Real Estate Investment Analysis Formulas

**Income and Expense Statement**

Income

Potential Gross Income (PGI) $__________
Less: Vacancy and Bad Debt Allowance $__________
Equals: Effective Gross Income (EGI) $__________
Operating Expenses
Exclude: Depreciation
Mortgage Payments
Non-Operating Expenses. E.G Directors Salaries
Capital Expenditures $__________
Net Operating Income (NOI) __________
Less: Debt Service (P + I) __________
Cash Flow Before Tax (CFBT) __________
Less: Income Taxes __________
Equals Cash Flow After Tax (CFAT) $__________

**Financial Measures:**

**Potential Gross Income Multiplier (PGIM)**
Also called Potential Gross Rent Multiplier (PGRM)

\[
PGIM = \frac{\text{Market Value}}{\text{Potential Gross Income}} \quad \text{or} \quad \text{Market Value} = \text{Potential Gross Income} \times \text{PGIM}
\]

\[
= \frac{\text{MV}}{\text{PGI}}
\]

**Effective gross Income Multiplier (EGIM)**
Also called Effective Gross Rent Multiplier (EGRM)

\[
EGIM = \frac{\text{Market Value}}{\text{Effective Gross Income}} \quad \text{or} \quad \text{Market Value} = \text{Effective Gross Income} \times \text{EGIM}
\]

\[
= \frac{\text{MV}}{\text{PGI}}
\]

**Net Income Multiplier (NIM)**

\[
\text{NIM} = \frac{\text{Market Value}}{\text{Net Operating Income}} \quad \text{or} \quad \text{Market Value} = \text{Net Operating Income} \times \text{Net Income Multiplier}
\]

\[
= \frac{\text{MV}}{\text{NOI}}
\]

**Capitalization Rate (Cap Rate)**
Also called Broker’s Yield

\[
\text{Cap Rate(\%)} = \frac{\text{Net Operating Income} \times 100}{\text{Market Value}} \quad \text{or} \quad \text{Market Value} = \frac{\text{Net Operating Income} \times 100}{\text{Cap Rate(\%)}}
\]

\[
= \frac{\text{NOI} \times 100}{\text{MV}}
\]

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Return on Equity (ROE)
Also called: Equity Dividend Rate (EDR)
Cash on Cash Return

\[
\text{ROE}(\%) = \frac{(\text{Net Operating Income} - \text{Debt Service})}{\text{Equity}} \times 100
\]

Where:
\[
\text{Debt Service} = \text{Principal & Interest Payment}
\]
\[
\text{ROE}(\%) = \frac{\text{Cash Flow Before Tax}}{\text{Equity}} \times 100
\]

Default Ratio (Break-even) (%)

Using Potential Gross Income
\[
= \frac{(\text{Operating Expenses} + \text{Debt Service})}{\text{Potential Gross Income}} \times 100
\]

Using Effective Gross Income
\[
= \frac{(\text{Operating Expenses} + \text{Debt Service})}{\text{Effective Gross Income}} \times 100
\]

Financing Measures.

Debt Service Ratio (DSR)

\[
= \frac{\text{Net Operating Income}}{\text{Debt Service}}
\]

Loan to Value Ratio (%)

\[
= \frac{\text{Loan Amount}}{\text{Market Value}} \times 100
\]

Rental Apartment Building Measures.

1. Price Per Suite
2. Price Per Sq. Foot (Using Suite Areas)
3. Rents Per Sq. Foot per month
4. Operating Costs
   a. Operating Costs Per Suite Per Year
   b. Operating Cost per Sq. Foot per Year
5. Operating Expense Ratio (OER) = \frac{\text{Operating Expense}}{\text{Effective Gross Income}} \times 100

Home Financing:

\[
\text{Gross Debt Service Ratio} = \frac{\text{(Principal + Interest + Taxes)}}{\text{Gross Family Income}}
\]

Lenders often modify the basic Gross Debt Service Ratio Formula.

\[
\text{Modified Gross Debt Service Ratio} = \frac{\text{(Principal + Interest + Taxes + Heat + % of Maintenance)}}{\text{Gross Family Income}}
\]

\[
\text{Total Gross Debt Service Ratio} = \frac{\text{(Principal + Interest + Taxes + Other Debt Payments)}}{\text{Gross Family Income}}
\]
Commercial Real Estate Sample Calculations

The following examples illustrate how to use the real estate formulas. In Example No.1 the information is obtained for the property and the financial measures calculated. In Example No. 2 the financial measures such as the Cap Rate are obtained for comparable sales and are used to calculate the Market Value for the subject property.

Example No 1.

Sale Price (Market Value) $3,165,000
Potential Gross Income: $306,000
Vacancy & Bad Debt Allowance: 4.5%
Operating Expenses $58,000
Mortgage $2,056,000
Mortgage Payment (P+i) $180,538
Number of Suites 30
Total Rentable Area 24,000 Square feet

Note: All figures are annual

Calculate: Potential Gross Income Multiplier (PGIM)
Effective Gross Income Multiplier (EGIM)
Net Income Multiplier (NIM)
Capitalization Rate (Cap Rate)
Return on Equity (ROE)
Default Ratio (Break even) based on:
Potential Gross Income
Effective Gross Income
Debt Service Ratio (DSR)
Loan to Value Ratio
Price per Suite
Price per Square Foot
Rent per Square Foot per Month
Operating Cost per Suite per Year
Operating Cost per Square Foot per Year
Operating Expense Ratio (OER) based on:
Potential Gross Income
Effective Gross Income

1. Construct an Annual Income and Expense Statement

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Gross Income</td>
<td>$306,000</td>
</tr>
<tr>
<td>Less Vacancy &amp; Bad Debt Allowance (4.5%)</td>
<td>13,770</td>
</tr>
<tr>
<td>Effective Gross Income</td>
<td>$292,230</td>
</tr>
<tr>
<td>Operating Expenses</td>
<td>58,000</td>
</tr>
<tr>
<td>Net Operating Income</td>
<td>$234,230</td>
</tr>
<tr>
<td>Less; Debt Service (P+i)</td>
<td>180,538</td>
</tr>
<tr>
<td>Cash Flow Before Tax</td>
<td>$ 53,692</td>
</tr>
</tbody>
</table>
2. Calculate the Financial Measures

Potential Gross Income Multiplier (PGIM):
\[
\text{PGIM} = \frac{\text{MV}}{\text{PGI}} = \frac{3,165,000}{306,000} = 10.34
\]

Effective Gross Income Multiplier (EGIM):
\[
\text{EGIM} = \frac{\text{MV}}{\text{EGI}} = \frac{3,165,000}{292,230} = 10.83
\]

Net Income Multiplier (NIM):
\[
\text{NIM} = \frac{\text{MV}}{\text{NOI}} = \frac{3,165,000}{234,230} = 13.51
\]

Capitalization Rate (Cap Rate):
\[
\text{Cap Rate} = \frac{\text{NOI}}{\text{MV}} = \frac{234,230}{3,165,000} = 7.40\%
\]

Return on Equity (ROE):
\[
\text{ROE} = \frac{(\text{NOI} - \text{DS}) \times 100}{\text{EGI}} = \frac{\text{Cash Flow Before Tax} \times 100}{\text{Equity}}
\]
\[
= \frac{53,692 \times 100}{(3,165,000 - 2,056,000)} = 4.84\%
\]

Default Ratio (Breakeven):
Based on Potential Gross Income:
\[
\text{Default Ratio} = \frac{(\text{Operating Expenses} + \text{Debt Service}) \times 100}{\text{Potential Gross Income}}
\]
\[
= \frac{(58,000 + 180,538) \times 100}{306,000} = 77.95\%
\]
Default Ratio (Breakeven) cont.

Based on Effective Gross Income:

\[
\text{Default Ratio} = \frac{(\text{Operating Expenses} + \text{Debt Service}) \times 100}{\text{Effective Gross Income}}
\]

\[
= \frac{(58,000 + 180,538) \times 100}{292,230}
\]

\[
= 81.63\%
\]

Debt Service Ratio (DSR) = \frac{\text{Net Operating Income}}{\text{Debt Service}}

\[
= \frac{234,230}{180,538}
\]

\[
= 1.30
\]

Loan to Value Ratio % = \frac{\text{Loan Amount}}{\text{Market Value}} \times 100

\[
= \frac{2,056,000 x 100}{3,165,000}
\]

\[
= 64.96\%
\]

Price Per Suite = \frac{3,165,000}{30}

\[
= \$105,500
\]

Price per Square foot = \frac{3,165,000}{24,000}

\[
= \$131.88
\]

Rent Per Sq. Foot per Mo. = \frac{306,000}{24,000 x 12}

\[
= \$1.06
\]

Operating Costs Per Suite Per Year

\[
= \frac{58,000}{30}
\]

\[
= \$1,933
\]
Operating Cost per Square foot per year

\[
\begin{align*}
\text{Operating Cost per Square foot per year} & = 58,000 \\
& - 24,000 \\
& = $2.42
\end{align*}
\]

Operating Expense Ratio (OER)

Based on Potential Gross Income:

\[
\text{Operating Expense Ratio (OER) based on Potential Gross Income} = \frac{\text{Operating Expenses}}{\text{Potential Gross Income}} \times 100
\]

\[
\begin{align*}
= & \frac{58,000}{306,000} \times 100 \\
= & 18.95\%
\end{align*}
\]

Based on Effective Gross Income:

\[
\text{Operating Expense Ratio (OER) based on Effective Gross Income} = \frac{\text{Operating Expenses}}{\text{Effective Gross Income}} \times 100
\]

\[
\begin{align*}
= & \frac{58,000}{292,230} \times 100 \\
= & 19.85\%
\end{align*}
\]

Summary.

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Gross Income Multiplier (EGIM):</td>
<td>10.83</td>
</tr>
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</tr>
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<td>Return on Equity (ROE):</td>
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</tr>
<tr>
<td>Default Ratio (Break even) based on:</td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>Effective Gross Income</td>
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<td>Operating Expense Ratio (OER) based on:</td>
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</tr>
<tr>
<td>Potential Gross Income</td>
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</tr>
<tr>
<td>Effective Gross Income</td>
<td>19.85%</td>
</tr>
</tbody>
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Example No 2.

Potential Gross Income:  $244,800
Vacancy & Bad Debt Allowance:  5.0%
Operating Expenses: $49,300
Mortgage: $1,685,000
Mortgage Payment (P+i): $147,500
Number of Suites: 24
Total Rentable Area: 18,720 Square feet

Note: All figures are annual

Calculate the Market Value using the following financial measures

Effective Gross Income Multiplier (EGIM): 9.30
Net Income Multiplier (NIM): 12.50
Capitalization Rate (Cap Rate): 8.00%
Return on Equity (ROE): 5.57%

1. Start by constructing the Annual Income and Expense Statement

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Gross Income</td>
<td>$244,800</td>
</tr>
<tr>
<td>Less Vacancy &amp; Bad Debt Allowance (5.0%)</td>
<td>12,240</td>
</tr>
<tr>
<td>Effective Gross Income</td>
<td>$232,560</td>
</tr>
<tr>
<td>Operating Expenses</td>
<td>$49,300</td>
</tr>
<tr>
<td>Net Operating Income</td>
<td>$183,260</td>
</tr>
<tr>
<td>Less; Debt Service (P+i)</td>
<td>$147,500</td>
</tr>
<tr>
<td>Cash Flow Before Tax</td>
<td>$ 35,760</td>
</tr>
</tbody>
</table>

2. Calculate the Market Value based on the:

Effective Gross Income Multiplier (EGIM):

\[
MV = \text{Effective Gross Income} \times \text{EGIM}
\]

\[
= 232,560 \times 9.30
\]

\[
= $2,162,808
\]

Net Income Multiplier (NIM):

\[
MV = \text{Net Operating Income} \times \text{NIM}
\]

\[
= 183,260 \times 12.50
\]

\[
= $2,290,750
\]
Capitalization Rate (Cap Rate):

\[
MV = \frac{\text{Net Operating Income} \times 100}{\text{Cap Rate}}
\]

\[
= \frac{183,260 \times 100}{8.0}
\]

\[
= 2,290,750
\]

Return on Equity (ROE):

\[
MV = \frac{(\text{NOI} - \text{DS}) \times 100 + \text{Mortgage}}{\text{ROE}}
\]

\[
= \frac{(183,260 - 147,500) + 1,685,000}{5.57}
\]

\[
= 2,327,011
\]