An Economic Analysis of the Proposed Material-Specific Discount Rate for Commodity Pricing in Highway Construction Life-Cycle Cost Analyses

White Paper — Special Report 203
Executive Summary

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Executive Summary

This white paper examines the proposed introduction of material-specific discount rates to highway construction life-cycle cost analyses (LCCAs). A recent version of the Financial Services and General Government Appropriations Bill (H.R. 2434) would have mandated that the Office of Management and Budget (OMB) publish these material-specific discount rates. Other recent legislation proposals such as the Consolidated Appropriations Act, 2012 (H.R. 3671) and the Moving Ahead for Progress in the 21st Century Act, or MAP-21 (S. 1813) envisioned review of best practices in regards to LCCAs and discount rates.

Discount rates are used in LCCAs to translate the future costs of an infrastructure project to present values for the purposes of comparing the costs of project design alternatives. Life-cycle cost analysis calculates the total lifetime costs of a project, including initial construction, rehabilitation, maintenance, and salvage value.

Several methods exist for the analyst to properly compute project costs in either real or nominal terms. These methods include:

1) Conduct in today’s dollars and deflate for opportunity value of time.
2) Conduct in future dollars (where available, such as in a rent or lease agreement) and deflate for both opportunity value and inflation.
3) Inflate today’s dollars to reflect “expected future changes in relative prices…where there is a reasonable basis,” (OMB Circular A-94, emphasis added) and deflate for both opportunity value and inflation.

Another method, proposed by the Concrete Sustainability Hub (CSH) at the Massachusetts Institute of Technology (MIT) in a paper entitled “The Effects of Inflation and Its Volatility on the Choice of Construction Alternatives,” uses a computation shortcut within Method 3 that combines theoretically distinct estimations of inflation for individual materials and discount rates. The CSH paper, funded by the Portland Cement Association (PCA) and National Ready Mixed Concrete Association (NRMCA), proposes a model that uses historical commodity prices and statistical simulation to combine material-specific rates of inflation and discount rates. In an effort to become the pavement of choice in highway construction, the concrete pavement industry is promoting the methodology developed in this paper as proof of concrete pavement’s future lower costs. The concrete pavement industry is also conducting a lobbying and outreach effort to influence federal legislation and introduce this new methodology to infrastructure LCCA calculations nationwide.

This white paper examines three issues related to the use of material-specific discount rates:

Best Practices: The use of material-specific discount rates is not accepted as valid by the economics profession. It is endorsed neither in OMB Circular A-94, the relevant federal guidance, nor in any other state, academic, or private-sector literature. In fact, the only mention of this methodology is in the CSH paper, in which the authors state that such a methodology should only be used as a “computational workaround.”

Predicting Commodity Prices: LCCAs require the projection of prices for commodities and services over years and decades. The CSH paper forecasts future prices using historical price inflation information. However, no theoretical or empirical evidence is provided to support this methodology. Numerous studies, which are referenced in this white paper, have demonstrated
that predicting future price trends for inflation or for commodities such as oil beyond periods as brief as six months is no more accurate than repeating the last known price in perpetuity. Methodological contributions such as Hotelling’s rule as well as empirical analyses by the Congressional Research Service (CRS) and others argue that the current prices of nonrenewable resources such as oil encompass future supply and demand considerations.

**The Bill of Goods, Asphalt Innovation, and Other Concerns:** Estimating the bill of goods (which includes the actual costs and usage of production inputs, including materials and labor) to construct and maintain a highway over time is difficult to predict due to a multitude of potential circumstances and the effects of technological change. For example, the CSH paper’s calculation of the standard bill of goods is inaccurate and overly simplistic: Larger contributors to the bill of goods, such as wages and overhead, are underestimated and are not inflated along with materials. The assumed life cycle for an asphalt resurfacing is lower than observed by almost every state DOT. The CSH paper also does not consider recent and anticipated innovations in asphalt engineering that would markedly alter the cost component, such as recycling and the use of warm-mix asphalt.

In light of these issues, this white paper concludes that mandating the use of material-specific discount rates would run counter to current best practices and is not defensible given the state of the art in commodity price forecasting and accuracy. However, further study of LCCA techniques and discounting methods, as proposed in the 2011 Consolidated Appropriations Act, 2012 (H.R. 3671) and the Moving Ahead for Progress in the 21st Century Act (MAP-21, S. 1813), is recommended.

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