Carnegie Mellon University

AutoMerge

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Goals

Discuss

- Outline Problem
- Alternatives
- Explain Costs and Calculations
- Specify Uncertainty
- State Assumptions
- Show Results
- Convey Sensitivity Analyses
- Conclusion

Problem
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Problem

Overview

- NYC to become a leader in *smart city* infrastructure
- One piece: Evaluate autononous vehicles
- By 2020, NYC expects its fleet to be autonomous.
- We will evaluate AutoMerge (AM) Inc as an alternative.

Alternatives

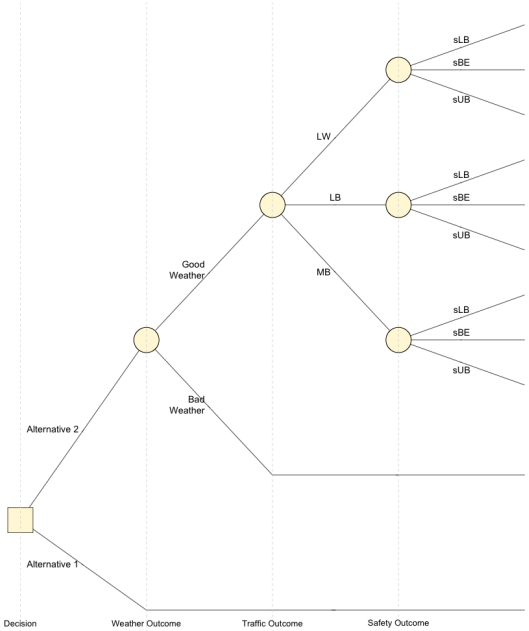
1. Do not not implement AM.
   This are the costs that would be incurred if the status quo continues so there is little uncertainty for this alternative.
2. Implement AM.
   Implementing AM comes with uncertainty with respect to AM performance.
3. Perform a pilot study.
   We decide size of pilot study. A larger the study reduces more uncertainty than a smaller one but costs more.

Costs and Calculations

	Variable	Value	Notes
(a)	# buses with age $<$ 5 years	2313	Source: [**am1**]
(b)	# buses with age 5-9 years	1296	Source: [**am1**]
(c)	# buses with age 10-20 years	1437	Source: [**am1**]
(d)	Capital Cost per bus age $<$ 5 years	$ 5000	Source: [**am1**]
(e)	Capital Cost per bus age 5-9 years	$ 6500	Source: [**am1**]
(f)	Capital Cost per bus age 10-20 years	$ 8500	Source: [**am1**]
(g)	**Total Capital Cost**(*)	**$ 45.7 Million**	**=(a)*(d)+(b)*(e)+(c)*(f)**
(h)	Annual O&M Cost per Bus	$ 1500	Source: [**am1**]
(i)	**Total Annual O&M Cost** (**)	**$ 7.6 Million**	**=[(a)+(b)+(c)]*(h)**
(j)	Annual Cost per Commuter	$ 1739	Source: [**UMR**]
(k)	Annual hours in congestion per commuter	74 hours	Source: [**UMR**]
(l)	Cost per minute	$ 0.39	$(h)/[(i) * 60]$
(m)	Total person trip per day	1.52 million	Source: [**nyctransit**]
(n)	Average time in daily person trip	49 minutes	Source: [**nyctransit**]
(o)	**Total annual congestion cost**	**$ 10.5 Billion**	**=360*(l*(k)*(j)**

Uncertainty

We account for uncertainty using decision trees. Our sources of uncertainty are weather and proformance of AM.



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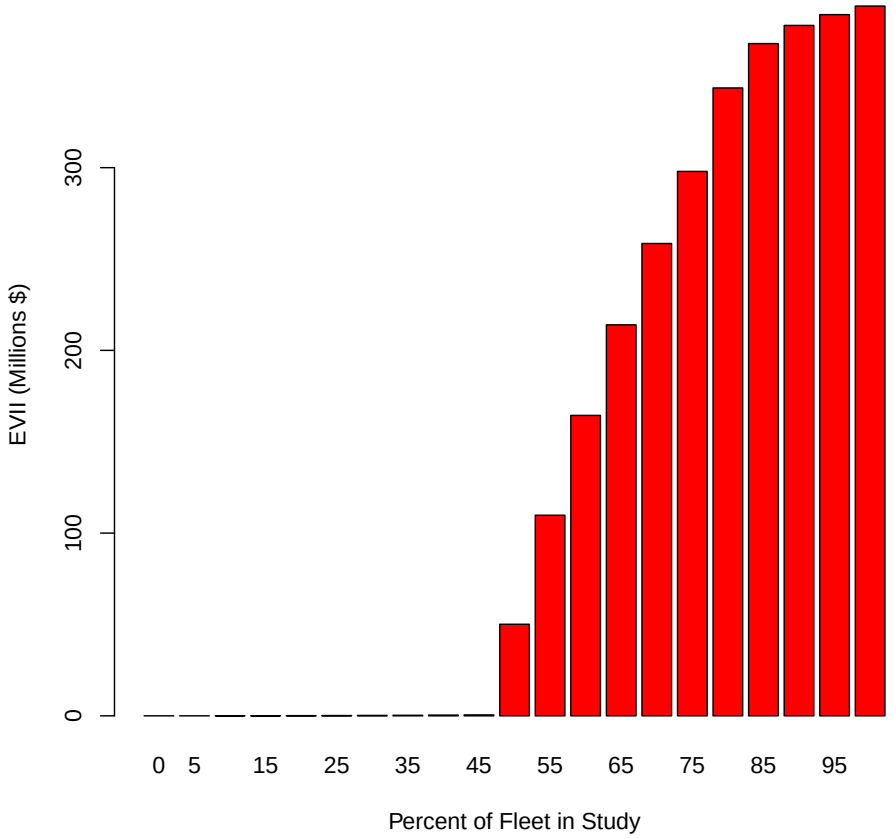
Assumptions

Pilot

- EVII
- Figure shows value after cost beyond alternative 2.
- Optimum value from 100% of fleet.



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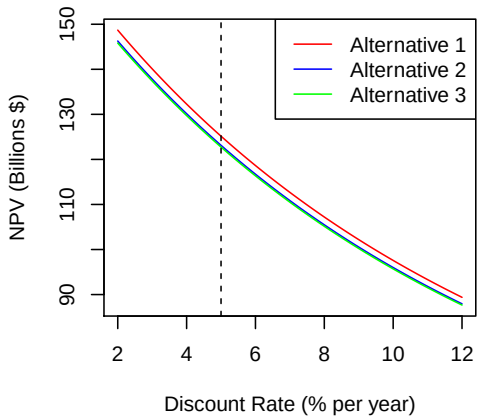
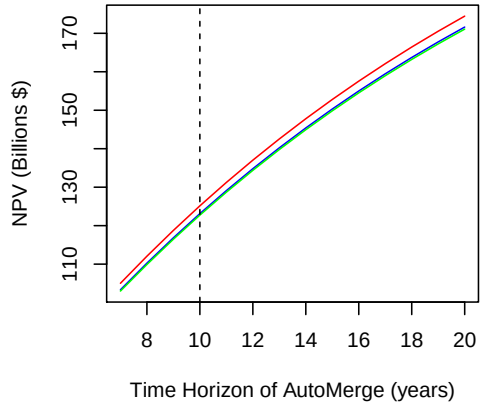
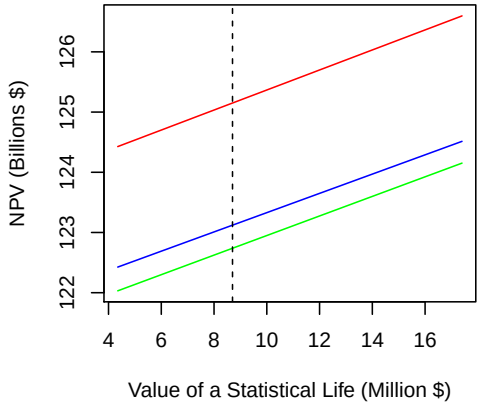
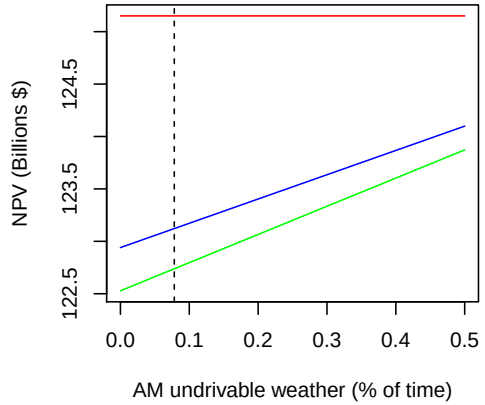
Sensitivity Analyses









References