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Authors

Fournier, Nicholas, PhD

Patire, Anthony, PhD

Skabardonis, Alexander

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Toll Pricing “Futures” Market Could Reduce Congestion and Increase Revenue

Nicholas Fournier, Ph.D., Anthony Patire, Ph.D., and Alexander Skabardonis, Ph.D.
Department of Civil and Environmental Engineering, University of California, Berkeley

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Issue

Transportation agencies are increasingly relying on tolls to raise revenue and to mitigate congestion, but conventional fixed tolls do not necessarily encourage off-peak use of infrastructure, and high tolls can dampen economic productivity. Dynamically adjusting pricing based on demand can incentivize travelers to avoid peak traffic periods and shift it to other modes, but given the unpredictable nature of traffic, travelers lack the information necessary to accurately predict congestion, so dynamic pricing has minimal effect on demand. Dynamic toll pricing also poses equity concerns for those who lack other travel options, such as access to transit. A simple “futures market” pricing mechanism has the potential to address these concerns—travelers can lock in a price for expected trips by prepaying for future tolls, with the future price increasing as more travelers book an overlapping time slot. To evaluate the effectiveness of a futures market to impact travel demand, trip density, traffic flow, and revenue, this research conducted a sensitivity analysis of elasticity and pricing constraints.

Concept

Travelers can lock in a lower price by pre-paying for future tolls. Travelers can purchase trips in advance while the price remains low or discounted, which also alleviates equity concerns for commuters who do not have alternate travel options. A basic booking interface could be a website or app where users can compare prices in advance and purchase their trip during a specified time window.



Figure 1. Examples of Dynamic Pricing

An existing toll system can easily be augmented with a futures market with software changes. Infrastructure investment would be minimal, especially if electronic tolling is already in place, such as FastTrack and EZ Pass. The technology can be developed independently and implemented as an incremental improvement of the existing toll collection system.

Key Research Findings

A futures market-based toll pricing mechanism can increase revenue and reduce delay. This approach encourages travelers to avoid driving during the peak periods when pricing increases toward capacity or to purchase trips in advance when the price remains low or discounted. Travelers that do not prepurchase their trip are subject to the real-time market price, which is determined by dynamic congestion pricing.

Dynamic pricing supports more efficient use of existing infrastructure. Transportation agencies must constantly balance between providing sufficient capacity for peak travel periods while minimizing expenditure. Yet the majority of infrastructure is underutilized during off-peak periods. Incentivizing drivers with lower prices to avoid peak times uses infrastructure capacity more efficiently.

More Information

This brief is drawn from a report that evaluated the revenue and operational benefits of a dynamic toll pricing “futures market” with a sensitivity analysis of the price elasticity of demand and pricing constraints. The sensitivity analysis was conducted using a simple elasticity-based simulation model to explore possible system outcomes for reducing delay and collecting revenue. The full article, “A Futures Market for Demand Responsive Travel Pricing” can be found here <https://doi.org/10.1177/03611981231167426>.

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