VARIABLE PRICING

Description

Variable pricing manages demand on congested roadways by providing motorists with carefully constructed financial cues. These cues encourage motorists to use the available roadway in a more efficient manner. Transportation agencies use variable pricing on congested facilities, often those with preexisting toll components. This includes roads, bridges, or tunnels. Variable pricing can take two main forms:

- Time of day pricing.
- Dynamic pricing.

Time of day pricing functions exactly as it sounds: the administering agency adjusts the toll to vary with the time of day. The toll adjustment schedule is set to generally (but not exactly) correlate with the level of congestion on the road; the times of day with higher congestion levels are tolled the highest, and the times of day with the lower congestion levels are tolled at a lower rate.

Dynamic pricing functions similarly to time of day pricing but provides an increased level of precision and technological complexity. Administering agencies set the toll to directly move in real time with level of congestion on the road. If the average speed decreases, vehicle count increases, or some other measure of congestion increases, the toll will increase in corresponding increments. Usually the agency sets a ceiling or floor for the toll, below which it cannot drop or above which it cannot rise.

Adjusting the toll encourages drivers to choose:

- An alternate route.
- A different departure time.
- A different transportation mode, such as transit, carpool, or vanpool.
- To telecommute or simply not take trips unless they are a high priority.

Cost:	●●○○○
Time:	**Moderate**
Impact:	**Corridor**
Who:	**Public Agency**
Hurdles:	**Public Acceptance**

Studies have found that variable pricing is one of the most effective ways to incentivize travel alternatives.

Target Market

The application of variable pricing can provide a signal for motorists to consider alternative travel arrangements. Variable pricing is most commonly used on congested roadways or roadways that are forecasted to be congested in the future. Variable pricing can be applied to roads without a preexisting toll component or used on legacy tolled facilities that previously used fixed pricing.

Administering agencies use variable pricing on two main facilities types:

- Priced lanes or shoulders.
- Priced roadways.

Variably priced lanes usually include express toll lanes and high occupancy toll (HOT) lanes. Shoulders should also be considered for future

applications of pricing. The toll is limited to one or a few lanes that run parallel to general purpose lanes. Variably priced roadways have a varying price on all of the facility's lanes.

Variable pricing works best by encouraging motorists to shift their travel time, alter their route, or use alternative transportation options, so this strategy is best applied on roadways that have readily available alternatives to traveling on the congested corridor, either using transit or a parallel route. They can be useful when the trips occurring in a corridor are discretionary and motorists could easily choose to drive at an alternative time or eliminate the trip entirely.

How Will This Help?

- Variable pricing can reduce congestion on tolled facilities by moving some traffic demand to alternate times, routes, modes, or by eliminating trips. Previous studies have found that when transportation agencies implement variable pricing, motorists significantly shift their travel patterns around the pricing structures. Motorists reduce their traveling from the peak periods to the discounted, off-peak periods. The construction of new, variably-priced express lanes allows traffic to flow at higher speeds and volumes than general purpose lanes, reduces congestion, and increases vehicle throughput on the overall facility.
- Variable pricing increases the efficiency of the transportation network by providing market signals to increase driver awareness of the trip costs. When roadways are not priced, the only costs that motorists incur (outside those for normal vehicle operation) is that of their time. When a variable price is put on the road, motorists will evaluate the value of the trip more accurately according to their preferences. Those who must use the road during the peak time will do so, and those who can use alternative routes, times, or modes will do so according to their preferences. The use of variable pricing can prevent congestion from occurring and reduce congestion on existing tolled facilities.
- Variable pricing can have low implementation costs that produce additional revenue for facilities or service provision. As an example, the Katy Managed Lanes running from Katy into Houston has an annual maintenance cost of $350,000 but generates approximately $6.6 million in revenue.
- Variably-priced facilities can accommodate equity concerns through transit alternatives and discounting fees for specified accounts. For example, the Katy Managed Lanes allow certain vehicles to travel for free any time, and others to travel for free only during peak hours. High occupancy vehicles can use the managed lane for free during peak periods, whereas motorcycles, and transit vehicles to travel on the tolled lanes at no cost during all periods.

Implementation

IH 15 FasTrak Express Lanes, San Diego, CA: The IH 15 FasTrak Express Lanes in San Diego, CA, are operated by the San Diego Association of Governments (SANDAG). A 20-mile section consists of two managed lanes in each direction, dynamically priced for SOVs, with intermediate ramps serving areas along the corridor. Bus rapid transit (BRT) is a significant component of the expansion project, with new BRT transit stations built along the route as part of the project. The IH 15 express lanes use dynamic pricing. Toll rates typically vary from $0.50 to $4.00 but can rise as high as $8.00 in severely congested conditions. Technology deployed in the corridor allows for the assessment of current traffic conditions. The toll rate is adjusted dynamically to ensure free-flow conditions in the

express lanes. Dynamic message signs posted prior to the entrance of the facility alert the drivers to the current toll.

IH 10 Katy Freeway, Managed Lanes, Houston, TX: The Katy Freeway managed lanes operate using time of day pricing. The toll charges $1 for a 12-mile trip in the off peak, $2 during the hour before and after the peak two hours, and $4 during the peak two hours in both the morning and evening. The lane allows HOV2+ vehicles to travel for free during peak hours. The pricing is set to ensure continuous free flow conditions in the lanes. The managing agency may choose to convert to dynamic pricing in the future if demand requires it.

Midpoint Bridge, Lee County, FL:
The Midpoint Bridge in Lee County, Florida provides a good example of the impacts of variable pricing. The facility had an existing toll component before implementing the variable pricing. The facility began providing a 50 percent discount when traveling during the discount periods (6:30 a.m. to 7:00 a.m., 9:00 a.m. to 11:00 a.m., 2:00 p.m. to 4:00 p.m., and 6:30 p.m. to 7:00 p.m.) provided they paid the toll electronically.

Following the implementation of variable pricing, the facility experienced increases in traffic in the off-peak (with increases reaching nearly 20 percent in some time periods) and experienced decreased traffic volumes during the peak period (with decreases reaching about 13 percent in some time periods).

IH 35W Dynamically Priced Shoulder Lane, Minneapolis, MN: The Minnesota DOT converted the shoulder into a tolled lane that operates during periods of congestion. The added lane increases the capacity of the road and provides a source of additional revenue to the state. The DOT constructed pricing signs that also indicate whether or not the lane is open to general traffic. The pricing is dynamic and varies between $0.25 and $8.00. The average toll for peak periods is $1.00–$3.00

Application Techniques and Principles

When implementing variable pricing, the managing agencies would need to assess the needs of their facility and select suitable options to match. If the toll component is new, tolling infrastructure will need to be constructed, software developed, and hardware selected for motorists' on-board units. Using all electronic tolling would be vital for maximizing throughput. If implementation occurs on a facility with preexisting tolling equipment, agencies would need to adjust the software algorithms to calculate and charge the new toll rates, especially with dynamic pricing. Signs that inform motorists of the current toll will need to be constructed. As with any major project, the managing agencies should develop a concept of operations that analyzes the relevant constraints and considerations, like the level of demand, willingness to pay, infrastructure needed, level of public support, and availability of transportation alternatives.

- **Level of demand**: is there sufficient demand, either currently or anticipated, to justify implementing variable pricing?
- **Willingness to pay**: how much are motorists willing to pay for what level of speed improvement?
- **Facilities**: Will an existing facility be modified, or will additional lanes need to be constructed?
- **Public support**: What is level of support, and what actions should be taken to increase support for this project?
- **Alternative transportation options**: are there sufficient alternative options for motorists who do not wish to pay a toll?

Issues

Variable pricing's most difficult hurdle lies in public resistance to variable tolling and a lack of public knowledge of the benefits and costs of the program. Many may resist the concept, thinking they must pay for something that has always

been free. This pressure may inhibit variable pricing program growth.

Public acceptance for variable tolling projects is often low in the initial stages of outreach, but after the project is implemented, acceptance tends to increase. One factor that has helped previous projects overcome this hurdle has been the support of a key stakeholder or project champion.

Who Is Responsible?

Variable pricing strategies can be managed by various governmental entities, and even partnerships between private organizations and governments. TxDOT manages several toll roads and currently plays a role (as part of a tri-party agreement) in a variably priced facility in Houston.

City and county governments can also manage variably priced facilities. For example, the Harris County Toll Road Authority (HCTRA) and the Metropolitan Transit Authority (METRO) manage variably-priced facilities in Houston. Various local jurisdictions currently operate toll roads in Texas and could implement variable pricing strategies if they so desired.

Project Timeframe

For facilities that already have tolling capabilities, the timeframe for implementation would be relatively short. This would mostly require educating the public about the changing policy and pricing, and then modifying tolling systems to vary the price of the toll. However, constructing an entirely new facility or making major changes to an existing facility can take significantly longer.

Cost

Operating and maintaining a variably-priced facility can be a relatively low-cost option for managing demand. These facilities can also provide revenues to cover operating and enforcement costs, improve transit services, and finance highway infrastructure. As mentioned above, the Katy Managed Lanes cost $350,000 to run annually, but bring in revenues of about $6.6 million. The costs and revenues are largely dependent upon the facilities needed for establishing the variable pricing program and the operational parameters and policies. For example, constructing a brand new roadway or additional lanes will create much larger costs than simply converting a flat rate tolling facility to variable pricing. Additionally, the amount of revenue generated will depend on the prices set, the level of demand on the roadway, and the number of vehicles allowed to travel freely.

Data Needs

Evaluating the need for variably priced lanes or roads requires knowing present and projecting future demand on the facility. This could include current and historical traffic volumes, peak hour volumes, and speed data to assess congestion. Determining the correct toll levels for the facility can require collecting input on willingness to pay for varying levels of time savings in the community. Collaborating efforts with local transit agencies and stakeholders could help to encourage alternative commuting options. Finally, managing a variably priced facility requires making adjustments to the toll rate. Managing agencies make the adjustments based on active data collections of traffic volumes, speed data, and peak hour volumes.

Variable Pricing Best Practice

- Type of Location: Works best on roads with pre-existing toll facilities, readily available alternative transportation options.
- Agency Practices: Agencies should ensure the public is informed about the new pricing policy and its benefits.
- Frequency of Reanalysis: Depending on whether the agency uses dynamic or time of day pricing, the congestion levels may need to be regularly evaluated to ensure that traffic continues to flow freely.
- Supporting Policies or Actions Needed: The managing agencies should collaborate with the local transit services and other stakeholders to ensure that transportation alternatives are adequately provided.
- Complementary Strategies: Managed (HOV/HOT) lanes, adding new toll roads, car and vanpooling, temporary shoulder use, express bus service, and electronic toll collection systems.

For More Information

Burris, Mark. *Value Pricing as a Congestion Management Tool.* Texas Transportation Institute. 2006.

Congestion Pricing: A Primer. Federal Highway Administration. 2008. http://bit.ly/MTzmC7.

Value Pricing Pilot Program: Lessons Learned. Federal Highway Administration. Project #052908. 2008.