Capitalization Rate and Cash on Cash Return

An income property is generally valued on its cash flow, either the current cash flow or the anticipated future cash flow after repositioning. The valuation of the cash flow is calculated according to the cost and structure of the available financing at the time of purchase or refinancing.

The fundamental equation that is used (and abused) is:

NOI: Net Operating Income

CPV: Capitalized Property Value

CAP: Capitalization Rate

[1] CAP = NOI÷CPV

Buying the income property for all cash CPV will generate an annual cash flow of NOI. Thus, the return rate on the equity investment is the CAP rate. However, most income properties are purchased with a combination of debt and equity to increase the yield on the equity through leverage.

Many real estate brokers, including CCIM (Certified Commercial Investment Members), abuse the CAP rate by saying that it represents the risk or safety in a particular market or submarket according to what other comparable properties have sold in the recent past. This is nonsense.

Others also point to competitive investments, like US Treasury Bonds and Notes, to compare the yields with a CAP rate. This is also nonsense.

The CAP rate is not a qualitative measure of risk, but rather it is a quantitative measure of blended yield requirements for both debt and equity.

As I mentioned above, the CAP rate is purely a function of the cost and structure of available financing that reflects the required yields of the investment tranches. Income properties are almost always purchased with a combination of debt tranches and equity tranches. Each tranche requires a minimum yield, referred as a "Debt Constant", "Loan Constant", "Mortgage Constant", or "Yield Constant". The constant is simply the periodic cash flow divided by the initial investment. The annual constant is the periodic constant multiplied by the number of cash flow periods in one year. Debt amortization is not considered, as it is separate agreement between the lender and the borrower on whether and how the Debt Present Value (DPV) will reduce over time. Two different loans can have the same Debt Constant, yet one loan is amortizing and the other is interest only. The tranche yield calculations are performed as if there is no change over time in debt or equity.

For debt, the Annual Debt Constant (ADC) is calculated as the Annual Debt Service (ADS) divided by the initial Debt Present Value (DPV).

ADS: Annual Debt Service

DPV: Initial Debt Present Value

ADC: Annual Debt Constant

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[2]   ADC  = ADS÷DPV
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For equity, the Annual Yield Constant (AYC) is also called the Gross Return on Equity (ROE) or the Cash on Cash Return (CCR). The ROE is calculated as the net Cash Flow before Tax (CFBT) divided by the initial equity investment (EQTY).

CFBT: Cash Flow before Tax

EQTY: Initial equity investment

LTV: Loan to Value

ETV: Equity to Value

ROE: Gross Return on Equity (also called the Cash on Cash Return [CCR])

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[3]   LTV  = DPV÷CPV
[4]   ETV  = 1 – LTV
[5]   CFBT = NOI – ADS
[6]   EQTY = ETV×CPV
[7]   ROE  = CFBT÷EQTY
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I reviewed a commercial income property certified appraisal. The appraiser mentioned a few different ways of calculating the CAP rate:

1. The "mortgage equity" method, which is actually a weighted average of the yields for debt and equity.
2. The "Debt Coverage" formula, which is used by many bankers that considers the Debt Coverage Ratio (DCR) applied to the Net Operating Income (NOI).

The "mortgage equity" calculation is:

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[8]   CAP  = ADC×LTV + ROE×ETV                    weighted average of yields
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The "Debt Coverage" formula calculation is:

DCR: Debt Coverage Ratio

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[9]   DCR  = NOI÷ADS
[10]  CAP  = DCR×ADC×LTV
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Most appraisers don't understand that the two formulae, "mortgage equity" [8] and "debt coverage" [10] are mathematically identical. Most commercial real estate brokers also don't understand this mathematical relationship. The appraiser simply guessed at the ROE for the "mortgage equity" method to calculate a CAP rate from the published debt parameters of a few commercial lenders. Then the appraiser guessed at a DCR for the "Debt Coverage" formula to calculate a different CAP rate. CAP rates are not guess work.

The "Debt Coverage" formula is the easier choice for calculating the CAP rate, because it is mathematically identical to the original calculation **CAP = NOI÷CPV**. Also, the DCR is a critical measure of how well the financing can tolerate recessionary pressures on income and expense. A low CAP rate means a low DCR that risks negative cash flow (default) in the event of reduced income or increased expenses.

Also, the ROE is derived precisely from the same three variables, DCR, ADC, and LTV.

Finally, the weighted average in the "mortgage equity" method "**CAP = ADC×LTV + ROE×ETV**" [8] is identical to the "Debt Coverage" formula "**CAP = DCR×ADC×LTV**" [10] .

The two equations initially, [8] and [10] , appear to be quite different. A little substitution of variables will demonstrate the equality.

A basic identity equation from high school algebra:

[11] (A×B)÷(C×D) = (A÷C)×(B÷D) = (A÷D)×(B÷C)

First, derive the CAP rate in terms of the DCR, ADC, and LTV:

[12] CAP = DCR×ADC×LTV = (NOI÷ADS)×(ADS÷DPV)×(DPV÷CPV)
[13] CAP = (NOI×ADS×DPV)÷(ADS×DPV×CPV) cancel ADS and DPV
[14] CAP = DCR×ADC×LTV = NOI÷CPV [10]

Next, derive the ROE in terms of the DCR, ADC, and LTV:

DCM: Debt Coverage Margin

CFM: Cash Flow Margin

Leverage Ratio: LR

Leverage to Debt: LTD

[15] LR = 1÷ETV
[16] LTD = LTV÷ETV = LR − 1
[17] DCM = 1÷DCR = ADS÷NOI
[18] CFM = 1 − DCM = 1 − 1÷DCR = 1 − ADS÷NOI = NOI÷NOI − ADS÷NOI
[19] CFM = (NOI − ADS)÷NOI = CFBT÷NOI
[20] CFM = 1 − 1÷DCR = DCR÷DCR − 1÷DCR = (DCR − 1)÷DCR
[21] ADS = DCM×NOI
[22] CFBT = CFM×NOI
[23] ROE = CFBT÷EQTY = (CFM×NOI)÷(ETV×CPV) = CFM×(NOI÷CPV)÷ETV
[24] ROE = CFM×CAP÷ETV = CFM×DCR×ADC×LTV÷ETV = CFM×DCR×ADC×LTD
[25] ROE = (1 − 1÷DCR)×DCR×ADC×LTD = ((DCR − 1)÷DCR)×DCR×ADC×LTD
[26] ROE = (DCR − 1)×ADC×LTD

At this point, a critical investment concept that many real estate brokers and investors miss is the "Leverage to Yield" (LTY). The LTY is the ROE divided by the CAP. The ratio is the multiplier on the CAP rate to produce the ROE. The LTY measures the true leverage on the equity investment. If the ratio is less than 1.00, then the equity investment has "negative leverage". If the ratio exactly equals 1.00, then the equity investment has "neutral leverage". If the ratio is greater than 1.00, then the equity investment has "positive leverage".

LTY: Leverage to Yield

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[27]  LTY  = ROE÷CAP = (CFBT÷EQTY)÷(NOI÷CPV)
[28]  LTY  = ((CFM×NOI)÷(ETV×CPV))÷(NOI÷CPV)
[29]  LTY  = ((CFM÷ETV)×(NOI÷CPV))÷(NOI÷CPV) = CFM÷ETV
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Therefore, to achieve positive leverage, the Cash Flow Margin (CFM) must be greater than the Equity to Value ratio (ETV). Avoid neutral or negative leverage, because the return rate is less than investing all cash. Non-positive leverage risks default on the debt and losing the equity in foreclosure.

Finally, demonstrate that the "mortgage equity" method (weighted average) [8] is mathematically identical to the "Debt Coverage" formula [10] :

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[30]  CAP  = ADC×LTV + ROE×ETV = ADC×LTV + (DCR − 1)×ADC×LTD×ETV
[31]  CAP  = ADC×LTV + (DCR − 1)×ADC×LTV
[32]  CAP  = ADC×LTV + (DCR×ADC×LTV − ADC×LTV)
[33]  CAP  = DCR×ADC×LTV
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From these identities, the appraiser guessing at the ROE in [8] or at the DCR in [10] is merely guessing at the effective CAP rate. That's why he calculated 2 different CAP rates for the same property, and then averaged the CAP rates and added a "fudge factor". Calculating the true CAP rate is not a guessing game. The CAP rate is calculated by the cost and structure of financing.

These same equations hold true for multiple tranches of both debt and equity. The yield constant is calculated similar to [8] by a weighted average of the individual tranche yields divided by the sum of the tranche ratios relative to the total property value.

PLTV: Primary Loan to Value ratio

PDC: Primary Debt Constant

SLTV: Secondary Loan to Value ratio

SDC: Secondary Debt Constant

CLTV: Combined Loan to Value

WDC: Weighted Debt Constant

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[34]  CLTV = PTLV + SLTV
[35]  WDC = (PDC×PLTV + SDC×SLTV)÷CLTV
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Therefore, when a buyer is negotiating with a seller for a purchase price, the negotiation involves the CAP rate that determines the price. The property can afford to pay a particular debt service, for a particular DCR and ADC applied to the NOI. Thus, negotiating the CAP rate is actually negotiating the remaining variable LTV, which is actually negotiating the ETV (how much equity the seller has in the property). All of that depends on the cost and structure of the financing that is available to the buyer, and not on what other properties have fetched. The buyer cannot recreate the cost and structure of financing on those other comparable properties. Therefore, there is no sensible definition of "comparable CAP rates".

When you are buying an income property, you are actually buying an income stream (NOI). Negotiate a CAP rate that fits the cost and structure of the financing that is available to you, and then divide the actual NOI by the calculated CAP to arrive at a price that the property can afford to pay.

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