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Comparing Pricing Mechanisms for Managed Lanes

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POLICY BRIEF

Project Highlights

- Compared the effectiveness of dynamic pricing with variable pricing on express lanes
- Developed pricing (tolling) performance metrics from both the traveler's and toll authorities' perspective
- Formulated two new performance metrics – scoring index and graphical display of performance
- Dynamic pricing was found to have a slight edge in most of the metrics

OVERVIEW

Implementation of priced managed lanes as a traffic management and revenue generation tool has gained in popularity in the United States over the past two decades. There are currently 53 priced lanes in 11 states and Puerto Rico. The lanes provide a premium service for travelers who pay a toll to use the lanes along with toll exempt vehicles like high-occupancy vehicles (HOV). The price (tolls) used to maintain the premium service increases with increased demand in the lanes. The pricing can be either variable pricing or dynamic pricing. In variable pricing, the tolls change based on the time of day and day of the week on a set schedule. SR-91 Express Lanes in California uses variable pricing where the tolls change based on the hour of the day. In dynamic pricing, the price changes dynamically based on current traffic conditions. MnPass Express Lanes in Minnesota uses dynamic pricing where the tolls can change every 3 minutes.

In practice, variable pricing is easier to implement as the tolling algorithm is based on the day of the week and time of day. The toll is reviewed on a set interval and adjusted depending on the traffic conditions during that time. The dynamic pricing algorithm can be more complex as the tolls need to be adjusted every few minutes.

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The tolls can be based on the change in density of the most congested downstream segment, available capacity, average speeds, travel time in the managed lanes and/or the general-purpose lanes, or a combination of these.

RESEARCH

This research compared dynamic pricing with variable pricing to determine if one is superior. The goal was to help tolling agencies choose a pricing mechanism for their managed lanes. To measure which pricing mechanism is better, several tolling performance metrics for the managed lanes were developed. The performance metrics were developed from the perspective of both the travelers and the toll authorities. The metrics capture the ability of the toll to achieve the objective of premium travel on the managed lanes. Three metrics developed from the travelers' perspective: travel time savings, variability benefit, and planning time index benefit. Four metrics were developed from the toll operator's perspective: the ability of the toll to impact congestion, speed threshold, speed graphical display of performance, and scoring index. The scoring index and the graphical display of performance are new metrics developed in this research. Traffic and toll data were obtained for four dynamically-priced facilities, including express lanes in Minnesota (I-35W, I-35E, I-394) and MoPac in Austin, Texas, and two variably-priced facilities, including SR-91 in California and I-25 North express lanes in Colorado.

FINDINGS

The results confirm that both pricing mechanisms are working well to maintain a high level of traffic flow in the managed lanes. The dynamically priced lanes appear to have a slight edge in several of the metrics. However, the difference in the scores was too small to firmly say that one type of pricing was significantly better than the other. To determine the dominant type of pricing, more managed lanes would need to be analyzed.

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