Incorporating Asset Values in Investment Decision-making

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Outline

- Traditional Considerations for Investment Evaluation
- Limitations of Traditional Considerations
- Assumptions in using Asset Value in Investment Evaluation
- Expression of Asset Value
- Methodologies for assessing:
  - Short-term impacts of investments on asset value
  - Long-term impacts of investments on asset value
- Importance of Asset Valuation in Investment Evaluation
- Conclusions
Traditional Considerations in Investment Evaluation
Traditional Considerations

- **Effectiveness (Benefits)**
  1. Preservation (increase in condition or service life)
  2. Mobility (congestion mitigation)
  3. Safety
  4. “Positive” externalities

- **Cost**
  1. Agency cost
  2. User cost
  3. Community costs / adverse externalities
Limitations of Traditional Considerations

- Traditional considerations involve different performance criteria

- Thus:
  - Inputs to investment analysis have different units or dimensions
  - Investment analysis plagued by “Apples vs. Oranges” dilemma
  - Difficult to select projects in portfolios having multiple asset types and multiple performance criteria
  - Difficult to assess tradeoffs across program areas in terms of the multiple performance criteria
Options for addressing this problem include:

- Conversion of all investment impacts into dollars and using economic analysis
- Multiple-criteria decision-making
- Using Asset Value Enhancement as the key criterion in the investment decision making
Assumptions

1. An investment leads to an enhancement (or degradation) in at least one of the following categories of asset value:
   - Value in terms of facility longevity or condition
   - Value in terms of mobility
   - Value in terms of safety
   - Economic development value
   - Social value
   - Value in terms of environmental quality
   - Etc.

2. Such increase in asset value can be determined using existing analytical methods
Which expression of asset value to be used in the investment analysis?

- **Pre-investment value (EV):** Value of the asset before the investment. Not altered by the investment. Not to be used alone for analysis.

- **Post-investment value (FV):** Actual or expected value of the asset after the investment.

- **Added value (AV):** Increase (or decrease) in asset value due to the investment (= FV – EV)

- **Combinations of the above**
  - Relative Value: (AV/RV)
  - Ratio of final to existing value (FV/EV); etc.
Short-term Impacts of Investments on Asset Value
Asset Value

Time

Accumulated traffic, accumulated climate, etc.
Accumulated traffic, accumulated climate, etc.
Asset Value

Year of Investment

Time Accumulated traffic, accumulated climate, etc.

$C_F$

$C_A$

$C_E$

$C_D$

$t_A$

$t_E$

$A$

$Z$

$W$

$E$

$D$
**Effectiveness:** Performance Jump (PJ or $\Delta V$)
**Relative Effectiveness:** $\frac{PJ}{C_D}$ or $\frac{\Delta V}{V}$
**Cost-effectiveness:** $\frac{PJ}{\text{\$ of investment}}$

**NOTE:** The change in value with respect to cost removes bias of large projects that skew value ranking with large initial construction costs.
Effectiveness: Reduction in the Rate of Depreciation \((S_1 - S_3)\)

Relative Effectiveness: \((S_1 - S_2) / V\)

Cost-effectiveness: \((S_1 - S_2) / \$ \text{ of investment}\)

NOTE: The change in value with respect to cost removes bias of large projects that skew value ranking with large initial construction costs.
Value enhancement depends on intensity of the investment.
Long-term Impacts of Investments on Asset Value
**Effectiveness**: Investment Life, $t_{IL} = f^1(AV^*)$

**Relative Effectiveness**: $t_{IL}/AV^*$

**Cost-effectiveness**: $t_{IL}/\$ \text{ of investment}$
**Effectiveness:** Increase in Asset Value, \( IAV = \frac{1}{t_{IL}} \sum_{i=t^*}^{t IL} (AV_{year\_i}) - AV^* \)

**Relative Effectiveness:** \( IAV/AV^* \)

**Cost-effectiveness:** \( IAV/\$\) of investment
**Effectiveness:** Area bounded by the depreciation/deterioration curve, \(ADC = \int_{t_*}^{t_{II}} f(t)dt\)

**Relative Effectiveness:** \(ADC/AV^*\)

**Cost-effectiveness:** \(ADC/\$\) of investment
Importance of Asset Valuation in Investment Evaluation: Multiple-criteria nature of highway investment impacts

One or more of:
Economic development
Customer Satisfaction,
Δ v/c Ratio
Δ Crash Rate
Δ NBI Rating
Δ IRI, etc.

Optimal decision-making based on multiple performance measures
Importance of Asset Valuation in Investment Evaluation: Multiple-criteria nature of highway investment impacts

Note: Performance measures shown are examples only.
Conclusions

- Current evaluation methods do not consider the value of the existing asset.
- However, consistent with business practices, investments must be evaluated not only on basis of costs and benefits but also existing asset value.
- Asset value can be used alone or together with other criteria in investment evaluation.
- Asset value encapsulates multiple criteria in itself.
Questions?