The implied internal rate of return in conventional residual valuations of development sites

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Abstract

Explicit discounted cash flow methods are used in many countries to assess the value of property investments or their likely rate of return given a particular price. These are typically supplemented by simpler models for the purpose of estimating market value and this has led to debate over the merits of different approaches. A parallel situation exists in the case of UK development sites: both cash flow appraisals and simpler residual valuations are used by the real estate industry to assess site values and development viability. Yet traditional residual valuation methods involve making assumptions that are inconsistent with financial theory and this makes it difficult to compare the required returns for such schemes against those used for other investment opportunities. Hence, in this paper, we explore the relationship between the profit and interest allowances used in traditional residual valuation models and the internal rates of return that they appear to imply. This is done with reference to a number of simulated examples of different schemes and the implications for practice are then assessed.

Introduction

Little is understood regarding either the expected or achieved rates of return for property development schemes. This is in contrast to the situation for property investments where the formation of target return rates is relatively well understood (see Crosby et al., 2016) and data on yields from transactions allows expected rates of return to be inferred if they are not disclosed explicitly. Meanwhile, achieved rates of return for investment properties at country, sector and segment level are published by MSCI for many mature property markets based on the holdings of large institutional investors. For development schemes, though, there is little information of this nature. Schemes are fewer in number, more heterogeneous and carried out by a diverse range of participants, many of whom are not formally benchmarked.

In the UK, a study of the financial performance of development schemes by IPD (2010) revealed wide dispersion and high cyclical sensitivity in outturn performance metrics based on a sample of schemes undertaken by institutional investors. This is unsurprising given that returns from real estate development will vary depending on the nature, location and timing of each scheme. However, the study was conducted against a backdrop of not knowing what the rates of return for property development *should* be. Developers expect to receive a return for enterprise and risk, but the way that this return is expressed, both at the beginning and end of a project, varies. Cash mark-ups on cost or value and internal rates of return are frequently used. The variety of possible metrics can make it harder to compare which schemes are more viable or profitable.

A similar issue arises in valuation. Methods vary in how they account for the developer's return. Residual valuations, used in the UK to estimate land value, tend to specify return as a cash sum linked to either the total cost or total value of the proposed scheme. Rules of thumb are applied when specifying the proportion of value or cost set aside as return, but such rules may be insensitive to the scale or time frame involved. If DCF is used instead, this expresses return in the form of a target rate. The issue then becomes that of gauging the appropriate rate. Yet application of DCF can depart from standard corporate finance practice, particularly with regard to how finance is dealt with (Coleman et al., 2012). Some approaches used in practice have involved discounting at a finance rate and including a profit allowance in the cash flow. Almost universally, a contingency allowance is incorporated as a percentage of cost and this is, arguably, no more than additional risk-adjusted return to the developer.

In this context, this paper investigates the relationship between expected profit mark-ups that are commonly used in practice (specifically profit on cost and profit on value) and the internal rate of return (IRR) that such mark-ups appear to imply. This is done by modelling developer returns for a set of hypothetical schemes and scenarios. Published data (on values, costs and other input variables) are used to set parameters for the model inputs, focusing on the ratio between development cost and value, the cost of finance and the duration of the scheme. The aim is to improve understanding of the form, extent and variability of developer returns with particular attention to expected returns implied by appraisals of development land. The paper focuses on the UK real estate development market, but the findings will be relevant for other countries where similar appraisal methods are used or where cash-based performance metrics predominate.

Literature review

There is little theoretical discussion of developer returns in the literature. It might be argued that setting an appropriate target rate should be simply an extension of techniques applied to property investments or other types of capital-intensive project. Corporate finance literature identifies a firm's weighted average cost of capital (WACC) as a major reference point and the Capital Asset Pricing Model (CAPM) as a technique for deriving a target return rate from first principles. The latter involves being able to identify an expected market return rate and how sensitive project cash flows will be to shifts in market return. In practice, though, target return rates for property investments typically are set with reference to a risk free rate and a more qualitative assessment of risk premium for the asset in question (IPF, 2017). These estimates can be cross-checked against the historical performance of real estate markets and assets.

In property development, little is known about the performance of schemes in general, while each specific scheme represents the creation of a new asset with no prior cash flow and with highly individual features around the site, process and intended end product. Nonetheless, Geltner and Miller (2000) stress that, although difficult, estimating a required rate of return is an unavoidable element of all project evaluations and inherent to the process. They suggest a number of possible approaches; use historical return data from listed property development companies, use real option pricing to devise a suitable rate, or use a 'reinterpreted' WACC. For the latter approach, they argue that a development represents a long position in property of the type being developed and a short position in a loan to cover construction costs. They suggest that target rate, $E[r_C]$, should be a function of returns for that property type, $E[r_V]$, returns on lending, $E[r_D]$, and the relationship between finished value (V) and costs (K), referred to as the leverage ratio, LR. Mathematically:

$$E[r_C] = E[r_D] + LR(E[r_V] - E[r_D]) \qquad (1)$$

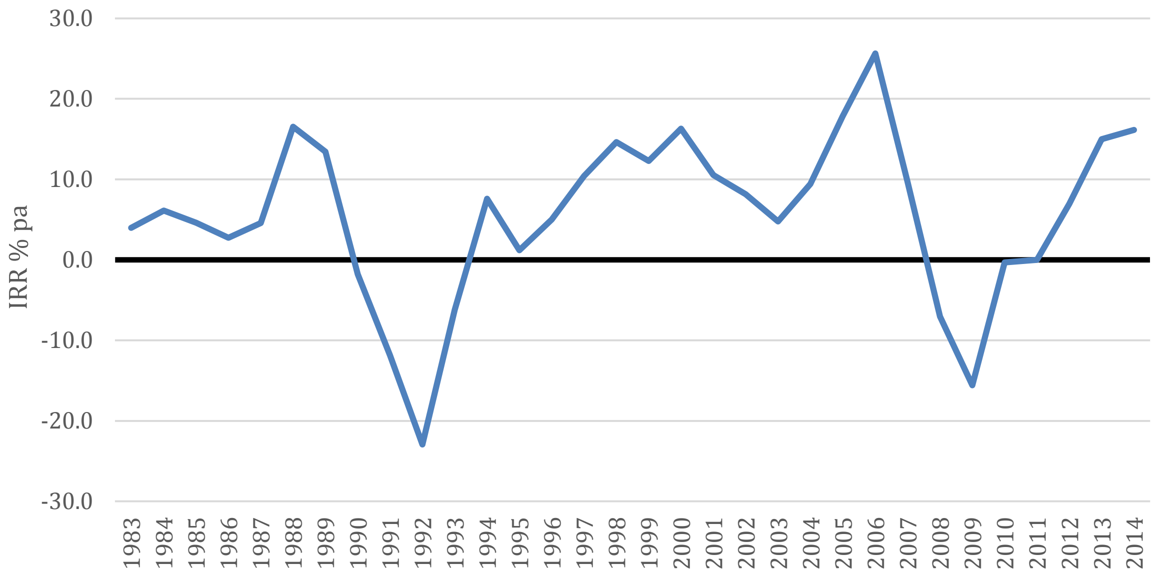
Where LR is the leverage ratio V/(V-K). This is a WACC-style calculation. For example, if V = 4.6m and K = 3.8m then LR = (4.6/0.8) = 5.75, and if $E[r_D]$ = 10% and $E[r_V]$ = 11%:

$$E[r_C] = 0.1 + 5.75 \text{ x } 0.01 = 0.1575 \text{ or } 15.75\%$$

Brown and Matysiak (2000) discuss risk grouping, risk ratios, CAPM, arbitrage pricing theory and WACC as ways of assessing the target return rate. However, it is clear that estimating a required IRR for development opportunities using some of these approaches requires data that typically do not exist or assumptions that are difficult to verify.

Meanwhile, there is very little data on the returns actually achieved by property development schemes. MSCI/IPD has previously published a series of development returns based on mainly commercial property developments carried out by UK institutional investors and REITs which subscribe to the MSCI benchmarking service. There are issues of timing in computing returns for such scheme – for example, when do sites (or existing properties) ripe for (re)development leave the investment "portfolio" and enter the development phase and when do they re-enter the investment portfolio after completion of the scheme? However, Figure 1 charts the reported per annum IRRs from 3,876 UK developments completed between the beginning of 1983 and the end of 2014, an average of 121 schemes per annum. This work concludes that the average IRR was only 5.5% per annum with a median of 6.5% per annum, less than the average total return offered by UK standing investments over the same period.

Figure 1 – Development project IRRs: UK All Property 1983 to 2014



Source: MSCI

In UK practice, when appraising development schemes, many valuers incorporate developer's return as a simple mark-up, either on total development cost or gross development value. In possibly the earliest survey of practice in this field, Marshall and Kennedy (1993) found that 90% of their sample of development companies, financial institutions and advisors used profit on cost as the return metric and 70% did not use a cash-flow technique. This was in 1989 and we might expect to see practice move on markedly since that time. Yet Coleman et al. (2012) examined 19 development viability appraisals published between 2007 and 2011 and found that 17 incorporated profit as a margin on cost or revenue, while only one used the IRR. All of the appraisals incorporated finance costs under the assumption that development costs were 100% debt financed. More recently, the London Borough of Southwark undertook a review of appraisals submitted by developers as part of the planning application process (Southwark LBC, 2014). Only two of 19 appraisals expressed developer's return as a target IRR: in both cases, this was 20% p.a. Sayce, et al (2017) examined some of the latest viability appraisals in London and the development return was not expressed as an IRR in any of the cases.

It is perhaps not surprising as the use of IRRs is not exactly encouraged within the financial viability regime underpinning the UK planning system. They are treated with suspicion by even the more informed local planning authorities such as Islington. In their 2016 Supplementary Planning Guidance they suggest that *"small changes to the development programme and timing of scheme costs and revenues, which may be uncertain at planning stage, can have a large impact on IRR. As such, depending on the quality of information available, the use of an IRR approach when determining development viability as part of the planning process has the potential to be more unstable*". This suspicion stems from instances when instances where *"costs have been assumed to occur at an unrealistically early stage in the programme while income has been received later than would reasonably be expected".* They conclude that this approach is, in some circumstances, "*likely to be less reliable".* This begs the question less reliable than what.

Why is this distinction between IRR and other forms of developer's return important? Property development projects take time, sometimes many years, and a developer's return that is expressed as a simple mark-up cannot reflect the timing of receipt of profit. Therefore, target returns set in this manner might not compensate market participants appropriately for the risks being borne and could lead to incorrect choices between projects. It is hard also to compare returns expressed as a simple cash mark-up with expected returns from investment opportunities in mainstream asset classes, which are quoted typically as per annum return rates. The result is convoluted logic such as "To be successful, a business must deliver a ROCE that exceeds the weighted cost of its capital. The time element means that the longer it takes to recycle the capital, the larger the profit required to deliver the same ROCE" (DCLG, 2007: 22).

Presumably, there are development companies and other stakeholders using cash flow based measures of development return such as the IRR, given their widespread adoption in other investment markets. Indeed, references to IRR metrics in UK trade and professional literature can be found. For example, Great Portland Estates, a major UK REIT, reported an outturn IRR for one of their flagship developments (33 Margaret Street in London) in their 2016 annual report. The ungeared IRR was 23.5% p.a. for the six-year scheme, representing a profit on cost of 137%. Great Portland Estates' reported KPI for such projects at that time was an ungeared IRR of 18% p.a. and a profit on cost of 27.1%.

A 2015 *Property Week* supplement on student accommodation included the quote "I would say 24 months ago they were looking at 20% IRR on a student development. [Now] I think they're going to need to be comfortable with a 15% IRR…"[1] Similarly, the Investment Property Forum (IPF, 2015) presented a 'risk-adjusted returns framework' for large scale residential investment and development, which was, essentially, a set of estimated IRRs for the types of activity associated with different market participants. Housebuilders undertaking development with planning risk were said to seek IRRs of 20% p.a. and these dropped to 15% p.a. for schemes without planning risk. Developer/investors constructing and then retaining a scheme long-term were reported to seek IRRs of 10-12% p.a., while investors looking to invest in existing (i.e. developed) buildings sought 8% p.a.

Former property consultants DTZ used IRRs in UK development appraisals and these suggest a range between 10% and 25% p.a. depending on the nature of the scheme. Between 2008 and 2010, area-wide development appraisals undertaken by DTZ included IRR targets as the benchmark (i.e. land value was an input). Property consultants Gerald Eve have also used IRRs in their area-wide development appraisals. In 2013, they produced an appraisal for the City of London and adopted IRR benchmarks of 14% p.a. for their current value model and 18% p.a. for

[1] Property Week Student Accommodation supplement 'Here comes the money', 27 November 2015, p19

their growth model. In both this case and the DTZ cases, the basis for determining the IRRs used is not disclosed.

In other cases, valuers undertaking development viability appraisals have used Argus Developer and reported IRRs alongside other measures of return. In 2009, GVA produced a Strategic Housing Land Availability Assessment for Wyre Forest District Council using residual cash flows to appraise a range of sites subject to a standard set of assumptions regarding building, ancillary and abnormal costs, fees and contingency allowance. Developer's profit was assumed to be 20% of costs, including debt finance. The main appraisal output was residual land value, but IRRs were also reported.[2] These ranged from 15% p.a. to 80% p.a., most likely as a result of the different development periods: bigger schemes took longer and so, given a standard mark-up, the IRR was lower.

Roger Tym and Partners (2013) undertook a series of viability appraisals of hypothetical retail developments in the UK. The results from these are summarised in Table 1. Although schemes A and C were similar in size, value and cost, the IRRs were very different, as they were for B and D. It is only on close inspection of the appraisal transcripts that the reason for this is revealed; a substantial letting void was assumed for A and B, though no mention of this appears in the viability report.

Table 1: IRRs implied by viability appraisals for hypothetical retail schemes

	Type	Size (m2)	NDV (£)	Total costs (£)	Profit (£)	Profit on cost (%)	IRR	Letting void finance cost (£)
A	Comparison	1,000	2,861,161	2,384,300	476,861	20%	19.54%	154,690
B	Comparison	200	663,789	553,158	110,632	20%	19.67%	35,778
C	Convenience	1,000	3,123,555	2,602,963	520,593	20%	38.43%	0
D	Convenience	215	639,585	532,988	106,598	20%	40.14%	0

Source: Roger Tym and Partners (2013)

This example exposes the dangers of relying on a profit-on-cost measure of developer's return. Including a letting void increases costs, but as developer's profit is calculated as a percentage of those costs, there is no obvious penalty (or risk) associated with it. Instead, land value is reduced and the landowner is penalized, while the implied IRR for the developer falls owing to the delay in receiving revenue that is associated with the void. If the developer manages to let the space in schemes A and B on completion, then the IRRs would increase to become similar to those for C and D. Clearly, a letting void is a development risk and the developer should bear it. Target IRRs might be then adjusted to reflect the additional void risk associated with A and B, but this would suggest that they should be higher and not lower than those for C and D.

In planning appeal cases, where one or both parties have used valuation software, implicit IRRs have been revealed. For example, in 2010 DTZ appraised a 150 dwelling development site at the Holsworthy Showground in Devon and assumed a profit on value of 18% (21.95% on costs). The Argus-generated IRR was 32%. Alder King also appraised this site but assumed a 20% profit on value (25% on costs). Their resultant IRR was 43%.

[2] These can be estimated by software such as Argus Developer based on the land value result and the revenues and costs used to estimate that value, in a similar manner to the approach outlined below.

Contrastingly, in 2009, in a planning appeal relating to land in Innsworth, Gloucester,[3] the valuer acting for the local planning authority used the IRR as the profit metric in his appraisal. The appraisal itself is not publicly available but, in his decision, the inspector discussed the use of IRR:

> *"The IRR approach … has no practical application in circumstances where the investor has no reliable information about the two key items of information, which are time and money. The Appellant has done his best to estimate the amount of, and time at which, money will be spent and the time and rate of income which will be derived. But these are estimates, provided in good faith but subject to a wide range of unknown variables. The effect of this is that the IRR is simply inapplicable in this case. If it were an appropriate tool then the industry would use it. The industry, plainly, does not use it."* (Paragraph 111)

In 2012, DVS[4] reviewed Savills' appraisal of the Heygate site in South London and criticised their use of a profit on cost metric. The scheme was huge: approximately 2,400 units over a 13-year development period. DVS recommended an IRR approach and suggested that a range of 15% to 20% p.a. for IRR is 'often quoted'.

In 2014, Gerald Eve adopted a target IRR of 20% for an appraisal of a large residential development site in London (Mount Pleasant Delivery and Sorting Office) comprising 681 dwellings and estimated to take six years to develop. Reviewing this appraisal, DVS adopted two IRRs – 14% for a non-growth (i.e. present-day values scenario) and 18% for a growth scenario. Contesting Gerald Eve's appraisal, BPS Chartered Surveyors favoured the more conventional profit-on-cost approach (24% on private market dwellings blended with 8% on affordable housing). BPS's argument for doing so was that such a long development period 'favours' the IRR metric. BPS provided an illustration where a 19.6% IRR for the scheme generates a 28% profit on cost (p19). They also argued that an IRR cannot differentiate between target returns on the various components of a scheme; in this case, private and affordable housing, which, conventionally, attract markedly different profit-on-cost ratios.

The variation in practice illustrated by these examples, the range in IRRs used or implied in such cases, and the often opaque handling of developer returns, raises two methodological questions when it comes to development appraisal. First, what does the use of a particular cash margin (profit on cost or value) imply about the rate of return that a developer is expected to make from different development opportunities? Second, do the rates of return implied by the use of cash margins exhibit logical relationships with the timescales, costs and risks present in different scenarios? These questions are addressed in the remainder of this paper through theoretical modelling of developer returns. This is with the broader purpose of reflecting on what is an 'appropriate' developer return in different situations.

Method

The traditional residual valuation model as applied in UK practice takes inputs for the value of a completed scheme, the estimated costs of constructing that scheme, and other costs, and uses these inputs to estimate either the profit a developer will make when the land price is known or the value of a piece of land given an assumption about the profit a developer should seek. In this paper, the focus is the second of these alternatives. When estimating land value, the developer's profit is expressed as a simple mark-up, but this could represent very different IRRs dependent on variables such as the development period and the scale of costs relative to revenues. This

[3] APP/G1630/A/09/2097181.

[4] DVS, or District Valuer Services, are part of the Valuation Office Agency, a government agency, and they provide valuation services to UK public sector organisations.

paper recasts a number of residual appraisals in cash flow form, testing a variety of inputs to explore the range of IRRs that result.

A simple residual valuation of a development site is illustrated below. As noted by Coleman et al. (2012), some steps in this method vary from project appraisal practices advocated in corporate finance. The assumed development value (on completion) is £2m, construction costs are £1m and the development period is two years. The model typically assumes that development costs are 100% debt financed at 5% p.a. and, to reflect incremental drawdown of construction costs during building phase, a simplifying assumption is made that these costs are incurred halfway through the development period. This means that interest is compounded over one year on the construction costs. The developer's profit is assumed to be 15% of all development costs (building, finance and land costs). Using all this information, the method produces a land value estimate of £413,223.

Development value	£2,000,000
Development costs:	
Construction costs	-£1,000,000
Finance on construction costs for half development period @ 5% p.a.	-£50,000
Developer's profit on construction and finance costs @ 15%	-£157,500
Residual balance	£792,500
Developer's profit on land cost @ 15%	-£103,370
Finance on land for total development period @ 5% p.a.	-£64,068
Residual land value	**£625,062**

It is assumed that the development value is realised at the end of the development period, while, as noted, construction costs are assumed to occur at the halfway point. The residual method compounds interest on these costs in order to estimate the liability that must be paid off when the scheme is complete. So the residual balance represents an amount available for land purchase as at the end of the development period; a sum that must cover land acquisition costs, finance costs and allowance for profit on land costs. This explains the approach taken in the final few rows of the calculation, which involves discounting the post-profit residual balance back to the present.

To recast this as a project cash flow, only three figures are needed: land cost, construction cost and development value. No assumption is required as to the eventual mix of funding, although flows to debt and equity could be computed if such an assumption is made (see appendix). The cash flow is shown below. The IRR for this cash flow represents the expected return rate for the project itself as implied by the residual method. The rate of return on the developer's equity could be higher if debt is used, but it is contingent on how much is borrowed and at what rate. It is unlikely that a bank would lend 100% of development costs in practice despite this being a standard assumption in the traditional residual approach.

	YEAR 0	**YEAR 1**	**YEAR 2**
Development value			2,000,000
Development costs	-625,062	-1,000,000	
Project cash flow	-625,062	-1,000,000	2,000,000

Profit as a percentage of costs rises to 23% because finance costs are no longer included in the denominator. The pre-finance IRR is 16% p.a., lower than the revised profit-on-cost ratio as it reflects the time value of money. Yet it is (slightly) higher than the original 15% profit-on-cost figure because it does not include finance costs in its calculation, i.e. the denominator in the conventional profit on costs calculation is bigger owing to the additional finance costs.

To compute the IRR implied by different residual valuations, it might be assumed that a trial and error approach is necessary, with each cash flow being unique and specific to the scenario being considered. However, for many basic residual valuations, an analytical solution is possible, since there are only three time points and two time intervals involved. A discussion of this analytical solution allows the key factors affecting the implied IRR to be identified. Typically, there is an initial outflow (land) assumed at time 0, a subsequent outflow (construction) at time 1 and then a final inflow (revenue) at time 2. The relationship between the three is shown in equation 2.

$$\mathrm{R} = \mathrm{L}(1 + \mathrm{r})^2 + \mathrm{C}(1 + \mathrm{r}) \tag{2}$$

Where R = revenue, L = land cost, C = construction cost and r = the internal rate of return that reconciles the timing of the inflows and outflows. Equation 2 shows that return must be earned over two time intervals for the capital invested in land and one interval for the capital invested in construction. Figures for R, L and C can be extracted from the residual valuation, but the rate of return is unknown. In order to solve for r, equation 2 can be rewritten, which shows that the problem has the form of a quadratic equation:

$$\mathrm{L}(1 + \mathrm{r})^2 + \mathrm{C}(1 + \mathrm{r}) - \mathrm{R} = 0 \tag{3}$$

The standard formula for solving quadratic equations could be employed at this point and there will be two possible solutions for (1 + r) in most cases, although only one of these is likely to be plausible in terms of representing the IRR. Note, though, that IRR is affected not so much by the absolute figures for L, C and R as by the relativities between them. So the IRR would be the same when, say, land cost is £4 million, construction is £5 million and revenue is £10 million as when land, construction and revenue are £8 million, £10 million and £20 million, respectively. Hence, we define p as the ratio between construction costs and land costs, and q as the ratio between revenues and land costs. Dividing through each term in equation 3 by L yields:

$$(1 + \mathrm{r})^2 + \mathrm{p}(1 + \mathrm{r}) - \mathrm{q} = 0 \tag{4}$$

In its present form, we cannot rearrange this formula to solve for (1 + r). However, this dilemma can be resolved if we add a new term to both the left and right hand sides of equation 4 that enables the left hand side to be rewritten as a single squared expression. So, moving q to the right hand side and adding the square of p ÷ 2 to each side produces the following formula:

$$(1 + \mathrm{r})^2 + \mathrm{p}(1 + \mathrm{r}) + (\mathrm{p} \div 2)^2 = \mathrm{q} + (\mathrm{p} \div 2)^2 \tag{5}$$

Equation 5 can then be rewritten as follows:

$$((1 + \mathrm{r}) + (\mathrm{p} \div 2))^2 = \mathrm{q} + (\mathrm{p} \div 2)^2 \tag{6}$$

By taking the square root of each side and subtracting (p ÷ 2), the term (1 + r) is successfully isolated and can be solved as a function of p and q:

$$(1 + \mathrm{r}) = \pm \sqrt[2]{\mathrm{q} + (\mathrm{p} \div 2)^2} - (\mathrm{p} \div 2) \tag{7}$$

Using the example above where the land cost was £625,062, construction costs were £1 million and revenue was £2 million, p = 1.6, q = 3.2 and so r = 15.96% per period, based on the positive root for equation 7. This result can be taken as the per annum IRR given that the development period happens to be two years. However, what if the development took one, three or any other number of years to be built? Provided that the construction costs fall halfway through the build period, there is no need to alter this approach, but the final answer must be rescaled so that it can be compared across projects or scenarios of different length. This can be done through the following formula:

$$(1 + \mathrm{r})^{(1/0.5\mathrm{t})} - 1 = \mathrm{IRR\ p.a.} \tag{8}$$

The key input variables are: development value, construction cost, development period, developer's profit/return, and finance rate. These will be modelled in the basic residual model to determine a range of land values. These land values are then input into a residual cash flow model to determine the corresponding IRRs. The modelled input parameters are shown in table 2. Two output IRRs are computed; an ungeared (project) IRR and a geared (equity) IRR. The latter assumes a loan-to-cost ratio of 60%.

Table 2: Input parameters

Input	Base case	Parameters	Increment size	Number of increments
Construction cost as % of development value	50%	25%-75%	25%	3
Finance rate (% p.a.)	5%	6%-7%	1%	3
Development period	2 years	1-6 years	1 year	6
Developer's profit (% costs)	15%	15%-25%	5%	3

Findings

Tables 3 and 4 show ungeared (project) and geared (equity) per annum IRRs respectively for the range of input parameters specified in Table 2.

Looking at Table 3 first, the two main drivers of variation between a simple profit on cost and the project IRR are the length of time a development takes and the ratio of costs to value, while finance rates have very little impact. The development period has the most impact on the IRR when tested against a fixed return on cost ratio. The longer the period the higher the interest charges in the residual model and the lower the residual land value. A reduced land value will reduce the initial costs of the scheme, but this is more than offset by the normal discounting process, which discounts future flows, especially at high discount rates, so as the development period gets longer the IRRs reduce. The project IRR most closely mimics the profit on cost for schemes of around two to three years; shorter schemes have higher IRRs than the profit on cost measure and longer schemes produce lower IRRs.

As the ratio between construction costs and development value gets higher, so does the IRR because, relatively, the initial outlay on land is getting lower. As land value becomes a larger share of the development cost, the IRR reduces because there is more cost incurred at the start of the development period.

These patterns help to corroborate, if not explain, the low average achieved IRR for the MSCI sample of UK development schemes discussed earlier. If institutional investors in general tend to participate in larger and longer development projects that are sited in higher value locations, then this is consistent with the relatively low return rates suggested in certain parts of Table 3. However, it is not clear how institutional investors are setting their return expectations at the start of such schemes, whether the achieved return rates are consistent with those expectations and whether lower per annum target rates of return would be rational in such situations. These questions require further investigation. For example, deeper analysis of the MSCI development returns data is necessary to see precisely what impact the length of developments had on their outcome.

Table 3: Ungeared (project) IRRs

		Developer's profit on cost - 15%						Developer's profit on cost - 20%						Developer's profit on cost - 25%					
		Development period (years):						Development period (years):						Development period (years):					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Construction cost as % of development value - 25%																			
Finance rate (% p.a.)	**5%**	24%	14%	11%	9%	9%	8%	30%	17%	13%	11%	10%	9%	37%	20%	15%	12%	11%	10%
	6%	25%	15%	12%	10%	10%	9%	31%	18%	14%	12%	11%	10%	38%	21%	16%	13%	12%	11%
	7%	26%	16%	13%	12%	11%	10%	33%	19%	15%	13%	12%	11%	39%	22%	17%	14%	13%	12%
Construction cost as % of development value - 50%																			
Finance rate (% p.a.)	**5%**	27%	16%	12%	10%	9%	9%	36%	20%	15%	12%	11%	10%	45%	24%	17%	14%	12%	11%
	6%	29%	17%	13%	12%	10%	10%	38%	21%	16%	13%	12%	11%	47%	25%	18%	15%	14%	12%
	7%	30%	18%	15%	13%	12%	11%	39%	22%	17%	14%	13%	12%	48%	26%	20%	17%	15%	14%
Construction cost as % of development value - 75%																			
Finance rate (% p.a.)	**5%**	35%	19%	14%	12%	11%	10%	47%	25%	18%	15%	*	*	61%	31%	*	*	*	*
	6%	36%	20%	16%	13%	12%	*	49%	26%	19%	*	*	*	63%	32%	*	*	*	*
	7%	38%	22%	17%	15%	13%	*	50%	28%	21%	*	*	*	65%	*	*	*	*	*

* Negative residual land value

Table 4: Geared (equity) IRRs

		Developer's profit on cost - 15%						Developer's profit on cost - 20%						Developer's profit on cost - 25%					
		Development period (years):						**Development period (years):**						**Development period (years):**					
		1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
Construction cost as % of development value - 25%																			
Finance rate (% p.a.)	**5%**	52%	26%	19%	15%	13%	12%	68%	33%	23%	18%	16%	14%	85%	40%	27%	21%	18%	16%
	6%	53%	28%	20%	16%	14%	13%	70%	34%	24%	20%	17%	15%	87%	41%	28%	22%	19%	17%
	7%	55%	29%	21%	18%	15%	14%	72%	36%	26%	21%	18%	16%	89%	42%	30%	24%	20%	18%
Construction cost as % of development value - 50%																			
Finance rate (% p.a.)	**5%**	64%	31%	22%	18%	15%	14%	86%	40%	28%	22%	18%	16%	110%	49%	33%	26%	21%	19%
	6%	65%	33%	23%	19%	16%	15%	88%	42%	29%	23%	20%	17%	112%	51%	35%	27%	23%	20%
	7%	67%	34%	25%	20%	18%	16%	90%	43%	30%	24%	21%	19%	115%	52%	36%	29%	24%	22%
Construction cost as % of development value - 75%																			
Finance rate (% p.a.)	**5%**	84%	40%	28%	22%	19%	17%	121%	54%	36%	28%	*	*	165%	69%	*	*	*	*
	6%	87%	42%	29%	24%	20%	*	123%	56%	38%	*	*	*	169%	72%	*	*	*	*
	7%	89%	43%	31%	25%	23%	*	126%	58%	40%	*	*	*	173%	*	*	*	*	*

* Negative residual land value

When finance rates increase, the IRR in Table 3 increases as well because a higher anticipated finance rate translates into a higher cost in the residual model, resulting in a lower site value and, presumably, a lower bid for the land as a consequence. As finance plays no part in the cash flow model, the project IRR then increases because the same cash flow is based on a slightly lower initial land input: within this analysis, that increase is virtually one-for-one across all of the permutations. This result might seem strange, but it is consistent with developers seeking higher returns from schemes in markets where the opportunity cost of capital is greater.

In practical terms, the 100% debt finance assumption in the residual model is not realistic. The reality is that developers may well debt finance at least some of the costs, including site acquisition, and a higher IRR on the remaining equity would be required as a result, with this increasing as the level of gearing increases. In the project cash flow, the effects of finance are (and should be) ignored, but this leaves the question of what the residual method implies about the rates of return received by developers once realistic assumptions about project gearing are applied.

Therefore, the analysis above is extended by assuming that the project expected costs in each and every scenario are split between developer (equity) and lender (debt), with a 60% loan-to-cost ratio used so that costs are split 60/40 between lender and developer, while the assumed finance rate determines interest payments to the lender. The IRR is then recalculated for the equity cash flow in each case in order to test the possible effects on equity rates of return from varying timescales, costs, finance rates and profit assumptions. The results of this analysis are set out in Table 4. The equity IRRs are higher than the corresponding project IRRs, as expected. In fact, the 60% loan-to-cost ratio approximately doubles the project IRR.

The impact of gearing on both absolute and relative increases in IRR is the same: the longer the scheme the less the impact. A one-year scheme has a very high project IRR relative to the profit on costs and this increases dramatically when calculated as an equity IRR on a 60% loan-to-cost ratio. For example, at a developer's profit at 20% of costs, finance at 5% and a 50% cost-to-value ratio, the project IRR over one year increases from 36% to an equity IRR of 86%. On a six-year scheme it increases from 10% to 16%. Nonetheless, the basic conclusions about the impact of timescale and of the cost/value relationship on implied per annum return rates given the use of standard profit metrics remain the same.

Conclusions

The literature review suggests that expected returns for property development projects are more opaque than those for investment properties and owe more to rules of thumb than any serious analysis. Measured development return data is hard to come by and, where it is available, tends to suggest that developments have produced very low IRRs. Case studies of individual schemes have become more plentiful in the UK due to the relatively new requirement to assess development viability in the English planning system and policy requirements act against the use and therefore publication of IRRs for development, preferring the use of simple profit on cost or value measures.

This preliminary analysis accepts the academic literature that project IRR is a more rational developer return metric as it accounts for the time value of money. We have therefore modelled IRRs against the land values and costs generated by a simple residual model. The basic findings are set out in the previous section but the most obvious one is that the IRRs vary through time by significant amounts despite there being no evidence that practice varies simple profit on cost measures for different length of projects. The expected IRRs are extremely volatile for short-term projects but they stabilize over time, again as would be expected. High land values (where development costs are a low percentage of development values) result in lower IRRs.

As indicated above this analysis is preliminary and raises many questions. The approach to the analysis was to first hold the developer's return constant and identify land value from the residual model. The revenues, land cost and construction cost from the residual model were then fed into a cash flow model, from which expected IRRs were identified and compared. Some inputs to the residual model were then varied, which amended land value and impacted on the implied cash flow and IRR in turn. This may appear to be a somewhat circular process, but the point is to identify what target return rate would be needed in a cash flow model to generate the same residual land value. The question then is whether the patterns implied by the results are rational and whether the simple residual can pick up any of the nuances in required return rate that ought to exist between different types and lengths of project.[5]

Other questions remain about the choice of target rates for development projects, which we have not addressed. For example, is the use of cash flow analysis and target return rates for assessing land value more widespread than public domain examples and literature suggest? What are the target rates of return that developers are using in practice? Should IRRs vary for different parts of a development project, for example for land and construction, or for private versus social/ affordable housing within residential developments? Should the cash flow be growth explicit and what impact does this have on target rates (nominal versus real)?

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[5] An alternative approach might have been to model the profit-on-cost input into a simple residual to obtain a consistent IRR across project types.

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Appendix: Introducing debt/equity finance

Period (quarter):	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Project cash flow:	413,223				1,000,000				2,000,000
Senior loan (drawn down at 60% of cash-flow):									
Opening balance		247,934	253,912	260,035	266,306	872,727	893,772	915,324	937,396
Interest		5,979	6,123	6,270	6,422	21,045	21,552	22,072	22,604
Closing balance	247,934	253,912	260,035	266,306	872,727	893,772	915,324	937,396	960,000
Equity (input at 40% of cash-flow):									
Equity cash flow	165,289				400,000				1,040,000
Profit as a % all costs									**31%**
Profit as a % developer's equity (return on equity)									**84%**
Equity IRR									**58%**

The equity cash flow profit-on-cost (31%) is lower than the project cash flow profit-on-cost (42%) because finance costs are now included, but higher than the basic residual profit-on-cost (25%) because it's not 100% debt financed. Profit as a percentage of equity is high because it reflects gearing but not time value of money.

The equity IRR is the geared return on developer's equity. With 0% gearing the profit-on-cost and the IRR are the same for the project cash flow and equity cash flow (i.e. 42% and 30% respectively in this case) because no finance is included in either cash flow. As more and more debt is introduced the equity cash flow profit-on-cost falls (due to increased finance costs) but profit-on-equity and the equity IRR increase due to the gearing effect.