The construction loan collapses a series of costs (cash outflows) incurred during the construction process into a single value as of a single (future) point in time (the projected completion date of the construction phase).

Actual construction expenditures ("draws" on the construction loan) are added to the accumulating balance due on the loan, and interest is charged and compounded (adding to the balance) on all funds drawn out from the loan commitment, from the time each draw is made.

Thus, interest compounds forward, and the borrower owes no payments until the loan is due at the end of construction, when all principle and interest is due.

Bottom line: Borrower (developer) faces no cash outflows for construction until the end of the process, when the entire cost is paid (including the "cost of capital").
The “Canonical” Formula
- Graphical Representation

To $T$
- Cash flows from the stabilized building(s) are discounted at Stabilized OCC to value main part of $V_T$ (or use direct capitalization with projected cap rate).
- Cash flows from the lease-up period are compounded at Speculative OCC (Stabilized OCC + 50 to 200bps for lease-up risk) to value rest of $V_T$
- Cash flows from the construction period are compounded at Construction OCC to form $K_T$

To $0$
- $V_T$ is discounted at Speculative OCC to arrive at $V_0$
- $K_T$ is discounted at Construction OCC to arrive at $K_0$
The “Canonical” Formula
- Graphical Representation

\[
\frac{V_T - K_T}{(1 + E[r_C])^T} = V_0 - K_0 = PV[V_t] - PV[K_t]
\]

\[
1 + E[r_C] = \left( \frac{V_T - K_T}{V_0 - K_0} \right)^{1/T}
\]
The “Canonical” Formula
- NPV Rule

For the development project:

**NPV exclusive of land cost** =

\[
PV[V_T - K_T] = PV[V_T] - PV[K_T] = V_0 - K_0
\]

- \( V_0 - K_0 < \text{Land Cost} \)
  - Don’t undertake the project
- \( V_0 - K_0 > \text{Land Cost} \)
  - Undertake the project
Three considerations are important and unique about applying the NPV rule to evaluating investment in development projects as compared to investments in stabilized operating properties:

1. “Time-to-Build”: Investment cash outflow occurs over time, not all at once up front, due to the construction phase.

2. Construction loans: Debt financing for the construction phase is almost universal (even when the project will ultimately be financed entirely by equity).

3. Phased risk regimes: Investment risk is very different (greater) between the construction phase (the development investment per se) and the stabilized operational phase. (Sometimes an intermediate phase, “lease-up”, is also distinguishable.)

We need to account for these differences in the methodology of how we apply the NPV Rule to development investments. . .
The Operating Budget (Recall the items from Chapter 11):

- Forecast Potential Gross Income (PGI, based on rent analysis)
- Less Vacancy Allowance
- = Effective Gross Income (EGI)
- Less forecast operating expenses (& capital reserve)
- = Net Operating Income (NOI)

The most important aspect is normally the rent analysis, which is based (more or less formally) on a market analysis of the space market which the building will serve. (See Chapter 6, or Wheaton’s 11.433 course.)

The bottom line:

NOI forecast, combined with cap rate analysis (of the asset market):

⇒ NOI / cap rate = Projected Completed Building Value = “Benefit” of the development project.
SFFA “Back Door” Procedure:

Start with rents & building, and end with supportable development costs…

<table>
<thead>
<tr>
<th>Step</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Leaseable Square Feet (based on the building efficiency ratio</td>
<td>( \text{Total Leaseable Square Feet} \times \text{Expected Average Rent Per Square Foot} )</td>
</tr>
<tr>
<td>times the gross area)</td>
<td>= \text{Projected Potential Gross Income (PGI)}</td>
</tr>
<tr>
<td>X Expected Average Rent Per Square Foot</td>
<td>- \text{Vacancy Allowance}</td>
</tr>
<tr>
<td>= Projected Potential Gross Income (PGI)</td>
<td>= \text{Expected Effective Gross Income}</td>
</tr>
<tr>
<td>- Vacancy Allowance</td>
<td>- \text{Projected Operating Expenses}</td>
</tr>
<tr>
<td>= Expected Effective Gross Income</td>
<td>= \text{Expected Net Operating Income}</td>
</tr>
<tr>
<td>- Projected Operating Expenses</td>
<td>\div \text{Debt Service Coverage Ratio}</td>
</tr>
<tr>
<td>= Expected Net Operating Income</td>
<td>\div \text{Annualized Mortgage Constant}</td>
</tr>
<tr>
<td>\div \text{Debt Service Coverage Ratio}</td>
<td>\div \text{Maximum Loan to Value Ratio}</td>
</tr>
<tr>
<td>= Expected Net Operating Income</td>
<td>= \text{Maximum Supportable Total Project Costs}</td>
</tr>
<tr>
<td>\div \text{Annualized Mortgage Constant}</td>
<td>\text{(Question: Can it be built for this including all costs?)}</td>
</tr>
<tr>
<td>\div \text{Debt Service Coverage Ratio}</td>
<td>- \text{Expected Construction Costs (Other than Site)}</td>
</tr>
<tr>
<td>= \text{Expected Net Operating Income}</td>
<td>= \text{Maximum Supportable Site Acquisition Cost}</td>
</tr>
<tr>
<td>\div \text{Annualized Mortgage Constant}</td>
<td>\text{(Question: Can the site be acquired for this or less?)}</td>
</tr>
<tr>
<td>\div \text{Maximum Loan to Value Ratio}</td>
<td>\text{Typical approach for “Use looking for a Site”.}</td>
</tr>
<tr>
<td>= \text{Maximum Supportable Total Project Costs}</td>
<td></td>
</tr>
</tbody>
</table>
Example:
• Office building 35,000 SF (GLA), 29,750 SF (NRA) (85% “Efficiency Ratio”).
• $12/SF (/yr) realistic rent (based on market analysis, pre-existing tenant wants space).
• Assume 8% vacancy (typical in market, due to extra space not pre-leased).
• Preliminary design construction cost budget (hard + soft) = $2,140,000.
• Projected operating expenses (not passed through) = $63,000.
• Permanent mortgage on completion available at 9% (20-yr amort), 120% DCR.
• Site has been found for $500,000: Is it feasible?

\[
\begin{align*}
\text{Potential Gross Revenue} &= 29,750 \times 12 = 357,000 \\
\text{Less Vacancy at 8\%} &= - 28,560 \\
\text{= Effective Gross Income} &= 328,440 \\
\text{Less Operating Expenses} &= - 63,000 \\
\text{= Net Operating Income} &= 265,000 \\
\div 1.20 &= \text{Required Debt Svc:} 221,200 \\
\div 12 &= \text{Monthly debt svc:} 18,433 \\
\Rightarrow \text{Supportable mortgage amount} &= 2,048,735 \\
\div 0.75 \text{ LTV} &= \text{Min. Reqd. Value:} 2,731,647 \\
\text{Less Construction Cost} &= - 2,140,000 \\
\Rightarrow \text{Supportable site acquisition cost:} &= 591,647.
\end{align*}
\]

So, the project seems feasible.

But again, something seems left out... Project may be feasible, but...
SFFA “Front Door” Procedure:

*Start with costs & end with rent required for feasibility…*

<table>
<thead>
<tr>
<th>Mathematical Expression</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Acquisition Costs + Construction Costs = Total Expected Development Cost</td>
<td></td>
</tr>
<tr>
<td>X Loan to Value Ratio = Permanent Mortgage</td>
<td></td>
</tr>
<tr>
<td>X Annualized Mortgage Constant = Cash Required for Debt Service</td>
<td></td>
</tr>
<tr>
<td>X Lender Required Debt Service Coverage Ratio = Required Net Operating Income or NOI</td>
<td></td>
</tr>
<tr>
<td>+ Estimated Operating Expenses (Not passed through to tenants) = Required Effective Gross Income</td>
<td></td>
</tr>
<tr>
<td>÷ Expected Occupancy Rate = Required Gross Revenue</td>
<td></td>
</tr>
<tr>
<td>÷ Leasable Square Feet = Rent Required Per Square Foot</td>
<td></td>
</tr>
</tbody>
</table>

**Question:** Is this average required rent per square foot achievable?

Typical approach for “Site looking for a Use”.
Example:
• Class B office building rehab project: 30,000 SF (of which 27,200 NRSF).
• Acquisition cost = $660,000;
• Rehab construction budget: $400,000 hard costs + $180,000 soft costs.
• Estimated operating costs (to landlord) = $113,000/yr.
• Projected stabilized occupancy = 95%.
• Permanent loan available on completion @ 11.5% (20-yr amort) with 120% DSCR.
• Estimated feasible rents on completion = $10/SF.

### Calculation Summary:

- **Site and shell costs:** $660,000
- **Rehab costs:** $580,000
- **Total costs:** $1,240,000
- **Lender required LTV x 80%:** 1,240,000 x 0.80 = $992,000
- **Annualized mortgage constant:** x 0.127972
- **Cash required for debt service:** $126,948
- **Lender required DCR x 1.20:** $152,338
- **Estimated operating expenses (to landlord):** $113,000
- **Required EGI:** $265,338
- **Project stabilized occupancy [(1-vac) ÷ 0.95]:** $279,303
- **Rentable area:** $27,200 SF
- **Required rent/SF:** $10.27/SF

**What major issue is left out here?**

**Lender will base mortg on Mkt Val, not constr cost.**

**Use mkt cap rate info to est. bldg val.**