Value Capture, debt, and net present value

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Transportation infrastructure can be funded through *user fees*, paid by those who *use* the transportation system or by *general taxes*, paid by all taxpayers. The logic of paying for infrastructure through general taxes is that members of the general public benefit from the presence of transportation infrastructures regardless of whether they use it. However, the benefits they enjoy may not necessarily be distributed proportionately with the taxes they pay.

Value capture strategies are mechanisms that seek to raise revenue for transportation infrastructure based on the value of its non-user benefits. If businesses adjacent to a new bike path[1] or transit line experience an increase in retail sales, then sales taxes at those businesses might be a form of value capture. If property values increase when a new bridge or ferry service makes a community more accessible to employment centers, then property taxes might be a form of value capture.

[1] See the New York City Department of Transportation's Report, *Measuring the Street*, for an examples of increases in retail sales following the installation of new bike and pedestrian infrastructure. https://www.nyc.gov/html/dot/downloads/pdf/2012-10-measuring-the-street.pdf

Debt

Revenue from value capture strategies or user fees comes after a project opens for service, but the costs of constructing a project must be paid before it opens.

Public agencies can borrow money from investors to build a project and use value-capture or user-fee revenue to repay those loans. There is a fairness argument for funding transportation infrastructure using debt: Those who will benefit from a project are the ones who will pay for it.

Net present value

In order to compare future benefits or revenues from a project to immediate costs, we need to have a way of converting expected future benefits to an equivalent present-day value.

If I were to offer to give you either $100 today or the same amount of money two one year from now, you would likely prefer to have the money today, and there are a couple reasons why this would be reasonable:

1. There are things you value that you could purchase today, and those things may not still be available at that price next year.
2. You could invest that money and earn an additional year's worth of interest if you had it today.
3. Life is uncertain and something could happen in the next year that makes it impossible for me to give you the money.

If I were to offer you either $100 today or $120 one year from now, your preference between those two options would depend on your beliefs about:

1. How much the prices and availability of things you want to purchase might change over the next year;
2. How much interest you can earn in a year; and
3. How likely it is that something will happen to prevent me from paying you next year.

There is some value of money I could promise you next year where you would be indifferent between receiving $100 now, or receiving that amount next year. The percent difference between that value and the money you could receive now is your own personal *discount rate*.

In other words:

$$r = \frac{FV}{PV} - 1$$

Where *r* is the discount rate and *FV* and *PV* and the future values and present values that you are indifferent between.

If you know the future value and the discount rate, you can rearrange that formula to find the present value:

$$PV = \frac{FV}{(1+r)}$$

This is all assuming we'd be getting that future benefit in one year. If we had to wait two years for the future benefit, we'd need to apply the discount rate twice:

$$PV = FV\left(\frac{1}{1+r}\right)\left(\frac{1}{1+r}\right)$$

We can write this formula for the present value of a benefit we'll receive *any* number of years in the future as:

$$PV = \frac{FV}{(1+r)^t}$$

Where *r* is the annual discount rate and *t* is the number of years in the future.

In a both Microsoft Excel and Google Sheets, you can calculate the present value of set of future benefits using the function:

=NPV(r, cell1:celln)

Where r is the annual discount rate and cell1:celln is a list of future benefits, where the first value in the list is the benefit that will come after one year, the next value is the benefit that will come after two years, and so on.