



# LCCA Elements: RECOMMENDATION FOR DISCOUNT RATE

The missions of transportation agencies across the United States are inextricably connected to the welfare of the people in the communities they serve. Many will find this statement unsurprising given that agencies are stewards of taxpayer money, members of the community, and users themselves. Yet, the fact that Departments of Transportation expressly tie their mission to the welfare of constituents is an important finding in a literature review of the key factors and interpretations of life cycle cost analysis (LCCA).<sup>1</sup>

Frequently defined as a tool to determine the most cost-effective option among competing alternatives, LCCA is widely used by agencies on multiple assets including pavements. Some interest groups have suggested that, given limited agency budgets, adoption of LCCA should be expanded to every project within an agency's purview. Considering the volume of projects advertised by each transportation agency, application of LCCA on this scale would slow project letting and construction, derailing agency best practices and failing to align the agency's mission with its goal to serve in the

best interest of its citizens. Instead, it is worth considering a welfare-augmented version of LCCA, where funds are allocated to projects that maximize people's welfare.

While never intended to be the sole factor in pavement-type selection, one critical element of an LCCA is the discount rate. Used by economists to compute the net present value of an asset over decades, the discount rate reflects the time value of money, where benefits and costs are worth more when experienced sooner.<sup>2</sup> **Conventional guidance from the Federal Highway Administration (FHWA) and industry has supported use of the Office of Management and Budget's (OMB) real interest rate to calculate the discount rate used in LCCA.<sup>2,3</sup> However, a reexamination of this guidance is required due to a phenomenon that occurred in December 2020, when a negative real interest rate was reported for the first time in history.** A negative real interest rate indicates that investors are willing to purchase bonds now, knowing that upon maturity they will receive less cash than they invested – a notion that does not align with human behavior.

<sup>1</sup> Buttlar, W. & Haslag, J. (2022). *A Review of LCCA Literature: Key Factors and Interpretations*. National Asphalt Pavement Association, Greenbelt, MD.

<sup>2</sup> Circular No. A-94 Revised. (1992). Guidelines and Discount Rate for Benefit-Cost Analysis of Federal Programs. Office of Management and Budget, Washington, D.C. Retrieved February 28, 2022, from <https://www.transportation.gov/regulations/omb-circular-94>.

<sup>3</sup> Copeland, A. (2017). *Understanding LCCA in Highway Legislation & Federal Projects, Its Appropriate Use, and the Importance of State Autonomy* (SR 220). National Asphalt Pavement Association, Lanham, MD.

Understandably, given past guidance, many agencies used the negative real interest rate as the discount rate in their life-cycle cost analysis without understanding the unintended consequences. This warrants an examination of how the OMB real interest rate is calculated. Not directly observable, the nominal interest rate (rate before accounting for inflation) is analyzed for U.S. Treasury securities. From this observation, OMB subtracts the Administration's inflation rate assumptions to obtain the real interest rate.

In December 2020, the Administration projected a 2 percent inflation rate over the next six years. While the Federal Reserve judged 2 percent inflation as consistent with its price stability mandate, this judgement is not equivalent to the expected inflation rate used by market investors for Treasury securities. Therefore, when OMB reported that the 30-year nominal interest rate for a Treasury bond was 1.7 percent, then subtracted the 2 percent inflation rate assumption, it made the calculated 30-year real interest rate -0.3 percent.

FHWA notes that the value of LCCA is contingent upon its proper use and the quality of the data, repeatedly stressing the need for agencies to gather and verify the data and inputs used in LCCA.<sup>4</sup> Since the use of the OMB real interest rate is not subject to market forces (rather the Administration's inflation rate assumptions) and agencies have a mandate to serve their constituents, **economists suggest a more appropriate discount rate would correspond to the opportunity cost facing the average household.**<sup>1</sup> U.S. Treasury securities are considered risk-free due to the low likelihood of payment default, whereas investors have a diversified portfolio composed of different asset types aimed at reducing the natural risk of investment. The opportunity cost on a diversified portfolio is closer to 4 percent historically. In fact, economists gathered data over 58 years on the real return in a diversified portfolio consisting of stocks, real estate, government bonds, and corporate bonds and calculated the average real interest rate at 4.45 percent.<sup>5</sup>

For an agency to fulfill its fiduciary responsibility, a discount rate closer to that of a diversified portfolio and a 4.45 percent real interest rate is more appropriate than a discount rate based on risk-free real (Treasury securities) interest rates. Utilizing a proper discount rate is prudent to maximize the welfare of the people.



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<sup>4</sup> FHWA (2002). *Life-Cycle Cost Analysis Primer (FHWA IF-02-047)*. Federal Highway Administration, Washington, D.C. Retrieved February 28, 2022, from <https://rosap.nhtl.bts.gov/view/dot/39695>.

<sup>5</sup> Doeswijk, R., Lam, T., & Swinkels, L. (2020). "Historical Returns of the Market Portfolio." *The Review of Asset Pricing Studies*, Vol. 10, No. 3, Pp. 521-567. Retrieved February 28, 2022, from <https://doi.org/10.1093/rapstu/raz010>.