Dynamic Cash-Flow Analysis

Financial Theory: The Logic behind Real Estate Financing Decisions -

First part of chapter discusses the source of returns for lenders and equity investors who provide funding (and expect certain rates of return in regards to the amount of risks involved).

The later part deals with the costs and benefits of debt financing from the viewpoint of the equity investor.

Lastly, the mechanics of the analytic tools that help lenders and equity investors make their investment decisions are discussed.

The main topics discussed:

- The productivity of property
- Financing from the equity perspective
- Financing from the lender’s perspective and estimating the property’s value
- Ability to service the debt
- Leverage effects

The Productivity of Property

Net operating income (NOI) measures the property’s productivity and is the source of the returns to lenders and equity investors. A basic statement of NOI looks like this:

\[
\text{Potential Gross Income - Vacancy Allowance = Effective Gross Income - Operating Expenses = Net Operating Income}
\]

Important things to note:

NOI is not a number manipulated by the owner or manager, as rents, vacancies, and operating incomes are dictated by the market. The development’s features, functions and benefits determine how the project’s rent will compare with other projects in the market, but the market is still the constraining factor.

Gross rent is constrained by competing properties in the market, and a significant increase in rents will bring increased vacancies.

Operating expenses will be forced to hover at or near market rates to maintain a competitive maintenance program so as to not lose tenants.
Calculations of NOI are based on market conditions, and thus, NOI is a ‘same-for-all’ number that measures the amount of income expected to be available to be divided between the debt and equity investors. How that income will be divided depends on the financing decisions made during the development process.

**Making the Financing Decision: The Equity Perspective**

For the past several decades, loan-to-value (LTV) ratios have clustered at 60 to 90 percent – as this did not occur by chance, it indicates that benefits can accrue to owners through the use of debt financing.

(Because I didn’t know what the hell LTV actually was, here it is, from Wikipedia)

The **loan-to-value (LTV) ratio** expresses the amount of a first mortgage lien as a percentage of the total appraised value of real property. For instance, if a borrower wants $130,000 to purchase a house worth $150,000, the LTV ratio is $130,000/$150,000 or 87%.

Loan to value is one of the key risk factors that lenders assess when qualifying borrowers for a mortgage. The risk of default is always at the forefront of lending decisions, and the likelihood of a lender absorbing a loss in the foreclosure process increases as the amount of equity decreases. Therefore, as the LTV ratio of a loan increases, the qualification guidelines for certain mortgage programs become much more strict. Lenders can require borrowers of high LTV loans to buy **mortgage insurance** to protect the lender from the buyer default, which increases the costs of the mortgage.

Most investors do not use 100% debt financing, which means that certain costs must eventually offset the benefits of debt, to create an optimal loan-to-value range.

**The Benefits of Using Debt Financing**

- The basic benefit of debt financing is that it can be used to leverage the return of equity upward (you borrow to enact your plan, which, if good, is expected to more than the amount you borrowed with interest and also enough for profit).

- This “positive” leverage occurs when the cost of debt financing (loan constant) is lower than the overall return generated by the property (NOI divided by cost).

- The percentage return to the equity investor is greater using debt than it is with no debt (the interest you have to pay back to the person/entity you borrowed from).

- Interest payments are typically tax deductible.

- Using debt financing reduces the minimum investment necessary in any given project (minimizes how much of your own wealth is needed for a project to work)
- Investors have limited resources, so a reduced minimum investment in one project allows them to spread their wealth over several investments (this is called ‘diversifying’). Diversification reduces portfolio risk, and lower risk means higher value.

- Flexibility of an investment can be tailored to a client through a combination of various debt and equity structures, and the decision-maker can create risk-return opportunities to fit specific needs.

The Costs of Using Debt Financing

- Not a free lunch for the borrower: despite appearing as if positive leverage creates higher returns and through diversification, potentially lowered risk, the reality of the situation is that the basic relationship between risk and return is not suspended when using debt. When equity investors borrow in an attempt to chase higher returns, they assume the cost of greater variability in those returns – high risk.
- At the extreme, if the project’s income drops below the level of debt service, the investor may face default and foreclosure.
- Borrowing includes various direct costs; financial institutions charge fees for their services
- As the LTV increases, the lender’s exposure increases – in response, lenders raise the interest rate
- Paperwork required in mortgage lending and the lender’s time (including the financial intermediary) must be compensated
- The combination of the previous points can outweigh the benefits

Making the Financing Decision: The Lender’s Perspective

In practice, LTV ratios are not solely the result of owners’ decisions. Prospective lenders must also be convinced that an existing property or a new development will support the level of debt requested by the equity investor.

Lenders use two basic criteria for making their decisions about lending:

1) The adequacy of the property’s value as collateral for the loan
2) The ability of the property’s income stream to service the loan

Estimating Property (Collateral) Value

Two approaches to estimate property value:

1) Discounted cash flow models
2) Capitalization rates

Estimating Value using discounted cash flow model
When comparing alternatives for investment, investors are motivated by two preferences:

- More is better than less
- Sooner is better than later, or a dollar received today is more valuable than a dollar received in the future

Both statements refer to project income or cash flows and suggest that both the magnitude and timing of those cash flows are important.

Investors prefer the alternative that will produce the most total income from operations and resale – more is better than less.

Among alternatives for investments with comparable risk and equal total income, investors prefer the option that will produce income more quickly – sooner is better than later.

_Why is a dollar received today more valuable than a dollar received in the future?_

Three major concepts:

1) **Opportunity cost** – a dollar today provides more choices; it can be used for consumption or can be invested. If the dollar is not to be received for one year, the interest that could have been earned must be forgone – forgone interest represents the opportunity cost associated with receiving a dollar in the future rather than today. Consequently, today’s value, or the present value, of the dollar to be received in one year should be reduced by the cost of the lost opportunities.

2) **Inflation** – inflation reduces the value of the dollar. When price levels rise, more dollars are required to purchase the same quantity and quality of goods and services than previously. When a dollar is to be received in the future, its present value is reduced if inflation occurs before the investor receives that dollar. Conversely, if money is borrowed today, dollars used for future repayments will have less value than the dollars borrowed should inflation occur in the interim.

3) **Risk** – If a dollar is due in the future, the possibility always exists that more or less than a dollar will be received or that inflation has been incorrectly estimated. Business risk and the risk of unexpected inflation diminish the present value of the future dollar.

**The consideration of Time-Value in the DCF Model**

The fundamental idea that sooner is better than later is applied in DCF models by *discounting* future income at a rate that reflects the opportunity costs, inflation, and risks accompanying the passage of time. The word *discounting* describes exactly what occurs: the value of future income is discounted (reduced) to estimate its present value.

(Attached is an example from the book, at a 10% discount rate, for easier understanding, and a definition of reversion)
**Reversion** or reversionary benefit, in real estate appraisal it is a lump-sum benefit an investor receives or expects to receive upon the termination of an investment. A reversion can be used in real estate valuation by valuing the last projected cash flow as a perpetuity using a reversion cap rate.

<table>
<thead>
<tr>
<th>Year</th>
<th>Income</th>
<th>Reversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$110,000</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>111,000</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>112,000</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>115,000</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>125,000</td>
<td>$1,000,000</td>
</tr>
</tbody>
</table>

With application of the DCF model, the present value of the property is estimated as follows:

\[
V = \left(\frac{110,000 \times \frac{1}{(1 + .10)^1}}{(1 + .10)^2}\right) + \left(\frac{111,000 \times \frac{1}{(1 + .10)^2}}{(1 + .10)^3}\right) + \left(\frac{112,000 \times \frac{1}{(1 + .10)^3}}{(1 + .10)^4}\right) + \left(\frac{115,000 \times \frac{1}{(1 + .10)^4}}{(1 + .10)^5}\right) + \left(\frac{125,000 \times \frac{1}{(1 + .10)^5}}{(1 + .10)^6}\right)
\]

The estimated value of $1,052,960 is driven by the expected return of 10 percent. An investor who pays the estimated value and then receives the forecasted stream of income plus the reversion will make exactly a 10 percent annual return.

Calculating the discount factors

\[
\frac{1}{(1 + .10)^1}, \frac{1}{(1 + .10)^2}, \ldots, \frac{1}{(1 + .10)^5}
\]

yields 0.909, 0.826, 0.751, 0.683, 0.621. The present value of $1.00 received one year from today, given the discount rate of 10 percent, is $0.91, or $1.00 (0.909). Similarly, a dollar received two years from today is worth only $0.83, or $1.00 (0.826).

**Estimating Value Using Capitalization Rates**

Second commonly used method is to compare the first year NOI with the *capitalization rate*, which is calculated from the sales of comparative properties.

\[V = \frac{NOI}{R}\]

Where \(V\) = value of the property and \(R\) = capitalization rate

To compare two properties similar to the previous example:

<table>
<thead>
<tr>
<th>Comparable sale</th>
<th>Sale Price</th>
<th>NOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$1,400,000</td>
<td>$145,000</td>
</tr>
<tr>
<td>2</td>
<td>$1,350,000</td>
<td>$150,000</td>
</tr>
</tbody>
</table>
Capitalization rate on the first sale was $145,000 / $1,400,000 = .104 and for the second, $150,000 / $1,350,000 = .111.

The two sales are equally similar, so the average market capitalization rate is about .1075. Applying this rate to the first year ROI gives:

\[ V = \frac{110,000}{.1075} \]

\[ = 1,023,256 \]

Which is similar to $1,052,960 from the first example.

DCF models force the analyst to think explicitly about future income and property value. In practice, most people do both and start negotiations with the figure that works better for them.

**Converting the Estimate of Value to a Loan Account:**
**Applying the Loan-to-Value Ratio**

After determining a property’s value, the maximum loan amount is determined by applying the loan-to-value ratio, which is the percentage of value the lender is willing to loan.

Example: If at 70% LTV ratio, then a loan of .70 x $1,050,000, or $735,000 is indicated. A 70% loan means a 30% value “cushion” exists before the property’s value falls below the amount of the loan and puts the lender’s principal at risk.

**Ability to Service the Debt**

Property value is not the only criterion for making loans – of equal importance is the ability for the property to service the debt. Lenders demand an ability-to-service cushion – the debt service coverage ratio (DSCR) which is the NOI divided by debt service:

\[ \text{DSCR} = \frac{\text{NOI}}{\text{Debt service}} \]

Example: if at a 20% DSCR

\[ \text{DS} = \frac{110,000}{1.2} \]

\[ = 91,667 \]

The debt service coverage ratio (DSCR), is the ratio of net operating income to debt payments on a piece of investment real estate. It is a popular benchmark used in the measurement of an income-producing property’s ability to produce enough revenue to cover its monthly mortgage payments. The higher this ratio is, the easier it is to borrow money for the property. The phrase is also used in corporate finance and may be expressed as a minimum ratio that is acceptable to a lender; it may be a loan condition, a loan covenant, or a condition of default.
The $91,667 is used to calculate the maximum loan amount – for any interest rate and term, an amount of debt service must be repaid each period to pay the lender's interest and full amortize the loan. The amount of debt service divided by the original loan produces a percentage called the mortgage constant.

\[ MC = \frac{DS}{Loan} \]

The mortgage constant is the percentage of the original loan that must be repaid each period.

The combination of the DSCR and the MC are used by lenders to calculate the maximum loan amount.

Back to the example:

12% mortgage constant (for state interest rate X and loan term Y, a payment of 12% of principal each year will pay off the loan in year Y with X percent interest on the unpaid balance)

At $91,667:

\[\text{Debt} = \frac{\text{NOI}}{\text{MC}}\]

\[= \frac{91,667}{.12}\]

\[= 763,892\]

Thus, a $735,000 loan is justified based on a 70% loan-to-value ratio applied to property value, and that a $763,000 loan is justified based on the ability to service. In practice, lenders tend toward the lower, more conservative amount, in this case, $735,000.

**Leverage Effects**

In finance, leverage (or gearing due to its analogy with a gearbox) is borrowing money to supplement existing funds for investment in such a way that the potential positive or negative outcome is magnified and/or enhanced. It generally refers to using borrowed funds, or debt, so as to attempt to increase the returns to equity. Deleveraging is the action of reducing borrowings.

**Rate of Return on Total Capital**

ROR measures the overall rate return to the property, calculated as follows:

\[\text{ROR} = \frac{\text{NOI}}{\text{Cost}}\]

Similar to capitalization rate. Both use NOI as the measure of monetary benefits, difference is that the overall capitalization rate is the ratio of NOI to property value, while the ROR is the ratio of NOI to property cost.

**Rate of Return on Equity**
ROE measure the return to the equity position – ratio of before-tax cash flow to the equity investment.

\[ \text{ROE} = \frac{\text{BTCF}}{\text{Equity investment}} \]

Since it is based on before-tax cash flow and the equity invested, also known as cash-on-cash return.

**Positive and Negative Leverage**

The general rule is that if the MC is less than the ROR, leverage is positive and works for the equity investor by increasing the expected return on equity. If MC is higher than ROR, however, leverage is negative and works against the equity investor by decreasing the expected return on equity.

**BASICALLY:**

If an investor pays less for borrowed funds than can be earned on the same funds when invested (MC < ROR), ROR will be leveraged upward, and vice versa.

**Leverage and the Variability of Returns**

Equity investor chasing higher returns using leverage, at the cost of accepting higher risk. (think double or nothing)

**Summary**

The financing decision can have a huge impact on investment risks and expected returns. Historically, loan-to-value ratios have clustered around 60 to 90 percent, which suggests that a ratio in that range is optimal in terms of its costs and benefits to owners and lenders.

Two criteria determine the financing decision, especially from the lender’s perspective.

1) Property’s value must provide adequate collateral to cover the loan, with a cushion of value shown in the loan-to-value ratio
2) Regardless of the adequacy of the collateral, the property must have an expected income stream adequate to service the loan, with the cushion of income measured by the debt service coverage ratio

Collateral value is estimated in two ways:

1) By capitalizing first year NOI with capitalization rates from comparable sales
2) By discounting expected income and reversion using a discount rate that reflects the various risks and costs associated with real estate investment

The ability to service the debt is measured by the debt service coverage ratio, which produces the maximum amount for debt service. This maximum is then capitalized by the mortgage
constant, producing a maximum loan amount. When the loan amounts calculated by the collateral value and ability-to-service criteria differ, lenders tend to base their loans on the lower value of the two.

The use of debt affects both expected risk and returns for the equity position.

*Positive leverage* occurs when the cost of debt is lower than the overall return to the property – leverage increases expected equity returns.

*Negative leverage* occurs when the cost of debt exceeds the overall return to the property – leverage reduces expected equity returns.

The use of leverage to raise expected returns carries financial risk. Leverage increases cash flow variability, and should NOI become insufficient to service the debt, default and possibly foreclosure may result.

All I can say is... this chapter was full of examples and it’s easier to understand the material through them. Many of the concepts were better explained through the examples, so I recommend reading the chapter itself.