

YTA OFFICE BUILDING OPTIONS

Life Cycle Cost Analysis

Objective

- Using **life cycle costing analysis**, examine which of three scenarios is better for the YTA:
 - Build a new building
 - Lease office space
 - Remain at current location

What is Life Cycle Costing

- ASTM standards
 - A technique of economic evaluation that sums over a given period the costs of initial investment (less resale value), replacements, operations (including energy use), and maintenance and repair of an investment decision (expressed in present value or annual value terms).

ASTM Standard E 833-06 Terminology of Building Economics

Use of LCC

- Can be used either for whole building or for certain building components
 - Typically used by mechanical engineers in determining what HVAC system to use.
- A single measure gives no indication of economic merit
 - need two or more alternatives for LCC

Examples of use of LCC

- Renovate vs. build
- Build vs. buy existing building
- Lease vs. buy vs. build uses similar technique
- Data generated can be used to establish future budgets

Use in project economics

- Can be used to compare alternatives and decide between them
- E.g. energy improvements
- Higher energy efficient structure vs more conventional one
 - Is the investment in higher energy efficiency worth it?
- Renovate vs build
 - Which is more cost effective in the long run

Concept of Life Cycle Cost

$$\begin{array}{ccc} \text{Present} & & \text{Present} \\ \text{Value of} & & \text{Value of} \\ \text{Capital} & + & \text{Operating} \\ \text{costs} & & \text{costs} \end{array}$$

Expressed in today's dollars (i.e. present value)

How do we do LCC?

- Estimate capital costs for each option
- Estimate annual operating costs for each option
 - Energy
 - Maintenance and repair
 - Insurance
 - Building management
 - Property taxes
 - Janitorial
 - etc.
- Calculate **present value** of costs

Present value

- Future costs are “discounted” using some discount rate.

- Basic idea is that:

“A dollar today is worth more than a dollar tomorrow.”

- Another way of looking at it is:

How much money do you need to put in the bank today to pay for a stream of future costs?

Selecting the discount rate

- Controversial issue, makes a big difference
 - The higher the discount rate, the less future costs/benefits are valued.
 - For \$1,000,000, 10 years from now

Discount rate	PV of \$1 million in 10 years
15%	\$247,184.71
12%	\$321,973.24
10%	\$385,543.29
5%	\$613,913.25
2%	\$820,348.30

Selecting the discount rate

- ASTM says:
 - The discount rate should reflect the investor's time value of money. That is, the discount rate should reflect the interest rate that makes the investor indifferent between paying or receiving a dollar now or at some future point in time.
- In most cases, we use their borrowing rates if have to borrow to make the investment.
- Here we use 7.5% interest/discount rate,
 - which is a reasonable amount for a commercial real estate mortgage rate (you can get lower)

Inflation

- Inflation is general increase in prices in the economy
- Often will separate out energy cost inflation from other prices
 - We don't for this analysis
- Use inflation rate
 - Works the same way as a discount or interest rate
 - We use 2% per year in this analysis

LCC

- A single measure gives no indication of economic merit
 - PV of costs of a project on its own does not mean very much
 - need two or more alternatives for LCC
- Compare the present value of life cycle costs and the lower cost one is usually the better
 - But has to be apples to apples comparison
 - E.g larger building will obviously have higher costs than a smaller one.

Issues with LCC

- Need at least two similar projects
- Have to be careful to compare apples to apples
- Length of study period can have important effects.
 - E.g. use 20 years when building or component has a 25 year life and would need to be replaced at that point, underestimate LCC
 - Need to look at whole life of asset
- Discount rate can be arbitrary

Results NPV @ 7.5% discount rate

	LEASING	NEW CONSTRUCTION	CURRENT BUILDING
11 years	\$704,058	\$228,801	\$380,126
20 years	\$1,222,931	\$616,216	\$1,141,751
25 years	\$1,441,538	\$785,136	\$921,973
30 years	\$1,543,952	\$959,730	\$1,103,786
40 years	\$1,740,010	\$1,166,600	\$1,314,977
50 years	\$1,860,516	\$1,204,965	\$1,352,917

Annual payments

	NEW CONSTRUCTION	CURRENT BUILDING	LEASING @ \$30.00/sq.ft. NNN
Total Capital Cost	\$1,823,353	\$1,225,440	
Down-payment			
Land	343,353	343,353	
Proceeds from sale	<u>650,000</u>	<u>0</u>	
Mortgage amount	\$ 830,000	\$ 882,087	
LTV ratio	46%	70%	
Interest rate	7.5%	7.5%	
Amortization period	25 years	20 years	
<u>Annual loan payment</u>	<u>\$72,863</u>	<u>\$84,532</u>	<u>\$87,273</u>

Common assumptions: all scenarios

- 3,200 square feet (apples to apples)
- Discount/mortgage interest rate: 7.5%
- Future inflation: 2.0% per year
- Following costs are the same in all scenarios
 - Water & sewer, garbage,
 - Janitorial,
 - Insurance,
 - Building security
- Annual Maintenance and repair costs from Whitestone, *Facility Repair and Maintenance Cost Reference, 2011-12*,
 - Data for “Office Building, 2 storey, Washington DC”, adjusted for exchange rate and differential between Whitehorse & Vancouver & Washington DC.

New building

- \$1,823,000 Total capital cost:
 - Base construction cost \$300.00/sq.ft.
 - \$70.00/sq.ft. tenant improvements
 - 10% consultants (architect, engineers, etc.)
 - 15% contingency
- 50-year life of building
- Mortgage
 - 7.5% over 25 years, \$993,000 down-payment (land value + sale of existing building—\$650K)
- Energy costs based on 75kWh/m² (High energy efficiency)
- Property taxes
 - Assessment based on 31.6% of total capital costs (same ratio as current building value to property assessment)

Leasing assumptions

- Base rent \$30.00/sq.ft. triple net (NNN)
- Tenant pays share of operating costs
 - Similar to current building,
 - but lower energy costs—125kWh/m²
- Tenant improvements
 - \$70.00/sq.ft every 10 years
- Proceeds from sale of current building & waterfront lot are used to reduce rental costs
 - Annuity @ 2.49% risk free interest (Govt. of Canada benchmark bond yields, 10 years, 4/4/2014)

Current building assumptions

- Major \$1,225,440 renovation (gutting & rebuilding)
 - Base cost 75% of cost of new building (rule of thumb)
 - 13% consultants
 - 25% contingency
- Remaining building life 20 years
 - New 3,200 sq. ft. building built after 20 years at 2014 cost plus inflation
- ~25% reduction in energy use to 216kWh/m²
 - Currently (NPI) between 288 and 361kWh/m²
- Property taxes increase by about \$5,000
 - 25% of construction costs added to property assessment

Sensitivity analysis

- Conclusion that a new building is best dependent on assumptions made.
- Sensitivity analysis changes assumptions & examines whether conclusion remains the same.
- Analysis includes:
 - Changing NNN rental rate
 - Changing amount of renovation for existing building
 - \$77,000 repairs needed at first (based on *Whitestone*)

Sensitivity: Leasing

	Leasing @ \$30.00/ sq.ft.	Leasing @ \$20.00/ sq.ft.	New construction
11 years	\$704,058	\$518,428	\$228,801
20 years	\$1,222,931	\$915,257	\$616,216
25 years	\$1,441,538	\$1,093,297	\$785,136
30 years	\$1,543,952	\$1,164,628	\$959,730
40 years	\$1,740,010	\$1,318,622	\$1,166,600
50 years	\$1,860,516	\$1,414,432	\$1,204,965

Sensitivity: Leasing

- @ \$20/sq.ft. NNN
 - Building comes out ahead
- Need to rent at between \$10.00 & \$13.00/sq. ft. NNN to match cost of building new.

Sensitivity current building

	New construction	Current building with major renovations	Current building with NO major renovations
11 years	\$228,801	\$380,126	\$69,737
20 years	\$616,216	\$1,141,751	\$364,974
25 years	\$785,136	\$921,973	\$527,593
30 years	\$959,730	\$1,103,786	\$719,606
40 years	\$1,166,600	\$1,314,977	\$957,234
50 years	\$1,204,965	\$1,352,917	\$1,077,747

Sensitivity Current Building

- Result highly dependent on amount required for renovation.
- Using Whitestone numbers (\$77,000 renovations required in year 30 as opposed to \$1,225,000 complete refurbishing):

Keeping current building for 20 years and rebuilding at that point comes out ahead.

Conclusion & Recommendations

- Leasing is out:
 - Selling current building and waterfront lot & leasing is more expensive.
- On one hand: If a major new renovation needed, it would be cheaper to build a new building in the long run;
- On the other hand: if a major renovation of existing building is NOT needed, stick with the current building & rebuild in 20 years.
- Recommendation:
 - Get inspection done to estimate life of current building & components and cost & schedule of renovations**
 - using ASTM UNIFORMAT II format.