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The discount rate for income properties

Jaime Sabal Cárdenas
Profesor titular de Finanzas en ESADE y autor del libro *Decisiones financieras en países emergentes* (España).

jaime.sabal@esade.edu

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Abstract
Due to the lack of liquid and transparent markets it is extremely difficult to estimate betas for income property returns. Because of these difficulties, the *CAPM* is discarded by practitioners when valuing income properties. Instead, free cash flows are often discounted with rates derived from Gross Yields. However, Gross Yields only apply to income streams and other cash flows closely correlated with income whereas different discount rates must be applied to other cash flows such as expenses and investments. It is remarkable that this obvious anomaly has not been previously pointed out in the literature on real estate valuation. The common practice of discounting free cash flows with Gross Yields results in an overvaluation bias. Through a simple example it is demonstrated that the bias is more pronounced for larger gross yields, and the more important are the less risky cash flow streams in relation to the income correlated ones.

Key words
Real estate, income properties, valuation, discount rates, cash flow discounting.

Resumen
Debido a la ausencia de mercados líquidos y transparentes es muy difícil la estimación de betas para los rendimientos de propiedades generadoras de renta. Por este motivo, el modelo CAPM generalmente se descarta para la valoración de estos activos y, en su lugar, las analistas suelen utilizar los rendimientos brutos *(gross yields)* para descontar los flujos de caja libres. Sin embargo, los rendimientos brutos solo son aplicables a los ingresos y otros flujos de caja altamente correlacionados con ellos. Otras partidas, como los gastos operacionales y las inversiones, deben ser descontadas a tasas diferentes. Es muy curioso que esta obvia anomalía no haya sido detectada previamente en la literatura sobre valoración de activos inmobiliarios. La práctica común da como resultado una sobrevaloración de estos inmuebles. A través de un ejemplo práctico se muestra cómo la sobrevaloración es más pronunciada cuanto mayores son los rendimientos brutos y cuanta más importancia relativa tienen los flujos de caja menos riesgosos.

Palabras clave
Inmobiliario, patrimonialista, valoración, tasa de descuento, descuento de flujos.

1. Introduction

When discounting cash flows it is always necessary to determine a proper discount rate. This discount rate is often a hurdle rate that seems to "reasonably" compensate the investor for the risk of the venture. It might be also one that is commonly used by the business community for the same line of business.

A more formal approach is to apply an accepted model such as the CAPM (Capital Asset Pricing Model) (Sharpe, 1964). In formula 1, the CAPM equation is represented.

$$ER_i = R_f + \beta i \cdot (ER_m - R_f) \quad (1)$$

Property analysts commonly use Gross Yields to estimate discount rates

where:

ER_i is the discount rate.
R_f is the risk-free rate.
i is a measure of the systematic risk of the project.
$ER_m - R_f$ is the market risk premium.

To apply the CAPM it is necessary to estimate its parameters: the risk-free rate, beta and the market risk premium. The risk-free rate and the market risk premium are common to all investments. However, beta is specific to the type of business under analysis.

Beta can be estimated either directly or indirectly. Direct estimation is done through a regression analysis of the firm's stock returns against a proxy for the market portfolio such as the S&P 500. Indirect estimation is based on the betas of companies in the same or similar business. In both instances, the estimation of beta demands the existence of price series of stocks traded in liquid and transparent markets.

Unfortunately, because of their heterogeneity, high transaction costs and lack of liquidity time series are non-existent for income properties. So, it is generally quite difficult to estimate property betas (Damodaran, 2002).

Having said this, it must be acknowledged that there have been attempts to overcome this problem. An interesting approach takes advantage of Real Estate Investment Trusts, also known by their acronym REITs.

REITs are a type of mutual fund specializing in property investments. For all practical purposes these funds do not pay income taxes but only once, at the final investor level, although this might vary with each country's regulations. Besides their tax advantages REITs let personal investors invest in diversified real estate portfolios without the need to worry about the administration of the properties in their portfolios.

REITs are usually tradable in capital markets, pretty much as normal shares of stock. Therefore, the prices of REIT shares are a reflection of the value of the properties, rental tendencies and investors' expectations as regards the property market. This makes them a good proxy for the value of their property portfolios on a daily basis. Breidenbach, Mueller & Schulte (2006) have proposed to take advantage of these characteristics of REITs to estimate beta for income properties.

Another problem is that even when price series for real estate can be obtained it is found that the corresponding return distributions are non-normal showing asymmetries and fat tails. Hence, the relevance of the CAPM (that assumes normality of returns) is brought into question (Lusht, 1988). To deal with this problem Coleman & Mansour (2005) develop a model that assumes biased and fat tailed return distributions.

In spite of these laudable attempts, both academicians and reputable real estate textbooks, (acknowledging the problems of the CAPM concerning property investments) disregard the CAPM as a tool for discount rate determination and instead suggest the use of investor surveys (Casanovas i Ramon & Santandreu i Gràcia, 2007), treat the discount rate as "given", or suggest an "appropriate" return (Brueggeman & Fisher, 2008; Clauretie & Sirmans, 2010; Brown & Matysiak, 2000).

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Practionners also generally ignore the possibilities of the CAPM for the valuation of income properties. The exception is when real estate is specifically dedicated to a particular business, such as a pharmaceutical plant or a cement factory. In these cases, the discount rate is the one matching the business since the implicit income from the property is closely tied to the firm's returns. In all other instances, that is when the property is in itself the business to be valued, the CAPM is not considered by the overwhelming majority of practitioners as a valid option.

The common way for real estate professionals, looking for a formal approach for the determination of discount rates, is to use the Gross Yields published for different types of income properties in many parts of the world. Among some well-known sources it is worth mentioning: The European Public Real Estate Association (EPRA); the Investment Property Databank; Jones Lang Lasalle; CB Richard Ellis; and the Real Estate Investment Service.

In formula 2, the Gross Yield *(y)* is defined.

$$y = \frac{I_{gp}}{V} \tag{2}$$

where:

I_{gp} is the Gross Potential Income, and
V is the appraised or market value of the property.

The Gross Potential Income is the rent that would be produced by the property assuming no vacancies, no collection losses and no special discounts to tenants (known as "concessions").

The yield formula is based on the valuation of a sort of perpetuity where the numerator is the Gross Income from the property and the denominator *(y)* is the discount rate of a no-growing perpetuity. This is demonstrated in formula 3.

$$V = \frac{I_{gp}}{y} \tag{3}$$

Observe that this valuation formula is based on Gross Income instead of free cash flow as would be the case for a regular perpetuity.

The formula is most often interpreted as the present value of a growing perpetuity. Under this interpretation y is defined, in formula 4.

$$y = r - g \tag{4}$$

where the discount rate is *r,* and *g* stands for the growth rate. For income properties the growth rate is usually assumed to be equal to the expected inflation rate. This is based on the normal situation where rents are indexed by inflation during the length of the leasing contract.

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The Gross Yield approach overestimates the present value of the property

Note that the discount rate *r* corresponds to unleveraged cash flows because the yield formula ignores financing expenses.

The common practice among real estate analysts is to discount free (unlevered) cash flows at the rate *r*. Or alternatively to use *r* as an input for the calculation of WACC (Weighted Average Cost of Capital) when leverage is factored in. For simplicity, all calculations in this document will be performed on unlevered cash flows.

In the next section it is shown why this approach is incorrect, and an alternative methodology is proposed[1].

2. An Alternative Approach

For non-real estate investments, betas and discount rates are estimated from series of stock returns. Stock returns reflect actual and expected earnings and, hence are closely related to the free cash flows to shareholders. Therefore, it is consistent to discount free-cash flows with betas and discount rates estimated from stock returns.

Nevertheless, this does not ensue when gross yield-derived returns are used. Gross yields refer to gross potential income. Therefore, the corresponding discount rate must apply only to gross potential income and those cash flow streams closely correlated with it.

Other cash flows must be separated and discounted at different rates more in harmony with their risk characteristics. The question is: at what rates must these other cash flows be discounted?

The answer can be inferred from an analysis of each of the cash flows. Chart 1 shows the relationship between cash flow functions and their consequences.

Chart 1
Components of the Unleveraged Overall Free Cash Flow

Item	Meaning
+ Gross Potential Income	Potential rent
– Losses	Vacancies, collection losses and concessions
Effective Gross Income	**Net**
+ Recoveries	Common expenses charged to tenants
Gross Income	**Net**
– Expenses	Operational and non-operational expenses
+ Other Income	Supplementary income (services)
EBITDA	**Net**
– Depreciation and Amortization	
– Taxes	
EBIAT	**Net**
+ Depreciation and Amortization	
+ CAPEX	Capital expenditures
Free Cash Flow	**Net**

[1] I am indebted to Pere Viñolas for some comments.

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Internal rates of return are invalidated when Gross Yields are the rates of reference

Now, let us pay closer attention to the risk characteristics of each of these items.

- Vacancies tend to move in the same direction as rent per square meter, and collection losses and concessions are proportional to rent. Thus, losses must be closely associated with income.
- Recoveries are proportional to expenses, thus they depend on their magnitude. But, recoveries are a function of the level of occupancy (and income) as well. Thus, Recoveries depend on two different sources of risk.
- Expenses are quite predictable and vary little with occupancy. So, it could be considered an item that depends mostly on managerial decision making.
- Other Income such as services to tenants is clearly associated with occupancy (and income).
- CAPEX and Depreciation and Amortization are tied to the property itself and are independent of income.
- Taxes are proportional to taxable income. But taxable income fluctuates mainly with income levels, since most other cash flows are predictable or managerial in nature. Because of this, it is reasonable to assume that Taxes are tied to income.

From the previous description two main risk streams are identified. One group of cash flows that is closely tied to income and other group showing insignificant volatility (or low risk). Only Recoveries is somewhere in between since it depends on both occupancy (and rent levels) and expenses.

All those cash flows that are highly predictable or managerial in nature are practically risk-free. Hence, it is reasonable to discount these low-risk items at the risk-free rate. Other possibility might be to use the borrowing rate. Nonetheless, the borrowing rate is not really risk-free since it depends on the credit risk of the borrower. It is for this reason that the risk-free rate is preferable and will be the one employed in this paper.

In conclusion, chart 2 represents the cash flow streams that are segmented according to their risk levels and corresponding discount rates.

Chart 2
Risk Levels and Corresponding Discount Rates

Cash Flow Group	Discount Rate
Gross Potential Income Losses Other Income Taxes	Gross Yield Implied *(r)*
Expenses Depreciation and Amortization CAPEX	Risk-Free rate (r_f)
Recoveries	Between r and r_f

So, two main rates are identified: the Gross Yield-implied rate *(r)* and the risk-free rate (r_f). The only exceptional item is Recoveries whose discount rate is not well-defined given that they are affected by different sources of risk: expenses, rent and vacancies.

This poses a problem. Fortunately, Recoveries are rarely a primordial supply of income. Instead, they usually remain modest in comparison with rents, expenses and investments. Thus, as long as their magnitude is not significant, it will not make a material difference at what rate Recoveries are discounted. In this paper a practical solution is chosen and they will

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The overvaluation bias is larger for larger gross yields

be discounted at the risk-free rate. However, in those situations where, because of their relative importance, this might not be accurate enough a possible solution is to approximate the discount rate as the average between the gross yield-implied rate *(r)* and the risk-free rate *(r_f)*.

Now, let us focus on the final impact of decomposing the cash flows and discount them with two or more discount rates, as opposed to the common practice of discounting free cash flows with only one rate: the gross yield-implied one.

Discounting free cash flows at the gross yield-implied rate is equivalent to discounting one and every component of free cash flow at this rate. This means that not only those cash flows that are highly correlated with rents are being discounted at the gross yield –implied rate, but also that expenses, investments and, in short all those cash flows that are highly predictable or managerial in nature will also be discounted at the gross yield-implied rate.

This results in lower present values for the low-risk cash flows and thus an overestimation of the present value of the property. This is precisely the main point of this paper and the central weakness of the common practice of using gross yield-implied rates to discount free cash flows when valuing income properties. It is surprising why this simple incongruity has not been identified in the literature.

In the next section the differences resulting from the two methods will be illustrated by means of a practical example.

2.1. Method Comparison: A Practical Example

Let us work out the following simple example:

A real estate investor is considering the acquisition of an income property for €2.5 million. The property has 10 thousand square meters of leasable space. Rent is expected to amount to €40 per square meter during the first year and vacancies are estimated to remain constant at a rate of 10%. Expenses will be €1.50 per square meter of leasable space and recoveries will be equivalent to 80% of expenses. Both rent and expenses will grow at a yearly inflation rate that is anticipated to stay constant at 2%. There will be no other significant income. Major rehabilitation work for €1 million is planned for the first year. In addition, major maintenance for €500 thousand is scheduled for year 5. Average yearly depreciation will be €100 thousand.

The gross yield for this type of property is 8% and the long-term yearly risk-free rate is 4%. Using discounted cash flows a recommendation must be made as to whether the proposal is an acceptable one.

The following simplifying assumptions apply:

a) Recoveries will be discounted at the risk-free rate.
b) Rehabilitation and maintenance will not affect operating cash flows or depreciation.
c) There is no leverage.
d) The cash flow projections will expand to a horizon of 10 years.
e) The terminal value of the property will be estimated following commercial custom by multiplying expected Gross Income by the Gross Yield.

Based on this information, the discount rate *r* is easily estimated as follows in formula 5.

$$r = y + g = 8 + 2 = 10\% \quad (5)$$

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The free cash flow is computed in chart 3.

Chart 3
Free Cash Flow Computation

	Time (years)										
Cash Flows (€ Thou)	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Price	−2.500,00										
Major Rehabilitation		−1.000,00									
Major Maintenance						−500,00					
Gross Income		400,00	408,00	416,16	424,48	432,97	441,63	450,46	459,47	468,66	478,04
Vacancies		−40,00	−40,80	−41,62	−42,45	−43,30	−44,16	−45,05	−45,95	−46,87	−47,80
Expenses		−15,00	−15,30	−15,61	−15,92	−16,24	−16,56	−16,89	−17,23	−17,57	−17,93
Recoveries		12,00	12,24	12,48	12,73	12,99	13,25	13,51	13,78	14,06	14,34
Depreciation		−100,00	−100,00	−100,00	−100,00	−100,00	−100,00	−100,00	−100,00	−100,00	−100,00
EBIT		257,00	264,14	271,42	278,85	286,43	294,16	302,04	310,08	318,28	326,65
Taxes		−77,10	−79,24	−81,43	−83,66	−85,93	−88,25	−90,61	−93,02	−95,48	−97,99
EAT		179,90	184,90	190,00	195,20	200,50	205,94	211,43	217,06	222,80	228,65
Depreciation		−100,00	−100,00	−100,00	−100,00	−100,00	−100,00	−100,00	−100,00	−100,00	−100,00
FCF	**−2.500**	**720,10**	**284,90**	**290,00**	**295,20**	**−199,50**	**305,91**	**311,43**	**317,06**	**322,80**	**328,65**
Terminal Value											**6.094,97**

Following commercial custom, the terminal value in thousands in year 10 is based on the expected Gross Income and the Gross Yield. Formula 6 shows this.

$$TV_{10} = \frac{(\text{Gross Inc}_{10}) \cdot (1 + \text{Inflation})}{y} = \frac{478.04 \cdot 1.02}{0.08} = 6094.97 \qquad (6)$$

Under common practice the free cash flow is discounted at the gross yield implied discount rate of 10%, as shown in chart 4.

Chart 4
Traditional Cash Flow Discounting

Present Value											
FCF	−2.500,00	−720,10	284,90	290,00	295,20	−199,50	305,91	311,43	317,06	322,80	6.423,63
PVs	470,33	3.267,36	4.386,20	4.511,44	4.643,59	4.783,23	5.481,00	5.692,60	5.919,29	6.162,46	
Net Present Value	**470,33**	**thousand**									

Employing the method proposed in this paper the free cash flow is segmented into risky and low-risk streams, and they are discounted at the gross yield implied discount rate (10%) and the risk-free rate (4%) respectively, as shown in chart 5.

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Chart 5
Proposed Cash Flow Discounting

Present Value											
Gross Yield Cash Flow		282,90	287,96	293,12	298,38	303,75	309,22	314,81	320,50	326,31	332,24
Gross Yield PVs	4.209,75	4.630,73	4.782,61	4.944,12	5.116,10	5.299,50	5.495,32	5.704,71	5.928,90	6.169,23	6.427,21
Risk-free Cash Flow	−2.500,00	−1.003,00	−3,06	−3,12	−3,18	−503,25	−3,31	−3,38	−3,45	−3,51	−3,59
Risk-free PVs	−3.898,98	−1.454,93	−470,01	−485,63	−501,81	−518,57	−15,94	−13,13	−10,14	−6,96	
Net Present Value	**310,78**	**thousand**									

The proposed method gives a more conservative estimate of €310.780 versus €470.330 for the traditional method, for a difference of €159.550. As anticipated, the traditional method ends up overestimating the value of the property, an error in this example of over 51% in terms of net present value.

The impact of discounting the low risk cash flows at the risk-free rate is relatively more important for larger gross yields. This makes sense since the higher the gross yield the larger is the difference between the gross yield-implied rate and the risk-free rate. In consequence, the larger will be the underestimation in present value terms of the low-risk cash flows and the overestimation of the value of the property. This can be observed in chart 6 that shows the difference in net present values (and the overestimation of value) for a series of gross yields.

Chart 6
Sensitivity to Gross Yield

Gross Yield	NPV Difference
6,00%	110,99
6,50%	123,52
7,00%	135,79
7,50%	147,80
8,00%	159,55
8,50%	171,06
9,00%	182,33
9,50%	193,37
10,00%	204,18

As expected, the difference in net present values and the overestimation bias increases with the gross yield as long as the risk-free rate remains the same.

Also, the difference in net present values and the overestimation bias increases the more important are the low-risk cash flows in comparison with the risky ones. This effect can be observed in chart 7 where the net present value gap is computed for different expense levels.

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Chart 7
Sensitivity to Expenses

Expenses (€/sqm)	NPV Difference
1,00	157,35
1,10	157,79
1,20	158,23
1,30	158,67
1,40	159,11
1,50	159,55
1,60	159,99
1,70	160,43
1,80	160,87
1,90	161,31

Something similar happens with major maintenance. Given that it is also discounted at the risk-free rate the larger the relative importance of this item the larger will also be the net present value difference and the overestimation bias. This effect can be observed in chart 8.

Chart 8
Sensitivity to Major Maintenance

Major Maintenance	NPV Difference
0	59,05
50	69,10
100	79,15
150	89,20
200	99,25
250	109,30
300	119,35
350	129,40
400	139,45
450	149,50
500	159,55

Naturally, major rehabilitation will behave in the same manner. The larger the value of major rehabilitation in comparison with other risky cash flows, the more significant will be the overvaluation of the property when following the traditional method.

2.2. Internal Rates of Return

A final word about the internal rate of return (IRR) method. This procedure remains the most popular way to value property. It consists in computing the internal rate of return (IRR) of the free cash flows and compare it with the gross yield-implied rate *r*. The investment will be acceptable whenever the internal rate of return is larger than *r*.

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The overvaluation bias is larger the more important are the low risk streams

This method assumes that all cash flows are invested at the resulting IRR. Given that not all cash flows should be discounted at the gross yield-implied rate, the IRR approach turns out to be inappropriate as well.

For those wishing to employ IRR in a way consistent with the proposal of this paper the calculations cannot be performed in one step. Instead it is necessary to proceed as follows:

a) Discount the low-risk cash flows at the risk-free rate (or alternatively at the borrowing rate). This will result in a present value for the low-risk cash flows.
b) Find the discount rate that makes the present value of the risky cash flows equal to the present value of the low-risk cash flows. That is, the discount rate that makes the overall net present value equal to zero.

This last discount rate must be compared with the gross yield-implied rate. If it is larger, the investment will be acceptable. Otherwise, the project must be rejected.

3. Conclusions

There are several ways to estimate discount rates for investment valuation. However, the most widely known formal method remains the "Capital Asset Pricing Model" (CAPM). The problem is that this model is difficult to apply in the case of income properties. Although it has been proposed to take advantage of the information contained in REITs currently traded in many capital markets to estimate CAPM discount rates for properties, this procedure is still not popular.

The fact is that the difficulties to estimate real estate betas remain and the CAPM is still ignored by practitioners when valuing income properties. Instead, the popular method is to discount free cash flows with discount rates derived from Gross Yields.

In this document it has been argued that the Gross Yield approach is erroneous. The mistake arises because all the components of the free cash flows are implicitly considered equally risky when discounted at a gross yield-implied rate, whereas there are actually at least two distinct classes of cash flow components: a group that is practically risk-free and another that is consistent with the risk characteristics of the income stream, and hence with a gross yield-implied rate.

It is remarkable that this obvious anomaly has not been previously pointed out in the literature on real estate valuation.

A method is proposed to fix up this miscalculation and through a simple example it is verified that;

a) The traditional approach results in overvaluation of the property.
b) The overvaluation bias is larger for larger gross yields since the relative weight of the risk-free discounted cash flows increases in comparison to the cash flows discounted at the gross yield-implied discount rate.
c) The overvaluation bias is also more pronounced the more important are the low risk streams in relation to the income correlated ones. This is particularly relevant when major maintenance and rehabilitation work are scheduled.

Lastly, given the differential risks of the cash flows, the internal rate of return approach is also invalidated and steps are proposed to apply this method in consistency with the proposals of this document.

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It is hoped that this work will help practitioners in the real estate market to correct the overvaluation bias and be able to obtain more accurate estimates for their investment projects.

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