

Fuel Price Synthesis: Potential Travel Model Considerations

Throughout the years a recurring discussion on the email list is the variety of travel model considerations to be addressed when accounting for fuel price changes. The ensuing diversity of comments (regarding potential behavioral responses to prolonged higher fuel prices) demonstrates the extent with which fuel price changes could eventually impact current modeling practice. Five key questions posted to the email list during different periods serve to define potential travel model considerations given higher fuel prices:

- If the cost of fuel (in terms of actual fuel price increases and/or corresponding gas tax increases) continues to a certain level (as yet to be determined), may it force general land use changes in the forecast scenario(s)?
- What are the potential consequences on household expenditure patterns given different auto operating cost scenarios?
- Is it reasonable to anticipate that people may choose to re-locate closer to jobs in denser settings that have greater alternative modes of travel to reduce trip lengths or retire certain trips altogether?
- What impact would these types of changes have on auto-dependant cities versus older/dense cities with greater transit service?
- What is the threshold value for the price of gasoline that will create basic changes in trip making characteristics and what are the potential outcomes?

Where there are few recommendations offering tangible solutions or practical examples to address the questions noted above, the discussion elicits a number of suppositions and observations on how select model input variables might require adjustment. Taken as a whole, these comments highlight the diversity of issues that eventually may need to be addressed in travel model development.

The following synthesis represents a compilation of all emails on the subject matter since the inception of the Travel Model Improvement Program (TMIP) email list.

Potential Travel Model Considerations

The synthesis describes six probable travel/land use related scenarios that may occur if fuel prices and auto operating expenses increase significantly for a sustained time period. These are:

- *Changes in land use patterns* may cause people to locate closer to jobs or shopping, thereby impacting densities and land use patterns.
- *Suppression of trips* is a reasonable expectation given higher auto-operating costs associated with increased gas prices.
- *Reduction in total trips* may be a possible outcome and will likely occur with weekend non-discretionary travel and long distance travel. One contributor noted changes will probably not occur with non-discretionary travel that occurs during the peak hours. Others thought that people would choose to combine trips to eliminate the need for non-discretionary travel during weekend travel.
- *Increased trip chaining* is possible.
- *Changes in trip length* may occur as a result of increased trip-chaining and changes in land development patterns.
- *Increased transit patronage* may occur as the price of owning and operating an automobile becomes extremely high (e.g. fuel, parking, tolls). Several contributors felt strongly about the relationship between higher fuel prices and transit patronage while

others indicated a basic concern about making a direct relationship between the two by citing examples regarding sensitivities to travel time versus the cost of travel.

Additional travel model considerations were offered that might require a re-assessment of certain model input variables; these are listed below:

- *Changes in household expenditure patterns:* Several contributors provided examples of how households may redirect household expenditures in response to higher fuel costs but were unclear how this may influence trip making.
- *Increased auto-operating costs:* As one contributor noted, the historical cost for operating a vehicle has been relatively low on a per mile basis. Moreover, given a large increase in the cost of fuel, the per mile fuel cost and any anticipated changes brought about by higher fuel costs may still be relatively low.
- *Changes in fuel efficiency assumptions:* Similar to fuel costs, fleet fuel efficiency is typically assumed to be a constant over time to yield a value of X cost/per mile. Changes to vehicle technology in response to higher fuel costs may have dramatic effects on fleet fuel efficiency depending on how quickly the fleet migrates to this new technology.
- *Increased costs to transit:* A number of postings noted that the corresponding costs to transit should not be ignored when accounting for changes in fuel prices.
- *Changes in the value of time:* A question was posed regarding the justification for changing the value of time for different forecast years and whether it was possible to have a different value of time for transit costs and tolls costs. Since transit, toll, fuel, and parking costs are out-of-pocket costs, these should all have a consistent value; otherwise, comparing transit and toll alternatives in the same corridor would be difficult observed one contributor.
- *Changes to toll usage:* Preliminary evidence using recent traffic data indicates that volumes on toll roads have not changed in response to increased fuel prices, even during periods of extreme price spikes (e.g. Hurricane Katrina). One contributor felt that perhaps this is because the income characteristics of the toll road users are not influenced by changes in fuel price and the corresponding increase in basic operating costs per mile.
- *Changes in the departure/arrival times to avoid the most congested periods:* One particular response that may be anticipated with higher fuel prices is the modification of people's departure and arrival times to avoid the most severe congestion. One recommendation was to increase the number of time periods being modeled in an attempt to capture this type of change.

Potential Travel Model Solution

One significant solution offered to the email community was to incorporate a feed-back between fuel costs and land use/demographics to account for the changes in travel related expenses, even though this is not a trivial endeavor. Understanding the underlying assumptions and correctly identifying the numerous land use-transportation dynamics associated with the cost of travel and determining the orders of magnitude and analytical approaches to interpreting the results are simply unknown at this point. Based on the contributions to the email list, it appears that beyond the realm of academia, these types of models have not been integrated into current mainstream travel model practice.

Conclusions

Each of the potential travel related outcomes and model considerations noted above are recommended for careful consideration; however, there are relatively few concrete suggestions

on how to account for these issues in the current model practice with a high degree of certainty. Based on available observed data, the modeling community has a limited ability to model the potential consequences of higher fuel prices on overall travel. As one contributor offered, modeling the effects of the cost of driving hasn't really been adopted because large scale changes in response to fuel price changes have never occurred and therefore, the true effects are hard to establish. Moreover, it is simply too speculative to predict whether market constraints and innovations will drive up or down the relative costs of driving over time.

DISCLAIMER

The objective of the series is to provide technical syntheses of current discussion topics generating significant interest on the TMIP e-mail list. Each synthesis is drawn from e-mails posted to the TMIP email list regarding a specific topic. The syntheses are intended to capture and organize worthwhile thoughts and discussions into one concise document. They do not represent the opinions of FHWA and do not constitute an endorsement, recommendation or specification by FHWA. These syntheses do not determine or advocate a policy decision/directive or make specific recommendations regarding future research initiatives. The syntheses are based solely on comments posted to the e-mail list.