Is there a Myers[1] way to value income flows?

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The world of property investment analysis paradigms is divided into two broad spheres of influence, the US-sphere and the UK-sphere. Despite superficial similarities, the two spheres hide different theories and practices. This paper focuses on a single illustration of this difference (the valuation of income flows) and suggests that alternative solutions can and should be adopted without having to re-invent the wheel.

Introduction

There is a major difference between the income valuation paradigms[2] used and diffused in the UK and the US spheres of influence. Both paradigms are supported by their respective corpus of literature and, because of the normative nature of textbooks and professional standards, it appears difficult to modify concepts and practices. This paper explains why the basic UK-sphere model is flawed and too limited to be useful and the basic US-sphere model is less flawed but raises empirical difficulties.We will also submit that, fortunately, the wheel does not have to be re-invented as appropriate alternative instruments can be found in the classic corporate finance textbooks[3].

Income... what income?

It may seem trivial to have to come back to basic definitions but most ambiguities found in the income method applications stems from the confusion between levels of income, levels of cash-flows and, of course, from the choice of the relevant discount

1. In honor of S.C Myers (see below) and with apologies for this weak attempt of a bilingual pun: the name Myers can easily be mispronounced in French as "meilleur" which means "better" or "best".
2. A paradigm is a scientific consensus. It can be seen as a pact of mutual understanding between and among the developers of theories and their users. In Kuhn's parlance, a valuation paradigm would be the set of tools, methodologies, techniques, jargon and savoir-faire that should unify the theory and professional practices. Paradigms are reinforced and officialised by textbooks and academic journal articles, then they are turned into professional standards and they become the accepted tools of the trade
3. Notably, Brealey and Myers "Principles of Corporate Finance".

rates. The following definitions seem to be generally accepted; thus we may as well start here.

Table 1: From Income to Cash Flows...

1	**Gross Income**	The **potential gross income (PGI)** is the maximum income that can be obtained from the property.The **effective gross income (EGI)** provides a more realistic rental situation of a property.
2	**NOI**	The **net operating income** is the most important level of analysis for the valuer. It is obtained by deducting the operating expenses from the effective gross income. Three of the income discounting models presented below are treated at this level.
3	**BTCF**	The **before tax cash flows** are the before tax rewards to the equity owner after servicing the debt (after the Bank...). The discounted cash flow methods should start at this level. The present value of the equity must be added to the present value of the debt to derive the full value of the asset in a no-tax world.
4	**ATCF**	The **after tax cash flows** are the residual reward to the equity owner. It is an after debt and after tax level (after the Bank, after the Queen....). The present value of the after-tax equity must be added to the present value of the debt to derive the full value of the asset in a taxed world. Only one of the models (the residual equity model) presented below is established at this level.

The valuation of income flows

Income generating properties can be valued using two general techniques:

1) the direct capitalisation of a single year income;

2) the discounting of a stream of income over the holding period[4].

In turn, the discounting stream of income has at least[5] two variants: the property model and the residual equity model.

1) Property models (or full asset models) discount a flow of net operating and disposal income. Property models can be pre or post tax and apply to levered or unlevered assets.

2) Equity models discount the residual operating and disposal cash flows going to the equity investors. Equity models are, of course, only relevant for levered assets and can be presented in pre or post tax formats.

4. Of course the direct capitalisation is simply a particular case of discounting a perpetual stream of income.

5. The family of discounting income models is larger than assumed here. For a full family picture see: D. Fischer: Income Property Analysis and Valuation (2000), chap. IX,

To clarify the difference between these two models we will examine how the various interests in property can be financially split among different flows and values.

Table 2: Splitting flows and values in a taxed world

Values	***Operation flows***	***Disposal Amount***
Asset	After tax net operating income + depreciation tax shelter + interest tax shelter	Net disposal proceeds - terminal tax consequences
Equity	After-tax cash flows (minus depreciation and debt amortisation)	After tax disposal cash flow = Net disposal - Outstanding balance - terminal tax consequences.
Debt	Debt payments	Outstanding Balance

- The standard corporte finance "full income" post tax model is written:

Value = PV of NOI_t + PV of annual tax effects + PV of NDISP - PV of disposal tax effects.

$$\text{Value} = \sum_{t=1}^{n} \frac{(NOI - dep)(1-T)_t + dep\mathbf{T}}{(1+k_a)^t} + \frac{NDISP_n}{(1+k_a)^n} - \frac{TAXDISP_n}{(1+k_a)^n}$$

With:

T	Marginal tax rate
dep	Annual deductible depreciation
NDISP	Net income at disposition
TAXDISP	Taxes on disposition (depreciation recapture and capital gain)
k_a	Discount rate applied to the full asset income stream.

The annual tax effects are a mixed bag of tax payments on operating flows and tax deductions of interest payments on the debt and asset depreciation.The disposal tax effects is another mixed bag of capital gain and depreciation recapture at disposal.

However the UK sphere treatment simplifies the previous standard format to a very simple pre tax formulation that is described as a "discounted cash flow analyis" :

$$\text{Value} = \sum_{t=1}^{n} \frac{NOI_t}{(1+k_a)^t} + \frac{NDISP_n}{(1+k_a)^n}$$

- The US sphere residual post-tax equity model can be formalised as:

Value =[PV of (PMT_t) + PV of (OSB_n)] + PV ($ATCF_t$)]+ PV ($ATEDISP_n$)

$$\text{Value} = \sum_{t=1}^{n} \frac{PMT_t}{(1+k_d)^t} + \frac{OSB_n}{(1+k_d)^n} + \sum_{t=1}^{n} \frac{ATCF_t}{(1+k_e)^t} + \frac{ATEDISP_n}{(1+k_e)^n}$$

Or, simply:

$$\text{Value} = \text{Debt} + \sum_{t=1}^{n} \frac{ATCF_t}{(1+k_e)^t} + \frac{ATEDISP_n}{(1+k_e)^n}$$

With:

ATCF	After tax cash flow
ATEDISP	After tax equity at disposition
OSB	Outstanding Balance
PMT	Periodic mortgage payment
k_e	After tax expected rate on equity flow
k_a	Effective cost of debt

A summary of the different flows, discount rates and value concepts are presented below:

Table 3: hat to discount? At what rate? To do what?

Flow level	***Discount rate***	***Value***	***Usage***
Effective gross income	Gross rate of return	Total asset value	Mostly used for real estate transactions.
Net operating income	Net rate of return or capitalisation rate	Total asset value	This is the ideal level of analysis for “fat market” valuation. (Information on comparables is abundant and reliable).
Before tax cash flow	Expected before tax return on equity (k^*_e)	Non taxed value of the equity	Mostly useful for “thin market” valuations and summary investment analysis. Also the appropriate level for non-taxed investors.
After tax cash flow	Expected after tax return on equity (k_e)	Taxed value of the equity	In the “motherhood” technique for “thin market” investment analysis and various forms of financial expertise.

UK-sphere textbooks[6] and professional standards[7] limit the valuation exercise to direct capitalisation and to the discounting of pre-tax Net Income. They do not explicitly take into account the financial split between mortgage and equity and they ignore tax consequences. Nevertheless the traditional description of this simplified treatmen is of a "discounted cash flow" model.

US-sphere textbooks[8] and professional standards[9] define the Discounted Cash Flow general format as a pre or post tax after debt cash flow.

Thus we are faced with two different income valuation methods:

- The UK-sphere "discounted cash flow" (DCF) reduced to the discounting of pre-tax net incomes from operation and disposition:
- The US-sphere "discounted cash flow" that requires a precise treatment of financing and taxation consequences.

Thus a UK "DCF" is not a US "DCF"...and not even a true discounted cash flow, since it discounts NOI and not Cash flows as habitually defined in the property litterature. Beyond this important semantic confusion we will now argue that:

- Methodologically the simple NOI discounting model is wrong — wrong in its maths and wrong in its use[10].

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6. Textbooks contents are the best indicators of the level of development of a paradigm as they are used to teach the tools of the trade. We can compare different sources of practices by comparing the principal textbooks used in the last 25 years to define and propagate the paradigms through the tertiary education programs. The exact dating of the introduction of concepts and models is not exact since it takes quite a few years before theories are turned into teachable textbook material, but the following examples provide an approximate benchmarking of the national differences.

   To avoid *ad hominem* undiplomatic confrontations of specific contents we will oppose the UK-sphere and the US-sphere streams admitting that this dichotomy is an oversimplification of the exact content of curriculums.

   The content of the UK-sphere paradigm is best described by the generally quoted texts such as Richmond (1985), Baum and Crosby (1988) Butler and Richmond (1990), Baum and Mackmin (1990), Isaac and Steley (1991), Enever (1995), Baum and Crosby (1995).

   The Australian texts seem to have followed most of the UK tradition (Millington. 1991) Although, other texts, to varying degrees, integrate some elements of both worlds: Robinson (1989), Whipple (1995), Rowland (1997).

7. Royal Institution of Chartered Surveyors Appraisal and Valuation Manual, Practice Statement, 1995.

8. Specific academic property studies started in the US at the end of the sixties and the first typical textbook was Wendt and Cerf (1969). Later, Jaffe and Sirmans (1982) integrated most of the now accepted elements of modern corporate finance. This general approach was then propagated through a large number of US textbooks, Canadian texts (Achour, 1987), Mexican texts (Achour and Castaneda, 1993) and French texts (Achour and Coloos, 1993. Hoesli and Thion, 1994).

9. The Appraisal of Real Estate, XIe edition, 1994.

- The Equity model, is OK in its maths, clumsy in its use but wrong in its financial hypothesis.

- Both models are empirically limited since they require the knowledge of a "difficult" rate: the expected leveraged rate of return on equity.

- A third approach is suggested: the maths are OK, the finance is OK and, most importantly, the required rates are "easier".

- A the same time, as a side dish, we will also suggest a easy way to deal with the embarrassing problem of simultaneity that plagues after financing formulations (see appendix: Chicken or egg).

What's "wrong" with the present contenders?

The sphere candidate

$$\text{Value} = \sum_{t=1}^{n} \frac{NOI_t}{(1+k_a)^t} + \frac{NDISP_n}{(1+k_a)^n}$$

- The general textbook prescription is to discount at a rate k_a =a weighted average cost of capital (WACC). In a no-tax world such a WACC is a linear combination of the cost of debt and the expected equity return.

$$WACC = k_d x \frac{D}{V} + k_e x \frac{E}{V}$$

- Unfortunately discounting at the weighted average cost of capital is inappropriate[11] since it assumes that the ratio debt/value is constant over the holding period[12]. Discounting at the WACC is wrong when we deal with an amortised debt and variable incomes. The case becomes even less tractable with a taxed property since the composite discount rate should also deal with the variable tax sheltering of interest and depreciation deductions. Thus the

10. Nevertheless, this is not the main problem because models are simple metaphors and exactitude is not an exacting criteria of validity. Or, put into plain English: we do not really care about the formal exactitude of the models, since the level of technical model "wrongness" is immaterial compared to all the other sources of predictive errors in the construction of financial flows. Or, for a final translation, we could say that the fuzz factor is much greater than the maths factor.

11. Inappropriate, but a notable improvement over the solution of using "a gilt + 2%" or some other form of "Bond rate + risk factor treatment" still suggested in the UK-sphere literature.

12. All the corporate finance textbooks repeat, ad nauseam, that the WACC is only applicable to perpetuities (or pseudo-perpetuities: constant growth mode and reversion at the WACC-capitalised value of the NOI). An amortised debt and resulting cash flow is not a perpetuity.

maths are wrong and the applicability limited when used for property investment analysis and financial expertise as we shall clarify now.

- The formulation takes neither taxation or financing in consideration. By simplifying the DCF treatment to the discounting of net operating and disposal flows, it eliminates most of the interesting stories. Interesting stories are told at the financing and tax levels.

- Financing is the blood (and sweat and tears) of property investment: it is such an essential part of the game that it cannot be left to implicit treatment through a composite discount rate. Property financing is quite different from corporate financing. The debt is asset specific and not firm specific. Mortgage debt has amortisation, collateralisation and risk traits that require explicit and detailed treatments.

- The psittacious argument that valuation should not be concerned with taxation, is a solid component of the "paradigm" (in both spheres). But this position is wrong. Wrong and contradictory to the income valuation methodology's mantra: "capitalisation rates should be derived from the observation of market transactions".

  However, properties are transacted by taxed and non taxed clienteles. The price makers (the bid winners) may or may not be tax paying investors. Some assets will be the exclusive turf of non-taxable non-levered institutions and some other assets will attract mostly taxed investors. The reading of the market requires a fine reading of its actors and their behaviours. If over-simplified analytical models rub off these behaviours, the model must be discarded.

  Property analysis that ignores financing and taxation is like the medical profession ignoring viruses and bacteria... not a healthy story.

The S sphere candidate

The financially split debt-equity model was presented as:

$$\text{Value} = \sum_{t=1}^{n} \frac{PMT_t}{(1+k_d)^t} + \frac{OSB_n}{(1+k_d)^n} + \sum_{t=1}^{n} \frac{ATCF_t}{(1+k_e)^t} + \frac{ATEDISP_n}{(1+k_e)^n}$$

- By contrast with the "full value" model, the residual equity model does not rely on a composite rate to "replicate" the leverage effects (the WACC). It explicitely splits the income components and discounts each flow at their respective rates. It deals explicitly with variable financing conditions, refinancing and with tax implications of interest and depreciation deductions. At least the maths are OK, the applicability is wider for investment analysis purposes and the model is no less suitable than the previous one for straightforward valuation. So where are the bugs?

1. A minor bug: the simultaneity problem

It is always a neat teaching trick to pretend that we know the value at the onset. We need to "know" the value in order to establish a debt story (we need V to find D/V, PMT and OSB). Furthermore we need a building value in order to establish depreciation schedules. But how do we start from V when that's exactly what we are looking for? This old logical issue was recently re-discovered by Burns and Walker (1998), we will suggest later that their solution is partial and a that a more general treatment has always been available (see the appendix: Chicken and egg).

2. A ma or and elusive bug: $_{e}$?

In the residual discounted cash flow model we need to use an expected rate of return on the investors equity[13] **and** we need to assume that this rate remains constant over the holding period. Obviously, for an amortized debt, the level of leverage decreases as payments are made to reduce the principal: thus the ratio D/V decrease and the expected risk adjusted equity rate should also decrease. But this is only a minor handicap[14] and the problem is quite similar, and less damaging, than the one affecting the use of the WACC. The real handicap is of a practical nature: what is the relevant benchmark?

The relevant discount rate of after-tax cash flows should be the expected return on a similar equity investment? Good... but where do we find a similar investment that has the same variable risk characteristics, the same taxation profile, the same holding period, the same pattern of cash flow distribution, the same illiquidity, the same market opacity, etc.

The answer to this question is not trivial, and textbook writers (including this author...) never really explain where to find this ideal "twin" investment. The wrapping in the CAPM golden paper does not really help: it sure looks better but real life analysts may be wondering where they could find a good daily newspaper that publishes fresh betas and risk premiums for property investments.

13. This rate has been noted k_e (post tax) or k^*_e (pre tax).

14. Although Some variable risk models have been suggested, none have been successfully applied to the property field. They could present a technical improvement at the cost of a greater complexity and no real serious gain in practicality: the fuzz factor is much greater than the maths factor.

Do we have an alternative candidate?

We have such a candidate, willing and able to serve for at least 25 years. This candidate is the Adjusted Present Value = APV, it was initially proposed by S.C Myers in 1974[15] and has been in the mainstream corporate finance textbooks for almost twenty years. Strangely enough it was never picked up. Probably another example of the Betacam-McIntosh syndrome.[16]

The concept is based on a simple idea: instead of fiddling with the discount rates we value the net income flows as if we had no leverage and then we add the value of the borrowing net effects. Since present values are additive, the value of the project is equal to the value of the without-debt project + the present value of the debt effects. This view is coherent with the Modigliani-Miller story that states that the debt/equity slicing of the cake does not change the size of the cake... except that it may add some cream in the form of the borrowing cost tax shield.

Let us write the simplified model (no disposition and a non-amortized debt):

$$NPV = \sum_{t=1}^{t=n} \frac{NOI_t - dep_t)(1-T) + dep_t}{(1+k_a)^t} + \frac{k_d . D_t . T}{(1+k_d)^t} - V_o$$

We observe that the first part of the equation discounts the taxed NOI and the tax shield effect of depreciation. The discount rate k_a is the expected rate of return on a full equity investment. Ideally such rate should be extracted from the reading of transactions of similar assets (same class, same risk, same operating leverages, same land to value ratio, same location, same age, same form of management and ownership, etc.).

The second part discounts the interest tax sheltering effects: the present value of a stream of interest tax deductions. The discount rate is the cost of debt and this part may be treated independently[17].

The major advantages of this method are the following:

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15. S.C Myers "Interactions of Corporate Finance and Investment Decisions - Implication for Capital Budgeting" Journal of Finance, 29:1 March 1974

16. i.e the best product does not always succeed.

17. With at least one exception: within the Canadian tax system, the depreciation allowance is limited when the interest deduction brings the taxable income to zero. Thus there is a relationship between depreciation and interest deductions. It explains why this author did not champion the APVmodel previously when he was a Canadian academic. He no longer has this constraint since the Australian tax system allows unlimited "negative gearing" (at least for the time being).

- The present value of the tax shield can describe very flexible and varying financing terms and conditions: financing costs, penalties, refinancing, acceleration, balloon payments, etc. This flexibility is impossible to simulate with a WACC discount and a bit clumsy in the Motherhood Discount Equity Flow model.
- The shield flows are discounted at the cost of debt: easy to find!
- The present value of the taxed NOI does not require financing in. It can be presented as: “if you don’t borrow, your NPV is that much. If you borrow, then we’ll see how your NPV will be modified...”.
- The taxed NOI are discounted at a rate easier to find than the elusive $k_{e.}$. It can be derived from similar non-leveraged transactions. A useful benchmark could be the hurdle rates selected by property funds, insurance companies, superannuation funds and other institutional investors. At least, compared to the WACC and k_e, the discount rate k_a is constant over the life of the project and its estimation makes more intuitive sense.

3. Does it really work?

Let us test four[18] alternative formulations and compare the results:

1. Discounting the NOI at the after tax WACC[19]

2. Discounting the NOI at the Miles-Ezzel cost of capital

2. Splitting the debt and equity flows (US-sphere motherhood treatment)

4. The Myer’s way

18. We sneak in an additional option: discounting at the Miles-Ezzel WACC. This will be justified below.

19. We cannot rely on the UK-sphere “no Bank, no Queen” model since the other models are measuring Bank and Queen’s effects.

The 4 models are regouped below:

Table 4: The four candidates (no disposition)

1	**After tax WACC**	$$NPV=\sum_{t=1}^{t=n}\frac{(NOI_t-dep_T)(1-T)+dep_t}{(1+WACC_{TB})^T}-V_0$$
2	**Miles-Ezzel WACC**	$$NPV=\sum_{t=1}^{t=n}\frac{(NOI_t-dep_t-k_d.D_t)(1-T)+dep_t+k_d.D_t}{(1+WACC_{ME})^t}-V_o$$
3	**Equity Model**	$$NPV=\sum\frac{[(NOI_t-dep_t-k_d.D_t)\times(1-T)+D_t]-(D_t-D_{t+1})}{(1+k_e)^t}+DEBT-E_0$$
4	**Myers APV**	$$NPV=\sum_{t=1}^{t=n}\frac{NOI_t-dep_t)(1-T)+dep_t}{(1+k_a)^t}+\frac{k_d.D_t.T}{(1+k_d)^t}-V_o$$

Table : The applicable discount rates

1	**Textbook post tax WACC**	$$WACC_{TB}=(1-T).k_d.\frac{D}{V}+k_e.\frac{E}{V}$$
2	**Miles-Ezzell WACC**	$$WACC_{ME}=k_a-k_d.\frac{D}{V}\times T\times\left[\frac{1+k_a}{1+k_d}\right]$$
3	**Equity Model**	Debt flows are discounted at $\mathbf{k_d}$ Equity flows are discounted at $\mathbf{k_e}$
4	**Myers APV**	NOI flows are discounted at $\mathbf{k_a}$ Debt tax shield flows are discounted at $\mathbf{k_d}$

Simulations

This simulation introduces more realistic assumptions than the ones expressed in the previous formula. The case remains very simple, but still realistic enough to to illustrate the effect of our main variables.

The results are based on the following assumptions.

- The net operating income are constants
- The debt is amortized (over 20 years in the case presented here)
- The full capital gains are taxed at the marginal rate but we do not recapture the depreciation

The rest of the required information is summarised below:

Value	$100,000	Debt payment	$6,974.76
Building to value ratio	80%	Initial Equity	$20,000
NOI	$10,000	Reversion value	$120,000
Depreciation rate	2.5%	Outstanding Balance	$67,740.65
Annual depreciation	$2,000	Amortisation	20
Marginal tax rate	40%	Holding period	5
kd	6.0%	Remaining years on D	15
ke	26.4%	Value growth	20%
ka	12%	Capital Gain	$20,000
Debt to value ratio	80.0%	Net disposition	$112,000
Equity to value ratio	20.0%	After tax equity reversion	$44,259

The various flows treated and resulting present values of the four models are illustrated below:

Textbook WACC	Miles-Ezzel	Equity flows at ke	Debt flows at kd	Myers at ka	Myers at kd
6,800.00	6,800.00	1,745.24	6,974.76	6,800.00	1,920.00
6,800.00	6,800.00	1,693.04	6,974.76	6,800.00	1,867.81
6,800.00	6,800.00	1,637.72	6,974.76	6,800.00	1,812.48
6,800.00	6,800.00	1,579.07	6,974.76	6,800.00	1,753.83
118,800.00	118,800.00	45,776.26	74,715.41	118,800.00	1,691.67
		$18,057.43	*$80,000.00*	*$88,064.29*	*$7,648.77*

P 1 2 . 1	P 43 .1	P .43	P 13.

And the final table compares the results with the Myers' APV base case as a percentage of difference between the present value results.

Model	Present Values	% variation from the APV base case
Textbook wacc	*$102,699.51*	7.30%
Miles-Ezzel	*$95,430.16*	-0.30%
ATCF	*$98,057.43*	2.45%
Myers APV	*$95,713.05*	0.00%

Conclusion

The same simulations were performed under various conditions. The results are quite sensitive to hypothesis but fairly consistent in their verdicts. Myers' APV is quite close to the Miles-Ezzel discounted results but quite far from the Textbook WACC. This implies that if you really want to discount your NOI you should use the Miles-Ezzel discount rate and not the WACC. One more reason to forget about the standard UK-sphere WACC.

The residual equity model provides systematically higher values but the relationship with the D/V ratio is not linear. At high rates and low rates of leverage, the residual equity model is very close to Myers' APV.

Thus the results seem to validate Myers' APV "easier" empirical treatment and more intuitive forma.

We would like to naively suggest that the APV should become the new Motherhood technique and eliminate the divergence between the transatlantic (and transpacific) paradigms.

Fat chance.

Appendix

Chicken and eggs

The problem of simultaneity is hidden behind every after-tax and after-debt formulations. Since we need to compute the depreciation and initial mortgage payments, we need to start somewhere (on an hypothetical initial price) in order to find a value. What comes first: the chicken or the egg?

The solution by Burns and Walker (1998) is quite involved and offers a correction only for the depreciation element, when in practice, obviously the mortgage calculation is much more determinant.

A simpler solution should be familiar to the old school US-sphere appraisers: it was proposed, in a different guise, by Inwood at the end of the 19th century. The solution is simply to transform all the information in $1 factors and then apply the resulting factor to the real case.

A simple example (based on the previous case) is illustrated below.

From a net income of 1 $ and a constant multiplier of 10, we find a present value factor of 0.95713 in the APV formulation. This factor encapsulates all the various hypothesis described previously. Then, for any level of NOI (say NOI = $10,000) we apply the same factor and multiplier in order to find the estimated value. Thus we multiply 0.95173 * 10 * $10,000 to obtain a value of $ 95,713 (as expected)

Of course the same trick could be applied for the Equity residual model and for any pattern of income variation as long as the same pattern of variable NOI is the same for the 1$ case than for the real case.

Simple... and cheap.

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