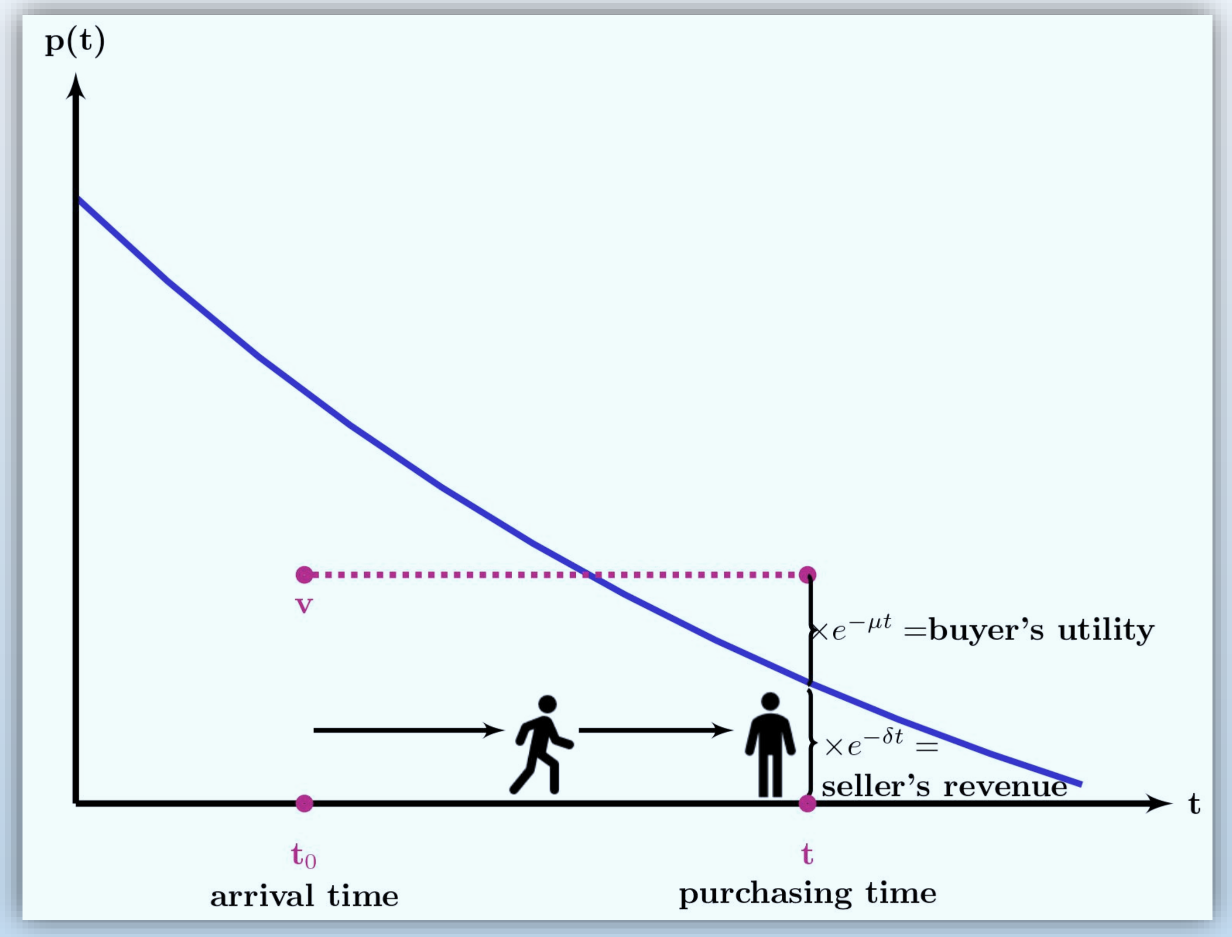
- Single seller with one item to sell over an infinite time horizon.
- Single strategic buyer with valuation $v \sim F$ and arriving at time $\tau \sim G$.
- Both the buyer and the seller have a discount rate, $\mu > \delta \geq 0$, respectively, i.e., the buyer is more impatient.
- Seller set prices maximizing her expected revenue.
- Buyer observes the price curve and decides when to buy maximizing his utility.

We consider and compare **two settings**:

Observable case:



Unobservable case:



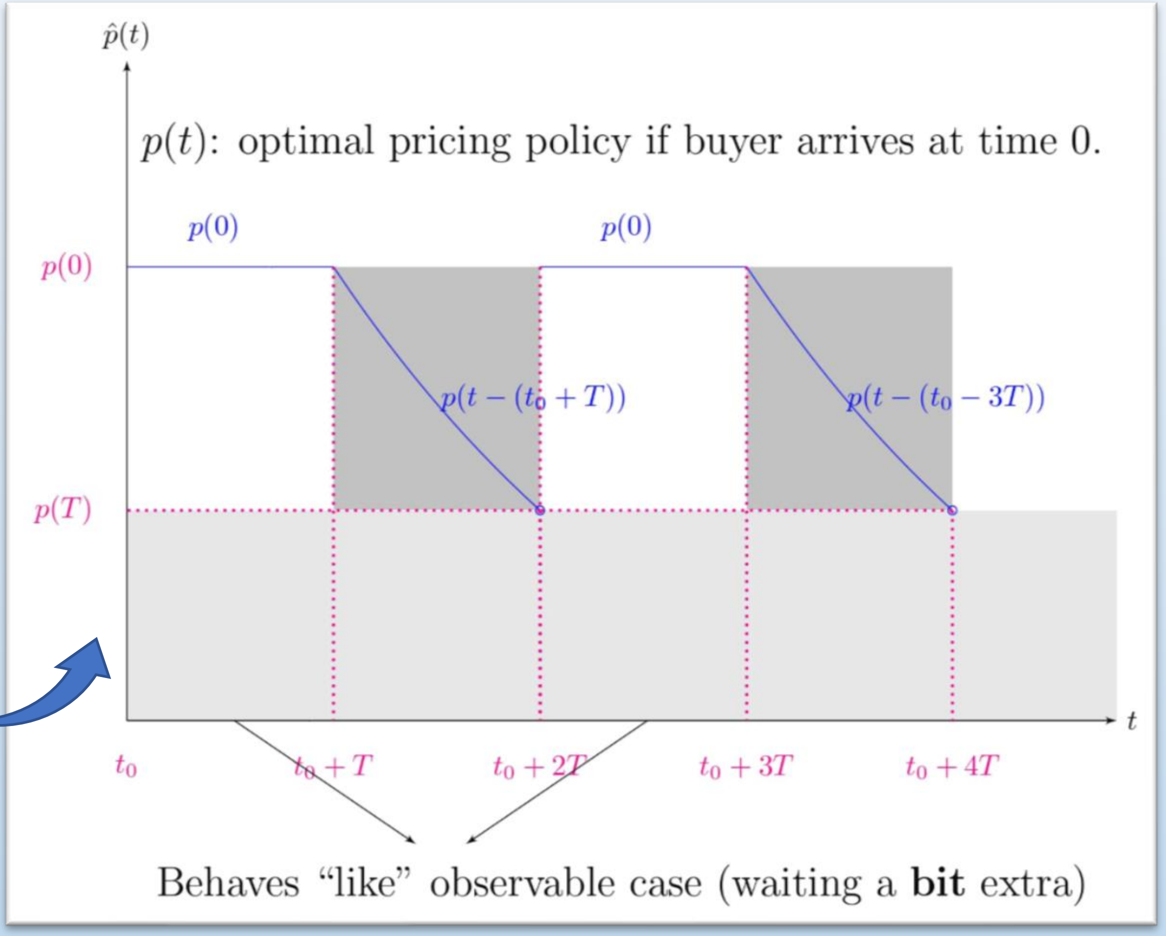
$$\textbf{Value of Observability} = \frac{\text{Expected revenue observable case}}{\text{Expected revenue unobservable case}} \leq \textbf{?}$$

Observable case:

- Already studied in the literature.

Unobservable case:

- Hard to obtain explicit solution.
- We search for a pricing policy that can recover a constant fraction of the revenue of the optimal solution in the observable case.
  - ✓ Main idea: use the optimal solution of the observable case and repeat along the whole horizon.



Main result: For every valuation distribution and arrival distribution, the **Value of Observability** is at most roughly **4.91**

✓ Our best **lower bound** is just 1.042 though.

Surprising because of several factors:

- the generality of the model,
- the bound is totally independent of the model primitives,
- simple pricing strategies, such as fixed pricing, fail to guarantee a constant bound.