Chapter 5
Property Investment Valuation

5.1 Introduction

Around half of all commercial and industrial properties in the UK are held as investments, where the ownership interest is separate from the occupation interest. The landlord leases the property to an occupying tenant or tenants. Investors in UK commercial property include large financial institutions such as pension funds and insurance companies (28%), overseas investors (15%), UK listed property companies (14%), UK private property companies (15%), limited partnerships, landed estates, charities, trusts, unitised and pooled funds and private investors (23%) (IPF, 2005). The majority of commercial property investments can be placed in one of three principal sectors: retail (shopping centres, retail warehouses, standard shops, supermarkets and department stores), offices (standard offices and business parks); and industrial (standard industrial estates and distribution warehousing). Investment market sub-sectors are often defined using a combination of this sector classification and their location, 'City of London offices' or 'south west high street retail', for example. There are also several smaller sectors of the property market that attract investment interest such as leisure parks, restaurants, pubs and hotels.

Property that is typically held as an investment is valued with this purpose in mind; the valuer will capitalise the rental income produced by the property at an appropriate investment yield using the investment method of valuation, as we saw in Chapter 3. The underlying principle is to discount net economic benefits from an investment over its predicted life at a specified rate of return or **discount rate**. Chapter 2 described discounting as the process of finding the present value (PV) of expected net benefits that may be in the form of a regular income, a future capital reversion or a combination of the two (Havard, 2000). The all-risks yield (ARY) technique described in Chapter 3 is based on the assumption that there is a relationship between the price paid (capital value) and the annual return (net rental income). This chapter develops this notion more explicitly and describes a technique for valuing a property investment that involves more direct recourse to the underlying cash-flow characteristics of the investment. Before that, though, a history lesson.

Up until the 1960s landlords who wished to lease commercial properties typically did so using long leases with no rent reviews. Investment in these commercial premises was regarded as low risk. Consequently the required (or target) rate of return was closely linked to similar low-risk investments such as gilts. Conventionally a premium of around 1–2% was added to the redemption yield on long-dated gilts to account for property market risk. Long-dated gilts were used as a benchmark because property was regarded as a long-term investment. Valuation of property investments involved analysing comparable evidence to determine the appropriate yield which was, in fact, mathematically and logically equivalent to the target rate of return (TRR) (Baum and Crosby, 1995). No adjustment was made to either the yield or the rent to reflect income or capital growth because there was none. A typical investment valuation prior to the 1960s is shown below.

Market rent (MR)(£)	10 000	
Years' purchase (YP) perpetuity @ 10%[a]	10	
Valuation (£)		£100 000

[a]Investor's target return and therefore comparable with other investments.

After the 1960s, and a period of limited supply of new commercial and industrial property and restrictive macroeconomic policy, commercial property rents increased significantly and landlords introduced rent reviews into shortening leases so that they did not miss out on rising rents. Property became a growth investment, more like equities than fixed interest bond investments, albeit with a peculiar income pattern that goes up (usually) every 5 years (Havard, 2000). Investors were prepared to accept a lower return at the start of the investment term in expectation of higher returns later on. Property investment valuation techniques handled this change not by explicitly forecasting rental growth but by capitalising the current rent at an ARY (derived from comparable evidence) that is lower than the TRR because it implies future rental income and capital growth expectations. The gap between the two represented the expected or implied rental growth hidden in the valuation – directly analogous to the concept of a reverse yield gap between equities and bonds (Baum and Crosby, 1995). Consequently, the assumed static cash-flow is not the expected cash-flow, the yield is not the target rate and is not comparable to target or discount rates used to capitalise or value income from other investments. A typical investment valuation after the 1960s is shown below.

MR (£)	10 000	
YP perpetuity @ 8%[a]	12.5	
Valuation (£)		£125 000

[a]Growth implicit ARY, not the target rate and therefore not comparable with other investments.

From Chapter 3 we know that the ARY investment valuation technique relies on comparison to justify adjustments to initial yields obtained from comparable investment transactions. These adjustments account for all factors that influence investment value except those that can be handled by altering the rent such as regular/annual management and maintenance expenditure. The most important investment characteristics that need to be reflected in the ARY are income and capital risk and growth potential, but influencing these characteristics are a multitude of economic and property-specific factors including macroeconomic conditions, property market and subsector activity, the financial standing of individual tenants, property depreciation and changes in planning, taxation, landlord and tenant legislation. The ARY has to implicitly quantify these factors and the all-encompassing nature of the ARY means that capital value is very sensitive to small adjustments. In essence, a single divisor (ARY) or multiplier (YP) conceals many of the assumptions regarding choice of TRR (which includes risk) and income and capital growth expectations.

Nevertheless, the ARY approach is practical and appropriate where there is a plentiful supply of comparable market transactions providing evidence of yields, rents and capital values. But there are circumstances when it is particularly difficult to use the ARY technique to value a property investment. Problems arise when, first, comparable evidence is scarce, either because market activity is slow or the property is infrequently traded, and second, where there is greater variability in investments, meaning more variables must be accounted for in the ARY. Regarding this latter point, we saw in Chapter 4 how flexi-lease terms are creating greater diversity in property investment cash-flows, often with gaps in rental income. But, in addition to that, non-prime properties are generally more variable in terms of location, physical quality, condition or covenant and are therefore more risky. And problems arise where the property is more complicated than a simple rack-rented investment: the ARY technique is inappropriate for valuing property that is over-rented, let on short leases or produces varying rental income streams from multiple tenants. It can be especially difficult to quantify all of these factors in an ARY when comparable evidence is scarce.

Harvard (2000) notes that increasing diversity in the property investment market has undermined the ARY valuation technique because it relies heavily on comparison between relatively homogeneous investment assets and simple adjustments to comparable evidence. As a result, property investment valuation techniques have emerged that focus more explicitly on the TRR that an investor requires, the expected flow of income, expenditure and capital growth that might be expected from an investment. The discounted cash-flow (DCF) technique uses an established financial modelling technique that allows comparison between property and other forms of investment. Where information is scarce, or when an unusual property is being valued, the DCF technique assists in the consideration of income and capital growth, depreciation, timing of income receipts and expenditure payments and the TRR. Indeed, International Valuation Standards now include guidance on the use of DCF analysis for valuation in *GN9 – Discounted Cash Flow Analysis for Market and Non-market Based Valuations* (IVSC, 2005). The guidance describes how DCF analysis involves the projection of a cash-flow for an operational or development property. This projected cash-flow is discounted at an appropriate market-derived discount rate to establish PV. In the case of standing investment properties, the cash-flow is typically a series of periodic net rental incomes (gross income less expenditure) along with an estimate of reversion value anticipated at end of the projection period. In the case of development properties' estimates of capital outlay, development costs and anticipated sales income produce a net cash-flow that is discounted over the projected development and marketing periods (cash-flows from property development will be covered in the Chapter 6). The guidance note discusses the structure and components of DCF models and the reporting requirements for valuations based on DCF analysis.

5.2 A DCF valuation model

The academic case for valuing property investments by capitalising a DCF at a TRR rather than capitalising an initial income estimate at an ARY derived from comparable evidence began in the late 1960s and continues to this day. Appendix 5A (see Appendix 5A at www.blackwellpublishing.com/wyatt) lists references to papers that make this case in detail, culminating in the seminal UK text book in this field by Baum and Crosby (1995). But whatever valuation technique is employed, it must reflect the behaviour of market participants. Recourse to comparable evidence (which is generated by market transactions) whenever possible and the adoption of pricing models that are used by market participants will undoubtedly be the most reliable and consistent way of estimating market price.

The ARY technique relies on analysis of prices and rents achieved on recent comparable transactions to estimate an ARY for the subject property. The growth-implicit ARY is then used to capitalise an initial estimate of the cash flow. The DCF technique capitalises or, in the language of investment mathematics, discounts the actual or estimated cash-flow at the investor's TRR. The DCF technique requires explicit assumptions, based on evidence, to be made regarding several factors but most importantly the TRR (which should cover the opportunity cost of investment capital plus perceived risk) and expected rental income growth. When a valuer capitalises an initial rent at an ARY of, say, 8% it is done so in the knowledge that the investor is anticipating a return in excess of 8% over the period of ownership as the expectation is that rental income and perhaps capital value will increase. Essentially, the DCF technique removes the growth element from the ARY and puts it in the cash-flow. As a result, it re-establishes the relationship between the TRR required from a property investment and those required from other investments, as was the case before the 1960s when rental growth was negligible. Instead of simply capitalising the current income (actual or estimated) at an ARY, the expected cash-flow, projected over a certain period of time at a rental growth rate, is discounted at a TRR.

Of course, as we shall see, the DCF technique is not a panacea and several criticisms can be levelled at it. The selection of the discount rate or TRR is subjective and the Appraisal Institute (2001) argues that it is difficult to find market-supported estimates for the key variables in the cash-flow. It might be necessary to estimate current market rent (MR) and expected changes over the next few years. It might also be necessary to try and predict what will happen when the tenant has an option to break or when the lease needs renewing. The variation in possible lease incentives that might be offered, length of possible voids and expenditure that might be incurred is considerable. Moreover, because the DCF technique separates the value significant factors as distinct inputs into the cash-flow and even separates the discount rate into a TRR and an exit yield, the risk of double-counting the effect on value of these factors is high.

5.2.1 *Constructing a DCF valuation model*

The relationship between the growth-implicit ARY and the growth-explicit DCF techniques can be represented by a simple equation:

$$y = r - g \qquad [5.1]$$

where y is the ARY, r is the investor's target return and g is the annual rental growth rate.

The left side of the equation represents the growth-implicit ARY technique and the right side represents a growth-explicit DCF technique. The DCF technique separates the ARY into two elements; a rental income growth rate and a TRR; in other words, the ARY implies the rental growth that the investor expects in order to achieve the TRR. An investor accepting a relatively low initial yield from a property investment when higher yields might be available from fixed interest investments implies an expectation of future income growth. For example, an investor with a target rate of 15% who purchases a property investment for a price that reflects an initial yield of 10% would require a 5% annual growth to achieve the target rate. This simple relationship is made more complex in the UK property market because income from property investments (in the form of rent) is normally reviewed every 5 years. This means that a slightly higher annual growth rate will be required to meet the investor's annual TRR. Provided the growth rate, target return and rent review period in the DCF approach are mathematically consistent with the yield adopted in the ARY approach, the valuation will be the same. The following explains why.

Starting with the ARY approach, the present (capital) value, V of an income stream from a rack-rented freehold property investment is the pv PV £1 pa or YP (see Equation 2.18 in Chapter 2) multiplied by the annual income or MR:

$$V = \text{MR}\,\frac{1-\left(1/(1+y)^n\right)}{y} \qquad [5.2]$$

where y is the growth-implicit ARY and n is the number of years for which the rent is received. If the rent is receivable in perpetuity, that is, freehold property investment, the above formula simplifies to Equation 2.23 from Chapter 2:

$$V = \frac{\text{MR}}{y}$$

In other words, the PV is equivalent to a constant annual income capitalised at (divided by) the ARY. In the case of the DCF technique, the income stream is discounted at the investor's TRR, *r*, rather than the ARY. So the PV of a rack-rented freehold property investment which consists of a constant (i.e. non-growth) annual MR receivable in perpetuity annually in arrears can be expressed as follows:

$$V = \frac{\text{MR}}{r} \quad [5.3]$$

But because the DCF technique is explicit about income growth we now need to introduce rental income growth, *g*, into this valuation model. Let us assume rent is receivable in perpetuity and there are annual rent reviews at which the rent is increased at the estimated long-term average annual rental growth rate, *g*. Assuming *r, g*, rental growth can be incorporated as follows:

$$V = \frac{\text{MR}}{r-g} \quad [5.4]$$

But for most property investments rent does not grow each year. If non-annual rental growth is now introduced, the following equation represents a freehold property recently let at MR in perpetuity with 3 year reviews:

$$V = \frac{\text{MR}}{(1+r)} + \frac{\text{MR}(1+g)}{(1+r)^2} + \frac{\text{MR}(1+g)}{(1+r)^3} + \frac{\text{MR}(1+g)^3}{(1+r)^4} + \frac{\text{MR}(1+g)^3}{(1+r)^5} + \frac{\text{MR}(1+g)^3}{(1+r)^6} + \frac{\text{MR}(1+g)^6}{(1+r)^7} + \cdots + \infty$$

The above expression (which is a geometric progression) simplifies to:

$$V = \frac{\text{MR}}{r - r\left[\left((1+g)^3-1\right)\Big/\left((1+r^3-1)\right)\right]} \quad [5.5]$$

Rearranging Equation 2.23 we can show that MR/*V* = *y* and, substituting these variables into Equation 5.5, the relationship between the ARY and DCF techniques can be shown by:

$$y = r - r\left(\frac{(1+g)^p-1}{(1+r)^p-1}\right) \quad [5.6]$$

This is the property yield equation derived by Fraser (1993) and based on a rack-rented freehold property investment. It shows that *y* is determined by the investor's TRR, *r*, the annual rental growth rate, *g*, and the number of years between each rent review (the rent review period), *p*. This equation is the same as Equation 5.1 except that the annual rental growth rate *g* has been increased to compensate for the fact that rental growth is not actually received until each non-annual rent review.

If the property to be valued is rack-rented and the rent and review period are known, then, applying the ARY technique, the valuer only has one variable, ARY, to predict in order to value the property. If sufficient evidence is available this is straightforward. With the DCF technique there are two unknowns: the investor's TRR and the growth rate. To predict the growth rate it is necessary to compare yields on recently let comparable freehold properties with an estimate of the investor's target return for those properties. Armed with this information and rearranging Equation 5.6 an average annual growth rate can be implied as follows:

$$g=\left(\frac{(r-y)(1+r)^{p}+y}{r}\right)^{1/p}-1 \qquad [5.7]$$

Where g is the annual rental growth expectation, y is the yield obtainable from comparable properties, p is the period between rent reviews in years and r is the estimated target return for properties of this type. The complexity of this formula is due to the rent review periods being greater than 1 year. If reviews were annual, the growth rate would be the target rate minus the initial yield on a rack-rented freehold property ($g = r - y$). For example, if an investor accepts an initial yield of 8% but requires an overall return of 12%, then the income must grow by 4% over the year. But with 5-year rent reviews

$$g=\left(\frac{(0.12-0.08)(1+0.12)^{p}+0.08)}{0.12}\right)^{1/5}-1$$

$$g = 4.63\%$$

So an investor accepting an initial yield of 8% would require 4.63% per annum growth in the income, on average (compounded at each review) to achieve the target return. Figure 5.1 illustrates this.

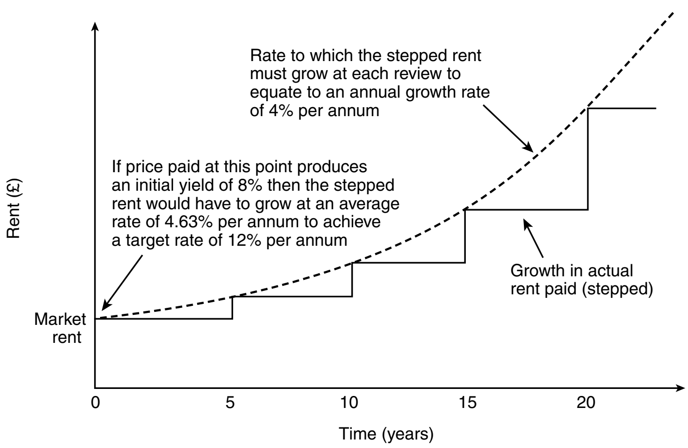

Figure 5.1 Rental growth. The figure assumes rent received in perpetuity (The figure assumes rent received in perpetuity).

Equation 5.7 is often referred to as the implied rental growth rate formula. The higher the client's target rate relative to the market-derived ARY, the better the investment must perform over the holding period to achieve the desired level of return. Comparable evidence can be used to ascertain the implied growth rate necessary to reconcile an ARY valuation with a DCF valuation (Crosby, 1990). The implied growth rate formula is constructed on assumption that property is rack-rented. g represents the market's expectations of future growth and is an average growth rate. In fact it is a discounted growth rate into perpetuity so g is influenced by expectations in the near future more than ones further away (Fraser, 1993). As an alternative it is possible to derive an explicit growth rate from direct analysis of rental growth rates prevalent in various market sectors, regions and towns. Some argue that the assumption of a stable and constant growth rate is simplistic but it can be taken to be an adequate reflection of the decision-making process of most investors. Before looking at the practical application of the DCF technique the next section will look at the input variables in more detail.

5.2.2 *Key variables in the DCF valuation model*

The key, value significant, variables in the DCF technique are the rent, rental growth rate, the TRR and the exit yield. Other variables include regular and periodic expenses, transaction fees and taxes, but these are determined in relation to the key variables and their estimation is relatively straightforward.

The rent must be net of any regular or periodic expenditure and the estimation of MR is undertaken in the same way as for the ARY technique described in Chapter 3. Rental growth can be separated into two components; growth in line with inflation and real growth in excess of inflation. Depreciation is the rate at which the MR of an existing property falls away from the MR of a property that is comparable in all respects except that it is (hypothetically) permanently new. The causes of depreciation, namely deterioration and obsolescence, will be discussed in Chapter 6. So, assuming constant rental growth, an annual rate of rental growth must be net of an average annual rate of depreciation. As these two components are interacting growth rates their mathematical relationship with is (Fraser, 1993):

$$g = g_m - d - dg_m \qquad [5.8]$$

Where g is the average annual rental growth rate of actual property, g_m is the average annual rental growth rate of permanently new property and d is the average annual rate of depreciation. As dg_m is usually very small the equation can be simplified to:

$$g = g_m - d \qquad [5.9]$$

A valuer may buy in or undertake research aimed at forecasting explicit rental growth rates and movements in capital values. Simple models might take the form of an historic time series of rents and capital values from which a moving average or exponentially smoothed set of values for future years might be predicted. More complex regression-based models will produce equations which identify independent variables such as GDP or other output measures, expenditure, employment, stock, vacancy, absorption and development pipeline and measure their effect on a dependent variable such as rental growth or yield (Baum, 2000). The Investment Property Databank (IPD) publishes figures for rental value growth for the properties in its databank (which, it should be remembered, are prime institutional investments in the main). Figures are published by sector, segment and region and within these broad groupings it is possible to examine the rental growth of various sectors of the property investment market and their broad location. Using these figures it is possible to get a feel for the rental growth rates of prime investment grade property. Table 5.1 shows how badly office investments in the City of London have performed recently, especially in comparison to Mid Town and West End offices and only mid-sized office space did not produce negative rental value growth in 2004. The annualised returns between 1999 and 2004 and 1994 and 2004 show that, over the longer term, things looked a little healthier but still lagged performance to the west of the City.

A similar analysis of rental growth for single-let standard shop units, shopping centres and retail warehousing reveals significant differences in performance, as can be seen from Table 5.2.

A more detailed regional and sector breakdown of rental value growth can be performed using IPD data and two examples are shown in Tables 5.3 and 5.4.

This sort of market intelligence, although not at the individual property level, paints a very useful picture of rental growth performance across the main investment sectors and locations in the UK and allows an implied rental growth rate to be verified against growth rates achieved in the market. As the tables above demonstrate, a great deal of rental growth information about prime investment property can be obtained from IPD and this information can be used to derive explicit rental growth rates depending on property type and location. It must be remembered, though, that rents can be volatile in the short-term and very little is known about depreciation rates and their effect

Table 5.1 Annual rental value growth (%).

	Floor area (m^2)				
Office investments in	**0–1000**	**1001–2500**	**2501–5000**	**5001–10 000**	**10 001+**
City					
2004	–2.0	–3.4	0.0	–2.5	–1.4
1999–2004	–0.9	–1.6	–2.2	–1.8	–3.2
1994–2004	3.5	3.2	3.2	2.7	1.8
Midtown/West End					
2004	1.0	4.0	3.7	2.6	5.1
1999–2004	–0.7	0.2	0.6	0.2	1.6
1994–2004	5.0	5.3	4.8	5.2	4.3

Source: IPD.

Table 5.2 Annual rental value growth (%).

	2004	**1994–2004**	**1999–2004**
Single-let standard shops by floor area (m^2)			
0–250	2.0	2.2	3.1
251–500	2.6	1.9	3.1
501–1000	3.4	2.4	3.4
1001–2000	3.0	2.5	3.8
2001+	2.3	2.7	5.2
All single-let standard shops	2.9	2.4	3.6
Shopping centres by floor area (m^2)			
0–7000	3.3	3.4	3.6
7001–14,000	2.5	3.0	2.7
14,001–25,000	2.9	3.7	3.8
25,001–50,000	3.6	3.1	4.2
50,001+	4.7	3.4	6.0
All shopping centres	3.7	3.3	4.2
Retail warehouses by floor area (m^2)			
0–2500	4.0	4.3	4.7
2501–5000	4.3	4.1	4.4
5001–10 000	5.4	5.3	5.7
10 001–15 000	6.4	6.6	7.4
15 001+	7.9	7.2	8.3
All retail warehouses	6.0	5.8	6.3

Source: IPD.

on rental growth prospects in the long-term. As an alternative, therefore, a long-term average expected 'market' rental growth rate can be implied from the relationship between the ARY derived from comparable evidence and the target rate on rack-rented freehold property investments. The way that this implicit growth rate can be calculated was shown in Section 5.2.1. The growth rate should be indicative of rental growth on properties regardless of whether they are rack-rented or reversionary freeholds or leaseholds (but with due care exercised in the case of geared profit rents). Also, if attempting to derive an implied growth rate from a reversionary comparable transaction it is important to bear in mind what Brown and Matysiak (2000) say in Section 5.2.3 below.

The TRR (also referred to as the **equated yield** or discount rate because it is the rate at which cash-flows are discounted to PV) should adequately compensate an investor for the opportunity cost of capital plus the risk that the investor expects to be exposed to. It is therefore a function of a risk-free rate of return and a risk premium: a higher risk premium (and thus higher target rate) would be used to discount the future cash-flow of a more risky property investment and cause its PV to reduce accordingly. It is difficult to obtain evidence of the target rate from the market but the base-line is the return from a risk-free investment. The closest available proxy for the risk-free rate is the gross redemption yield on long-dated fixed interest gilts; the

Table 5.3 Annual rental value growth (%).

	City/Mid-Town	West End	C. London Fringe	Rest of London	South East	South West	Eastern	East Midlands	West Midlands	North West	Yorks & Humber	North East	Scotland	Wales
Retails														
2004	0.7		0.5	3.8	4.9	4.9	4.9	3.5	3.7	3.9	5.2	5.0	3.0	4.4
1999–2004	2.4		2.7	4.1	4.2	3.4	4.0	3.7	4.2	3.6	3.8	3.6	2.9	3.6
1994–2004	5.7		6.4	4.4	4.2	3.6	4.8	4.4	4.4	4.3	3.9	4.8	4.1	3.8
Standard retails														
2004	0.6		0.0	2.5	2.8	5.3	2.8	3.3	2.3	2.6	5.6	3.2	1.3	2.6
1999–2004	2.2		2.7	3.2	2.4	2.9	2.4	2.4	2.3	2.3	3.4	2.6	1.0	2.3
1994–2004	5.9		6.3	3.7	2.6	2.6	2.4	3.4	2.4	3.3	3.3	3.7	3.5	3.0
Retail warehouses			London											
2004			4.4		7.4	6.8	6.9	5.8	5.4	5.9	6.1	5.6	6.1	5.4
1999–2004			5.8		6.6	6.1	6.6	6.2	5.4	6.3	4.5	5.2	4.9	4.1
1994–2004			6.1		6.1	6.7	6.5	7.4	6.8	6.5	6.1	6.7	5.2	5.4
Offices				Outer London										
2004	–1.7	0.4	4.6	–2.8	–2.1	1.2	0.1	–0.8	1.8	2.8	1.0	2.6	–0.1	1.7
1999–2004	–2.4	–0.7	0.6	–0.8	–2.2	2.7	1.0	0.6	2.0	2.7	1.7	2.2	1.8	0.8
1994–2004	2.3	4.0	5.0	2.3	1.3	1.0	2.5	0.9	1.4	2.0	0.5	1.5	1.5	0.3
Industrials			London											
2004			1.5		1.0	1.5	1.6	0.5	0.8	0.3	2.2	3.1	0.5	–0.6
1999–2004			3.3		2.1	1.8	2.6	1.3	1.6	2.1	1.7	1.6	1.8	2.5
1994–2004			4.1		3.1	1.7	2.3	1.6	1.7	1.6	1.0	1.5	1.5	2.4

Source: IPD.

Table 5.4 Annual rental value growth (%).

	2004	5 years	10 years
Standard shops	2.4	2.4	3.5
Central London	0.0	2.6	6.3
Rest of London	2.2	3.1	3.8
South East and Eastern	2.8	2.3	2.6
Rest of UK	3.4	2.3	3.0
Shopping centres	3.7	3.3	4.2
In-town	3.5	3.3	3.9
Out-of-town	4.5	3.4	—
Retail warehouses	6.0	5.8	6.3
Retail parks	6.5	6.1	6.7
Fashion parks	6.9	8.6	—
Other retail warehouses	4.6	4.3	4.8
Dept/variety stores	3.5	4.0	4.0
Supermarkets	3.6	2.7	2.6
Other retail	1.6	2.3	3.1
Standard offices	0.6	–0.4	2.5
Central London	1.3	–0.9	3.6
Rest of London	–1.9	–0.6	2.3
Inner South Eastern	–2.3	–2.4	1.5
Outer South Eastern	1.8	1.3	1.4
Rest of UK	1.7	2.4	1.3
Office parks	–1.9	–0.7	2.4
London and South Eastern	–2.6	–1.4	2.7
Rest of UK	–0.3	1.0	1.8
Standard industrials	1.1	2.4	2.7
London	1.6	3.4	4.1
Inner South Eastern	0.9	2.2	3.2
Outer South Eastern	1.1	2.5	2.5
Rest of UK	0.9	2.0	1.8
Distribution warehouses	1.1	1.5	1.9
Other property	1.1	1.2	2.7
Leisure	0.5	0.9	1.9

Source: IPD.

cash-flow is certain, the investment is liquid and it is cheap to manage. It thus provides a good indication of the opportunity cost of long-term investment capital – an investment time-frame or holding period comparable to property investment (Fraser, 1993). However, with an increasing prevalence of shorter leases, it might be appropriate to look to medium-dated gilts and SWAP rates as benchmark evidence for a risk-free rate of return. A risk premium is then added to this risk-free rate which should cover (Baum and Crosby, 1995):

- Tenant risk; risk of default on lease terms, particularly payment of rent but also repair and other obligations, risk of tenant exercising a break option or not renewing lease (higher risk if the lease is short). The level of tenant risk will depend to an extent on the type of tenant; a public sector organisation may be considered less likely to default than a fledgling private sector company.

- Physical property risk; management costs (e.g. rent collection, rent reviews and lease renewal) and depreciation. This type of risk is less acute in the case of prime retail premises because land value is a high proportion of total value, but the reverse is true for, say, small industrial units. A certain amount of physical property risk can be passed on to the tenant via lease terms.
- Property market risk; illiquidity caused by high transaction costs, complexity of arranging finance and accentuated by the large lot size of property investments.
- Macroeconomic risk; fluctuating interest rate, inflation, GDP, and so on, all affect occupier and investment markets in terms of rental and capital values and potential for letting voids.
- Planning risk; in the main, this refers to planning policy and development control. For example, Sunday trading, presumption against out-of-town retailing, promotion of mixed-use, city centre developments on previously developed land.

Baum and Crosby (1995) point out that, for valuation, it is not feasible to quantify all of these components of risk as this would need to be done for each comparable – this sort of thing is more appropriate in property investment appraisal (see Chapter 7). Instead, the valuer subjectively chooses and adjusts a target rate not at the individual property level but by grouping various property investments and examining the risk characteristics of each. By far the most frequently encountered investment type is a rack-rented freehold. Regular rent reviews mean that this is an equity-type investment that benefits from income and capital growth just as equities do, albeit with less frequent income growth participation. Whereas the return from an investment in company shares relies on the continued existence and profitability of that company, a property investment will remain even if the occupying company fails. Unlike share dividends, rent is a contractual obligation paid quarterly in advance and is a priority payment in the event of bankruptcy. After a likely rent void the premises can be re-let and perhaps used for a different purpose, subject to location, design and planning considerations. This reduces the reliance of the investment on a single business occupier, helps underpin the value of the investment and reduces risk. A freehold let on fixed ground rent has a risk profile similar to undated gilts as it generates a fixed income from a head-tenant who is very unlikely to default on what will probably be a significant profit rent. Consequently this type of property investment is very secure and risk will derive from changes in the level of long-term interest rate and inflation rather than property or tenant-specific factors (Fraser, 1993).

Some of the more general 'market' risks, such as illiquidity, tenant covenant and yield movement are best incorporated by adjusting the TRR.

Other, property-specific, risks such as regular deductions from gross rent, a depreciation rate slowing rental growth, voids and management costs can be reflected in adjustments to the cash-flow. In this way properties of the same type can be grouped together to help estimate a risk premium for a particular sector or sub-sector of the market such as high street shops or secondary industrials on the basis that properties within each sector have similar tenant risks and lease structures.

The selection of a risk premium for an individual property is therefore rather subjective but Baum and Crosby (1995) argue that a risk premium of around 2% is an appropriate rule of thumb 2% is based on historical relationship between prime property yields and gilt yields prior to reverse yield gap, although the size of the premium will vary over time and differ depending on sector.

The Appraisal Institute (2001) suggests that investors should be interviewed to obtain their views on target rates of return. If a target rate is used with an ARY to imply an average annual rental growth rate the valuation is insensitive to the level of target rate (within realistic bounds); a higher target rate implies a higher growth rate, *ceteris paribus*. Figure 5.2 illustrates the sensitivity of the capital value of a rack-rented freehold property investment to changes in the ARY and changes in the target rate. It can be seen that, particularly between 1% and 10% value is much less sensitive to changes in the target rate regardless of the growth rate and exit yield assumptions.

A property is a durable, long-term investment asset and in order to avoid trying to estimate cash-flows far off into the future, a **holding period** of between 5 and 15 years is normally specified, after which a notional sale is assumed. The length of the holding period can be influenced by lease terms, such as the length of the lease or incidence of break clauses, or by the physical nature of the property, perhaps timed to coincide with a redevelopment towards the end of the period, but the longer the period the more

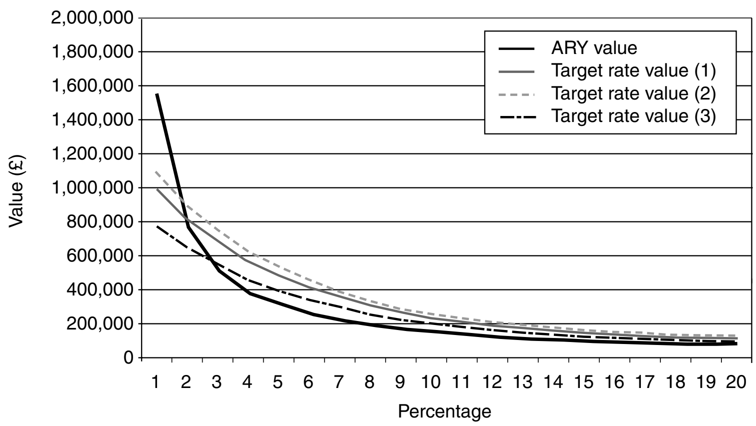

Figure 5.2 Capital value sensitivity to ARY and TRR. Capital value of £17 500 pa rental income using a range of ARYs and a range of TRR assuming a (1) rental growth at 5% pa and an exit yield after 25 years of 10%; (2) growth 5% exit yield 8% and (3) growth 3% and exit yield 8%.

chance of estimation error when selecting variables. The notional sale value or **exit value** is usually calculated by capitalising the estimated rent at the end of the holding period at an ARY. When an ARY is used to estimate an exit value it is called an **exit yield** and is usually higher than initial yields on comparable but new and recently let property investments because it must reflect the reduction in remaining economic life of the property and the higher risk of estimating cash-flow at the end of the holding period. The exit yield may reflect land values if demolition is anticipated. Prime yields tend to be fairly stable but care should be taken when choosing an exit yield, if the holding period is less than 20 years as it can have a significant impact on the valuation figure. Where an allowance has been made for refurbishment in the cash-flow during the holding period the exit yield should reflect the anticipated state of the property. The extent of depreciation also needs to be considered: for example, if the subject property is 10 years old and the appropriate market capitalisation rate is 7%, given an expectation of stable yields, the best estimate of the resale capitalisation rate after a 10-year holding period is the current yield on similar but 20-year old buildings. The effect of depreciation also needs to be considered when estimating projected rental values.

5.2.3 *Applying the DCF valuation model*

5.2.3.1 *Rack-rented freehold property investments*

A freehold property investment was let recently at £10 000 per annum (receivable annually in arrears) on a 15-year FRI lease with 5-year rent reviews. Assuming an initial yield of 8% (from comparable evidence), a target return of 12% (risk-free rate 9%, market risk 2%, property risk 1%), an implied annual growth rate (calculated in Section 5.2.1) of 4.63% and a holding period of 10 years after which a sale is assumed at an exit yield equivalent to today's ARY, the valuation of this property is shown below:

Period (years)	Rent (£)	Growth @ 4.63% pa	Projected rent (£)	PV £1 @ 12%	YP in perpetuity @ 8%	PV (£)
1	10 000	1.0000	10 000	0.8929		8 930
2	10 000	1.0000	10 000	0.7972		7 970
3	10 000	1.0000	10 000	0.7118		7 120
4	10 000	1.0000	10 000	0.6355		6 360
5	10 000	1.0000	10 000	0.5674		5 670
6	10 000	1.2539	12 539	0.5066		6 357
7	10 000	1.2539	12 539	0.4523		5 668
8	10 000	1.2539	12 539	0.4039		5 066
9	10 000	1.2539	12 539	0.3606		4 527
10	10 000	1.2539	12 539	0.3220		4 038
10+	10 000	1.5724	15 724	0.3220	12.5000	63 289
Valuation						124 986

The net income in each period is discounted at the TRR to a PV and these are totalled to obtain a total PV or valuation of the subject property. Because no growth is implied in the target rate the rental income must be inflated at the appropriate times (rent reviews) over the term of the investment to account for growth. At the end of the holding period a notional sale is assumed so the projected rent of £15 724 is capitalised at an exit yield based on the current initial yield of 8% (a YP of 12.5).

Checking this answer against an ARY valuation, because the rental growth rate has been implied from the relationship between the target rate and the ARY, the answers will be the same.

MR (£)	10 000	
YP in perpetuity @ 8%	12.5000	
Valuation (£)		125 000

A rack-rented freehold is least prone to inaccurate valuation using the ARY technique. The advantage of the DCF technique is that more information is presented, use of a target rate enables cross-investment comparisons and specific cash-flow problems such as voids and refurbishment expenditure can be incorporated. DCF valuations are frequently used for complex investment properties where there may be many tenants, all with different covenant strengths, rents, lease terms and rent review dates. Comparable evidence will therefore be scarce and the number of input variables high.

5.2.3.2 Reversionary freehold property investments

As we know from Chapter 3 a reversionary property is one where the rent passing is below the MR. The valuation of a freehold reversionary interest in a retail property let at £10 000 per annum on a lease with 3 years until the next rent review and a 5-year rent review pattern is shown below. A comparable property recently let on a similar review pattern at £15 000 per annum sold for a price that generated an initial yield of 6%. It is assumed that the investor's TRR is 13% and the holding period is until the second rent review in 13 years' time.

ARY term and reversion valuation:

Term (contract rent) (£)	10 000	
YP 3 years @ 5%	2.7232	
		27 232
Reversion to MR (£)	15 000	
YP in perpetuity @ 6%	16.6667	
PV £1 in 3 years @ 6%	0.8396	
		209 900
Valuation (£)		237 132

DCF valuation: Using the implied growth rate formula (Equation 5.7), the annual growth rate implied from a target rate of 13% and an initial yield of 6% assuming 5-year rent reviews is 7.76% per annum.

Years	Rent (£)	Growth @ 7.76%	Projected rent (£)	PV £1 @ 13%	YP in perpetuity @ 6%	PV (£)
1	10 000	1.0000	10 000	0.8850		8 850
2	10 000	1.0000	10 000	0.7831		7 831
3	10 000	1.0000	10 000	0.6931		6 931
4	15 000	1.2512	18 772	0.6133		11 513
5	15 000	1.2512	18 772	0.5428		10 189
6	15 000	1.2512	18 772	0.4803		9 016
7	15 000	1.2512	18 772	0.4251		7 980
8	15 000	1.2512	18 772	0.3762		7 062
9	15 000	1.8189	27 284	0.3329		9 083
10	15 000	1.8189	27 284	0.2946		8 038
11	15 000	1.8189	27 284	0.2607		7 113
12	15 000	1.8189	27 284	0.2307		6 294
13	15 000	1.8189	27 284	0.2042		5 571
13+	15 000	2.6436	39 653	0.2042	16.6667	134 954
Valuation						240 425

Baum and Crosby (1995) argue that, in a valuation, it is not really necessary to show cash-flow growth explicitly beyond the point at which the MR is obtained; that is more appropriate for appraisal, which we will look at in Chapter 7. Instead, a 'short-cut' DCF technique, developed by Sykes (1981) can be used. The technique discounts the term rent (which is fixed and contains no prospect of growth until the next rent review or lease renewal) at the TRR and then capitalises the rent receivable on reversion (which has been adjusted to account for any rental growth over the term period) at a growth-im. If an implied growth rate has been used then the projected rent at the reversion can be capitalised at the market yield for a rack-rented freehold. Mathematically:

V = (c × YP for term at r) + (inflated m × YP in perpetuity at y × PV for term at r)

$$= \frac{c\left(1-\left(1/(1+r)^n\right)\right)}{r} + \frac{m(1+g)^n}{y(1+r)^n} \qquad [5.10]$$

Where c is contract rent for term, m is the MR (net of non-recoverable running costs and ground rent), r is the TRR, y is the ARY and n is the period to next rent revision which might be the next rent review or lease renewal. The valuation would look like this:

Term (contract rent) (£)		10 000	
YP for 3 years @ 13%		2.3612	
			23 612
Reversion to MR (£)	15 000		
growth @ 7.76% pa for 3 years	1.2515		
		18 772	
YP in perpetuity @ 6%		16.6667	
PV £1 in 3 years @ 13%		0.6931	
			216 854
Valuation (£)			240 466

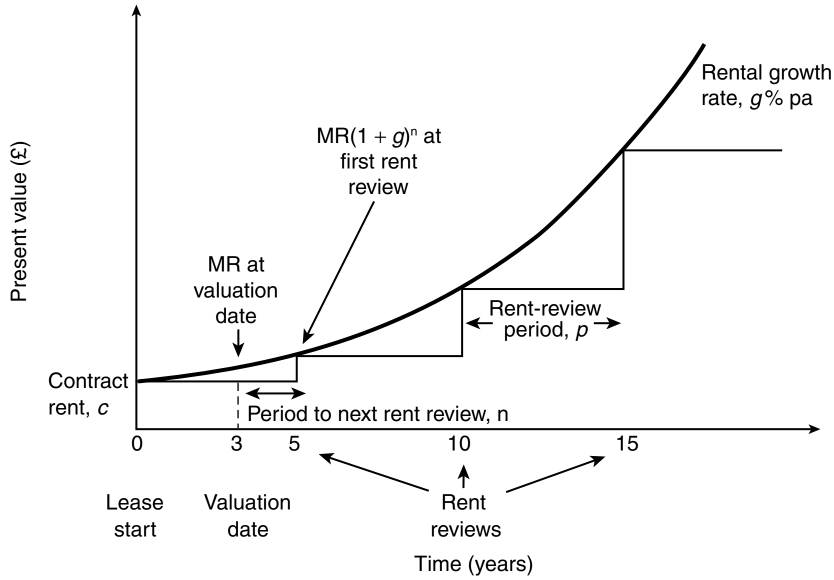

Figure 5.3 Rental growth between rent reviews.

Unlike the ARY-based term and reversion technique the short-cut DCF technique shows the correct capital values of the term and reversionary incomes and reveals the growth assumption over the term. It is explicit about the target rate and growth rate up to the first rent review, at which point the MR (which has been projected at the long-term implied growth rate) is capitalised at the ARY. For properties where the cash-flow is more complex and comparable evidence more scarce, a full DCF is perhaps more appropriate but can lead to greater variability between valuers regarding values of key input variables (Havard, 2000).

It is possible to use the implied rental growth rate formula to derive a growth rate that is implied from the ARY, TRR and rent-review period of a reversionary freehold property investment. The mathematics is a little more complex but Brown and Matysiak (2000) provide a clear explanation. Diagrammatically the situation is illustrated in Figure 5.3. The core and top-slice ARY model (with equivalent yields) for calculating the PV of this investment is adapted from Equation 3.3 in Chapter 3:

V = (c × YP into perpetuity) + ((m – c) × YP in perpetuity × PV for term)

$$V = \frac{c}{y} + \frac{m - c}{y(1+y)^n} \qquad [5.11]$$

Where y is the equivalent ARY and the other variables are as defined for Equation 5.10. The ARY implies growth and therefore the rent is not explicitly projected at the growth rate g. The DCF model does project rent at the growth rate but, unlike a rack-rented property, there are two periods to incorporate into the calculation; one that lasts until the first rent review and then the normal rent review period thereafter:

$$V = \frac{c\left(1-\left(1/(1+r)^{n}\right)\right)}{r} + \frac{m\,(1+g)^{n}}{r\,(1+r)^{n}}\left[\frac{(1+r)^{p}-1}{(1+r)^{p}-(1+r)^{p}}\right] \qquad [5.12]$$

Where n is the period to the next rent revision and p is the rent review period. If we assume that the PVs from each model produce the same answer we can calculate the implied growth rate for a reversionary property investment. To see how this works, take an example where the ARY is 8%, the TRR is 12%, the rent review period is 5 years (for a rack-rented property investment the growth rate implied by these figures would be 4.63% per annum) but the period to next review is 2 years. The contract rent is £8 000 per annum and the current MR is £10 000 per annum. An ARY core and top-slice technique, using equivalent yields, produces the following valuation:

$$V = \frac{8\,000}{0.08} + \frac{10\,000 - 8\,000}{0.08(1+0.08)^{2}} = 100\,000 + 21\,433 = £121\,433$$

If we assume that a DCF valuation should produce the same valuation, using spreadsheet iteration in the final stage, g can be calculated as follows:

$$121\,433 = \frac{c\left(1-\left(1/(1+r)^{n}\right)\right)}{r} + \frac{m\,(1+g)^{n}}{r\,(1+r)^{n}}\left[\frac{(1+g)^{p}-1}{(1+r)^{p}-(1+g)^{p}}\right]$$

$$121\,433 = 13\,520 + \frac{10\,1000(1+g)^{2}}{0.1505}\left[\frac{0.7623}{1.7623-(1+g)^{5}}\right]$$

$$\therefore\ g = 0.0455 = 4.55\%$$

Therefore the implied growth rate from this reversionary property is slightly lower than from the rack-rented equivalent because the rental growth will arrive sooner due to the rent review in 2 years' time rather than in 5 years.

5.2.3.3 Leasehold property investments

Baum and Crosby (1995) argue that a leasehold property investment producing a fixed profit rent over its entire term produces a risk that is almost entirely dependent upon the quality of the sub-tenant: a cash-flow from a good quality tenant is similar to the return from a fixed income bond plus a suitable risk premium. The target rate used to discount a fixed profit rent is therefore likely to be derived from comparison to other fixed income investments such as gilts with similar maturity dates. This approach is more logical and is not based on questionable comparisons with the freehold investment market (see Chapter 3).

If the profit rent is variable then there is a gearing effect. Basically if a fixed head-rent is deducted from a sub-rent which includes rent reviews the resultant profit rent must vary by an amount greater than the variation in the sub-rent itself. The magnitude of this variability depends on the size of the fixed deduction of head-rent from the variable sub-rent and can be expressed as the income-gearing ratio. To illustrate this consider three property investments; a freehold, a leasehold where the head-rent is very similar to the sub-rent and another leasehold where the sub-rent is very much larger than the head-rent. All three investments generate an initial income of £100 000 per annum subject to annual rent reviews and rental growth is estimated to be 5% per annum. As can be seen from Table 5.5 the income from the freehold investment grows at the rental growth rate of 5% per annum. The first leasehold investment receives a £900 000 per annum sub-rent and pays a £800 000 per annum head rent, leaving £100 000 per annum profit rent. The second leasehold receives a £110 000 per annum sub-rent and pays a £10 000 per annum head rent, leaving £100 000 per annum profit rent.

Except where the head rent is a peppercorn (very low) rent, rental growth for a leasehold profit rent is greater than the rental growth on an equivalent freehold. The growth rate diminishes at each subsequent rent review and tends towards the market rental growth rate in perpetuity (Baum and Crosby, 1995). The income-gearing ratio for the first leasehold is 89% and for second it is 9%. Life becomes a whole lot more complicated as we introduce asynchronous rent reviews in the head- and sub-leases. So the way

Table 5.5 Geared leasehold profit rents.

Year	Freehold initial net income (£)	Freehold income growth (%)	Leasehold 1 initial net income (£)	Leasehold 1 income growth (%)	Leasehold 2 initial net income (£)	Leasehold 2 income growth (%)
0	100 000	—	100 000	—	100 000	—
1	105 000	5.00	145 000	45.00	105 500	5.50
2	110 250	5.00	192 250	32.59	111 275	5.47
3	115 763	5.00	241 863	25.81	117 339	5.45
4	121 551	5.00	293 956	21.54	123 706	5.43
5	127 628	5.00	348 653	18.61	130 391	5.40
6	134 010	5.00	406 086	16.47	137 411	5.38
7	140 710	5.00	466 390	14.85	144 781	5.36
8	147 746	5.00	529 710	13.58	152 520	5.35
9	155 133	5.00	596 195	12.55	160 646	5.33
10	162 889	5.00	666 005	11.71	169 178	5.31
...						
40	703 999	5.00	5 535 990	5.76	764 399	5.07
41	739 199	5.00	5 852 789	5.72	803 119	5.07
42	776 159	5.00	6 185 429	5.68	843 775	5.06
43	814 967	5.00	6 534 700	5.65	886 463	5.06
44	855 715	5.00	6 901 435	5.61	931 287	5.06
45	898 501	5.00	7 286 507	5.58	978 351	5.05
46	943 426	5.00	7 690 832	5.55	1 027 768	5.05
47	990 597	5.00	8 115 374	5.52	1 079 657	5.05
48	1 040 127	5.00	8 561 143	5.49	1 134 140	5.05
49	1 092 133	5.00	9 029 200	5.47	1 191 347	5.04
50	1 146 740	5.00	9 520 660	5.44	1 251 414	5.04

that a profit rent might be expected to grow depends on the income-gearing ratio. Use of an ARY technique (even the single rate approach described in Chapter 3) is hard to justify because of heterogeneity of interests and potential complexity profit rent cash-flows. Similarly, identifying a market TRR for leaseholds with variable and geared profit rents is difficult as each investment opportunity will have unique ratios between head-rent and sub-rent leading to individual profit rent cash-flows and gearing circumstances. Furthermore, there will be differences in tenant quality and remaining lease term. The leasehold target rate must relate to the lease structure and any profit rent gearing and Baum and Crosby (1995) suggest that attention should focus on the choice of risk premium when moving from a freehold to a leasehold target rate. Other cash-flow variables such as the head-rent, rent reviews and so on can also be incorporated in the cash-flow.

Freehold investment transactions can be analysed to derive a suitable rental growth rate which can be applied to the leasehold investment cash-flow and this should be done in preference to estimating a growth rate that is implied by the relationship between target rate and ARY on a leasehold investment because of the heterogeneity of cash-flows from leasehold investments (Baum and Crosby, 1995). If the leasehold includes a head rent and sub-rent both with rent reviews at the same time and both rents are assumed to grow at the same rate, then the profit rent would grow at the same rate as the growth in MR for a freehold. But in cases where the rent reviews in the sub-lease (say every 5 years) are different to those in the head-lease (say every 15 years) the complexities are best handled by a full DCF rather than a short-cut. As an example the leasehold investment described in Section 3.3.3 of Chapter 3 will be valued again but this time using a DCF technique. Assuming a target rate of 10% and an ARY of 6% for freehold property this implies rental growth of 4.47% per annum. But the target rate at which the cash-flow from a leasehold investment is discounted must be adjusted to reflect additional risk. Here the adjustment is from 10% to 15%.

Years	Rent received (£)	Growth @ 4.47% pa	Inflated rent (£)	Less rent paid (£)	Profit rent (£)	PV @ 15%	PV (£)
1	30 000	1.0000	30 000	–10 000	20 000	0.8696	17 392
2	30 000	1.0000	30 000	–10 000	20 000	0.7561	15 122
3	35 000	1.0913	38 196	–10 000	28 196	0.6575	18 539
4	35 000	1.0913	38 196	–10 000	28 196	0.5718	16 122
5	35 000	1.0913	38 196	–10 000	28 196	0.4972	14 019
6	35 000	1.0913	38 196	–10 000	28 196	0.4323	12 189
7	35 000	1.0913	38 196	–10 000	28 196	0.3759	10 599
8	35 000	1.3578	47 523	–10 000	37 523	0.3269	12 266
9	35 000	1.3578	47 523	–10 000	37 523	0.2843	10 668
10	35 000	1.3578	47 523	–10 000	37 523	0.2472	9 276
11	35 000	1.3578	47 523	–10 000	37 523	0.2149	8 064
12	35 000	1.3578	47 523	–10 000	37 523	0.1869	7 013
Valuation							151 269

5.2.4 Case study – valuation of a city centre office block

You have been asked to value, for sale purposes, the freehold and head-leasehold interests in the property described below. The valuation date is the 1 April 2005. The property was constructed in 1980 and is located in the central business district of Bristol. It comprises a basement (used for storage) with five floors above (including the ground floor). Externally, notable features include glazed exterior cladding, a high quality entrance and reception area on the ground floor and a secure barrier to the car park at the rear. The office accommodation is open plan and finished to a reasonable specification (suspended ceilings and perimeter trunking but no air-conditioning or raised floors). There are two lifts serving all floors. Car parking is rather restricted due to the location of the property in the centre of the city but access to the railway station and main bus routes is good. The property is also close to the main retail area of the city. Occupying tenants can internally partition the floor-space under the terms of the leases. With regard to maintenance of the building, each occupying tenant pays a portion of the annual service charge to the landlord. The floor area that each tenant occupies is used to apportion the service charge between tenants. The service charge pays for the cleaning of common parts, general repairs, services, lighting to common parts, lifts, insurance and management. The tenants pay for their own cleaning and lighting.

5.2.4.1 Head-lease

Y is the landlord of the site which was let to Z on a 125-year-ground lease in 1988. The initial rent that was agreed was £10 000 per annum and the landlord has no responsibility for the insurance or repairs of the office building on the site. The rent payable under the ground lease is reviewed every 25 years. At each review the rent is reviewed to the existing ground rent plus 5% of the estimated market rental value of the head-lease in excess of the existing ground rent. The wording of the rent review clause in the ground-lease permits the head-lease to be valued assuming the building is vacant and to let.

5.2.4.2 Occupational sub-leases

All of the occupational sub-leases specify that the sub-tenants are responsible for all repairs and insurance (non-internal repairs and insurance payable via the service charge) and are subject to 5-year, upward-only rent reviews. Table 5.6 lists the details of the sub-leases.

Each occupying sub-tenant must pay a portion of the annual service charge, itemised in Table 5.7.

This total service charge per square metre is then apportioned between the sub-tenants on a floor area basis with a reduction of 50% for the basement store. The apportioned charges are listed in Table 5.8.

After a review of your firm's internal records and discussions with colleagues at other surveying firms in the city, three properties have recently

Table 5.6 Sub-leases.

Floor	Tenant	Use	Business	Covenant[a]	Area (m^2)	Current rent (£)	Date lease commenced	Length of lease (years)
Basement	A	Store	Solicitors	Good	305	21 350	1997	15
Ground	A	Office	Solicitors	Good	251[b]	40 160	2003	10
First	B	Office	Insurance	Good	449	76 330	2005	15
Second	C	Office	Travel	Poor	449	49 390	1988	25
Third	D	Office	Surveyors	Average	449	69 595	2000	10
Fourth	E	Office	Publishers	Poor	398	55 720	1997	15
Totals					2301	312 545		

[a]The covenant describes the quality of the tenant in terms of ability to meet the terms of the lease. It is a subjective measure of the security of the income.
[b]Entrance and reception areas are on this floor.

Table 5.7 Service charge details.

Item	Cost (£/m^2)
Staff	3.50
Cleaning of common parts	2.00
General repairs	5.00
Services	2.75
Lighting to common parts	1.25
Lifts	2.75
Insurance	2.75
Management	2.50
Total	22.50

Table 5.8 Service charge apportionment.

Floor	Sub-tenant	Use	Area (m^2)	Service charge (£)
Basement	A	Store	305	3 431.25
Ground	A	Office	251	5 647.50
First	B	Office	449	10 102.50
Second	C	Office	449	10 102.50
Third	D	Office	449	10 102.50
Fourth	E	Office	398	8 955.00

been the subject of transactions that provide comparable evidence for your subject property:

(a) The basement of the office building next door was recently let to the publishers (who occupy the fourth floor of the subject property) for additional archiving and general storage. The lease was agreed on standard terms for a period of 5 years at a rent that equated to £90 per square metre.

Table 5.9 Current and full rental values of the sub-leases.

Floor	Tenant	Date lease commenced	Length of lease (years)	Current rent (£)[a]	Next rent review	Current market rent (£)[b]
Basement	A	1997	15	21 350	2007	27 450
Ground	A	2003	10	40 160	2000	42 670
First	B	2005	15	76 330	2002	76 330
Second	C	1988	25	49 390	2000	76 330
Third	D	2001	10	69 595	1998	76 330
Fourth	E	1997	15	55 720	1999	67 660
Totals				312 545		366 770

[a] MR is not received until first rent review for each sub-lease.
[b] The comparable evidence of market rents for storage and office space are used to calculate the rental values for each floor of the subject property.

This provides evidence of the current MR for storage space in this type of building.

(b) The letting of the first floor of the subject property to the insurance company was recent and was agreed on standard terms. It therefore provides good evidence of the current MR for the office space. The rent agreed equates to £170/m^2.

(c) The fifth (top) floor of the office building next door was recently let on standard terms. The lease was for a term of 15 years at a rent that equates to £150/m^2. However, on inspection of this building it is noted that the lift only goes up to the fourth floor and clearly a reduction to the 'normal' MR for office space in this area has been made to take this into account.

It is decided that the comparable evidence in (c) will be classed as secondary due to the poor lift access. Thus the current MR for office space in this locality is estimated to be £170/m^2. Table 5.9 shows the current and estimated MRs for each sub-lease.

5.2.4.3 Valuation of the freehold interest

Term rent (£)			10 000	
YP 8 years @ 8%			5.7466	
				57 466
Reversion to MR of head-lease (£)	366 770			
less rent passing (£)	−10 000			
	356 770			
5% share of MR	0.05			
		17 839		

plus rent passing (£)	10 000		
		27 839	
YP in perpetuity @ 10%		10.000	
PV £1 for 8 years @ 10%		0.4665	
			129 871
Valuation (£)			187 337

5.2.4.4 *Valuation of the head-leasehold interest*

Valuing year-by-year until the rent on each floor is reviewed to market rental value and incorporating the review of the ground rent, the valuation below has been set out as a cash-flow. Given the long length of the ground-lease (125 years) and the relatively low ground rent (currently £10 000) this interest will be valued as though it were a freehold. The difference is negligible; the YP for the remainder of the ground lease (108 years) at 11% is 9.0906 whereas the YP in perpetuity at 11% is 9.0909.

Year	Rent received (£)	Ground rent (£)	Profit rent (£)	YP in perpetuity @ 11%	PV £1 @ 11%	PV (£)
2005	312 545	10 000	302 545		0.9009	272 563
2006	319 280	10 000	309 280		0.8116	251 018
2007	337 320	10 000	327 320		0.7312	239 327
2008	366 770	10 000	356 770		0.6587	235 004
2009	366 770	10 000	356 770		0.5935	211 743
2010	366 770	10 000	356 770		0.5346	190 729
2011	366 770	10 000	356 770		0.4817	171 856
2012	366 770	10 000	356 770		0.4339	154 802
2013	366 770	27 839	338 931[a]	9.0909	0.3909	1 204 436
Valuation						£2 931 480

[a]This rent is receivable for the remainder of the ground-lease (assumed to be in perpetuity) and is capitalised at a yield of 11% but deferred 9 years.

The main decision that a valuer must make is the choice of yield. Although this long leasehold interest is, in many ways, similar to a freehold interest, it is ultimately a wasting asset and is usually not as desirable as a freehold investment. The yield should reflect such market perception as well as opportunity cost of capital, potential for growth and a return for risk taken. Yield choice is always difficult and is particularly so with interests such as this where comparable evidence is hard to obtain. In practice different yields may be applied to the capitalisation of the various rental income streams. For example, a higher yield may be adopted for the capitalisation of the reduced profit rent receivable after the review of the ground rent in 2013. Similarly, different yields may be chosen depending on which sub-tenant the rental income originates from. This may help to reflect the security value of each portion of the rental income.

Key points

- The value of an investment can be considered to be a multiple of the current rent where the multiplier is the reciprocal of the investor's required income yield (ARY valuation technique) or the PV of the expected future cash-flow (DCF valuation technique) (Fraser, 1993). Techniques vary depending on the extent to which assumptions are made explicit. For example a valuer may wish to include an explicit growth rate forecast rather than imply a long-term average from analysis of comparable evidence, or depreciation may be explicitly accounted for in the cash-flow. The problem with being more explicit is that there is greater potential for valuation variance (Havard, 2000).
- The ARY model does not explicitly reveal the total return that an investor expects; instead, future rental income is discounted (capitalised) at a rate that implies that the investor expects the income to grow in order to achieve a TRR. The DCF model involves selecting a suitable holding period, forecasting the cash flow over this period and selecting an appropriate target rate and exit yield. All of these assumptions should reflect market behaviour so valuers need to interpret activities and expectations of market participants (Appraisal Institute, 2001).
- The DCF technique is better at isolating factors affecting future income flow from those that affect the TRR required by the investor, thus allowing direct comparison with other investment opportunities. It can also deal with complexity and reveal assumptions explicitly. In cases where a property presents a non-standard pattern of income a DCF approach will usually be preferable. For example, investments with a ground lease and an occupational lease granted at different times, phased development projects or leaseholds where the head-lease has infrequent reviews and the sub-lease does not, the DCF approach provides more information and helps focus attention on fundamental characteristics that the investor will be interested in, namely income growth, depreciation, the holding period, timing of income and expenditure and the TRR. Rent tends to be subject to depreciation and capital values to obsolescence and the effect of these can be handled explicitly by adjusting the rental growth rate and exit yield or implicitly by adjusting the TRR (Sayce *et al.*, 2006).
- Choice of method is a matter of availability of evidence and complexity of the property interest being valued: use the ARY technique when investments have a standard pattern of income and rent reviews, use the DCF technique for complex interests, long reversions and short leaseholds. When valuing leasehold investments complex gearing effects are much more suited to detailed cash-flow analysis rather than simple yield capitalisation.

5.3 Valuing contemporary property investments using ARY and DCF valuation techniques

At the end of the last section the case was made for using a DCF technique to value properties with particular investment characteristics that render the ARY technique inadequate. These characteristics include properties that are over-rented, let on short leases or on leases that contain break clauses. A DCF technique might also be employed to analyse transactions where properties have not been let at MR (perhaps because an incentive such as a rent-free period or capital inducement was offered) so that they can be used as comparable evidence. In all of these cases the overriding concern to the landlord is that the financial position is adequate for the option or incentive granted. The number of property investments subject to flexi-leases is increasing and Table 5.10 shows the percentage of tenancies monitored by IPD that were over-rented and void in 2004.

Table 5.10 Over-rented and void tenancies at the end of 2004 by market segment.

Market segment	% tenancies over-rented	% tenancies void
Standard shops	18.5	7.2
Central London	25.2	9.4
Rest of London	14.7	5.9
South East and Eastern	22.0	5.8
Rest of UK	15.6	7.4
Shopping centres	17.3	6.8
In-town	17.6	7.2
Out-of-town	15.5	4.3
Retail warehouses	6.8	4.8
Retail parks	7.1	4.0
Fashion parks	6.3	5.9
Other retail warehouses	6.3	6.4
Dept/variety stores	11.6	14.7
Supermarkets	10.7	5.3
Other retail	18.6	5.0
Standard offices	38.2	15.8
Central London	44.6	16.7
Rest of London	44.7	16.1
Inner South Eastern	54.4	15.2
Outer South Eastern	35.4	14.7
Rest of UK	20.5	14.6
Office parks	43.1	16.4
London and South Eastern	52.0	20.3
Rest of UK	27.6	9.4
Standard industrials	25.3	11.6
London	19.9	9.5
Inner South Eastern	27.5	11.2
Outer South Eastern	31.5	11.6
Rest of UK	23.0	12.4
Distribution warehouses	20.4	6.0
Other property	10.1	7.1
Leisure	14.4	11.0
All retail	16.1	6.7
All office	38.7	15.8
All industrial	25.1	11.5
All property	22.8	9.7

Source: IPD UK Digest (2005).

This section looks at how ARY and DCF valuation techniques can be used to value property investments subject to flexi-leases and over-rented properties.

5.3.1 *Short leases and leases with break clauses*

Short leases and leases with break options, collectively referred to as flexi-leases (see Chapter 4), mean greater diversity of lease contracts and increased uncertainty for investors. Will the tenant renew the short lease? If not will there be a rent void and how long might it be? What will the lease terms be and what will be the quality of the new tenant? Will a break option be exercised? All this uncertainty creates an income risk that an investor will wish to be compensated for in terms of price paid and the expected return. McAllister (2001) argues that the capital value of a contemporary property investment is dependent upon the cost and probability of the tenant vacating, a rent void occurring or the rent dropping, and the impact on value will depend on the length of the short lease, the structure of the break clause (specifically the terms of any penalty payment), the tenant's business plan and market factors (such as rental growth prospects and the state of the lettings market).

Before flexi-leases became commonplace homogeneity of lease contracts meant that, for property investment valuation, adjustments to initial yields of comparables to reflect geographical and physical differences could be justified. But now it is much harder to find comparables and justify small but often cumulative adjustments to the ARY because of the greater variety of possible differences between the subject property and each comparable. ARY adjustment is, therefore, an over-simplification and it is difficult to quantify and support; a more explicit approach is required to illustrate the reasoning behind the assumptions (Crosby *et al.*, 1998). The DCF technique allows assumptions to be made more clearly; the financial costs (and possible benefits) associated with the exercise of a break option or non-renewal of a lease and the possible void period that may follow for example. Research has revealed errors and a lack of consistency amongst valuers when valuing flexi-leases (see McAllister and O'Roarty, 1999; Ward and French, 1997). Valuers tend to focus on the worst-case scenario and assume that there will be a rent void at the end of the (short) lease or that a break option will be exercised. This is despite the fact that if the out-going tenant had to pay a penalty fee (equivalent to several months' rent) and a new tenant was found in the meantime the landlord may actually receive an income bonus. This conservative approach tends to undervalue flexi-leases and reduce their attractiveness to investors.

Consider the following example: a modern office property has just been let on a 15-year FRI lease at a MR of £50 000 per annum with no rent reviews. There is a break option in the tenant's favour in year 5, just before the rent review (to prevent the tenant from using it as a bargaining tool). Comparable evidence suggests that rack-rented office investments let on 15-year FRI leases with 5-year rent reviews to MR sell at prices that generate initial yields of around 7%. Long-term gilts currently yield 8% and a typical property risk premium is 2%. The inclusion of a break option clearly adds a degree of uncertainty to the income that the investor would receive after year 5. Indeed, an early break will have a greater impact on capital value than a later one due to the time value of money (Havard, 2000). Possible outcomes at the break are; the tenant exercises the break and a rent void follows, the break is exercised but there is no void, or the tenant continues in occupation. Faced with such uncertainty the valuer might increase the ARY slightly on the assumption that the break will definitely be exercised (French, 2001). Here the ARY has been increased from 7% to 8%.

MR (£)	50 000	
YP perpetuity @ 8%	12.5	
Valuation (£)		625 000

If the lease had no break option and was valued using a 7% yield the capital value would be £714 286, so the yield adjustment leads to a 12.5% reduction in value. This approach is simple and benefits from a direct relationship with comparable evidence, assuming there is a sufficient amount available, but it hides a lot of assumptions (Havard, 2000). Another approach might be a modified term and reversion valuation where the ARY is adjusted by a lesser amount and a rent void is incorporated in the cash-flow after the break. The valuer needs to be sure (via market evidence) that the void duration is realistic. An advantage of this approach is that different yields can be used for the existing and new leases (Havard, 2000) but, again, only if justified by market evidence. The valuation below incorporates a void period of 1 year after the break option in year 5 and, in order to avoid double-counting, the yield has only been adjusted upwards to 7.5%. Clearly this results in a more optimistic valuation.

MR – first lease (£)	50 000	
YP 5 years @ 7.5%	4.0459	
		202 950
MR – new lease (£)	50 000	
YP perpetuity @ 7.5%	13.33	
PV 6 years @ 7.5%	0.6480	
		432 000
Valuation (£)		634 950

It is useful to look at the level of rental growth as a guide to the likelihood of the rent dropping at the time a break option might be exercised. The short-cut DCF valuation is explicit about the target rate and the growth rate and accurately values each part of the income flow in a reversionary investment. Havard (2000) argues that the target rate would probably need to be increased to reflect the added risk associated with investing in a short lease. The problem is that there are now a lot of assumptions to make and this could lead to increased valuation variance. Similarly a full (year-by-year) DCF valuation is even more explicit about assumptions and therefore may lead to even greater valuation variance; changes to each key variable (growth rate, exit yield, target rate, void period, holding period) in isolation have little impact on the valuation but taken together they do (Havard, 2000). Assuming a TRR of 10% and an ARY of 7.5%, this implies a growth rate of 2.88% per annum. A full DCF valuation of a short lease with a break clause is shown below. On a standard lease a rent of £50 000 per annum and a yield of 7.5% would produce a valuation of £666 667.

Year	Net cash-flow (£)	Implied growth rate of 2.88%	Estimated cash-flow (£)	PV £1 @ target rate of 10%	Discounted income (£)
1	50 000	1.0000	50 000	0.9091	45 455
2	50 000	1.0000	50 000	0.8264	41 322
3	50 000	1.0000	50 000	0.7513	37 566
4	50 000	1.0000	50 000	0.6830	34 151
5	50 000	1.0000	50 000	0.6209	31 046
6	0	0.0000	0	0.0000	0
7	50 000	1.1857	59 286	0.5132	30 423
8	50 000	1.1857	59 286	0.4665	27 658
9	50 000	1.1857	59 286	0.4241	25 143
10	50 000	1.1857	59 286	0.3855	22 858
11	50 000	1.1857	59 286	0.3505	20 780
11-perp.	50 000	1.3666	911 065	0.3505	319 323
Valuation (£)		13.3333			635 723

A difficulty with these modified ARY and DCF approaches is their inability to handle the possibility that the break option is not exercised (or if it is and there is no rent void). Under this assumption, in terms of the cash-flow, the flexi-lease is no different from a standard lease but because of the yield adjustment and void assumption the landlord will receive a financial bonus in comparison to a standard lease. The problem is uncertainty; the cash-flow has been made more uncertain by the flexi-lease and this uncertainty has a price. The dilemma for the valuer is trying to estimate that price. One solution to this problem is to produce a range of valuations under different scenarios; the break clause is/is not exercised, the rent void does/does not occur, a void lasts for 6 months, 1 year, and so on. This leads to a lot of valuations and, as a way of summarising the various outcomes, probabilities could be assigned to them and a weighted average 'expected' valuation calculated (French, 2001). It is possible to extend this simple 'discrete' probability analysis into a continuous probability analysis using simulation or option pricing and we will look at these approaches in Section 5.4.

5.3.2 Over-rented property investments

Over-renting occurs when the rent payable under a lease with upward-only rent reviews exceeds the MR. Some valuers value **over-rented properties** as perpetual cash flows at the passing rent when the lease is long, contains upward-only rent reviews and no break clause. Because of the higher risk associated with the element of rent that exceeds the MR, known as the **overage** or froth, other valuers use a layer (core and top-slice) approach, using an ARY based on rack-rented freehold comparables to capitalise the core rent (which is taken to be the MR at the time of the valuation) and a fixed income yield that reflects the covenant strength of the tenant to capitalise the top-slice or 'overage'.

For example, value a property let 4 years ago at a rent of £250 000 per annum on a 15 year lease with 5 year upward-only rent reviews. The current MR is £200 000 per annum. Comparable properties have recently sold for yields averaging 6%. Medium-dated gilts are yielding 5% and the investor's TRR for this property is 11%. The ARY (core and top-slice) valuation is as follows:

Core (market) rent (£)	200 000	
YP in perpetuity @ 6%	16.6667	
		3 333 340
Top-slice (overage) (£)	50 000	
YP 11 years @ 7%[a]	7.4987	
		374 935
Valuation (£)		3 708 275

[a]Gilt yield plus a 2% risk premium.

However, there are problems with this approach: first, the core rent is capitalised at an ARY that assumes 5 years to the next review but the property is reversionary and the growth potential is closer – consequently the approach over-values the bottom layer; second, there is a lack of evidence on which to base the overage yield; and third, no attempt has been made to estimate the length of time that the property will remain over-rented. To resolve the last problem many valuers capitalise the overage for the whole period that the tenant is contracted to pay it (Crosby and Goodchild, 1992). But if, as Martin (1991) points out, the MR grows each year and the overage reduces, the MR may overtake the contract rent before the end of the lease and part of the overage is capitalised twice – the property will be over-valued. This is illustrated in the Figure 5.4.

Even if the overage is capitalised until the first rent review after the MR overtakes the contract rent a (smaller) amount of double-counting still occurs. The layer approach is unable to calculate the corresponding reduction in the overage necessary to avoid this double-counting. One way to resolve this problem is to be explicit about growth in the rental income and project the MR at a growth rate to determine when it will overtake the contract rent. This growth rate can be implied from the relationship between the chosen ARY and target rate or it can be explicitly forecast. A DCF approach can then be used to capitalise the contract rent up to this cross-over point (or the next review thereafter) at the target rate and the uplifted MR is capitalised at an ARY from the cross-over point into perpetuity, discounted for the period of waiting, at the target rate – just like a short-cut DCF.

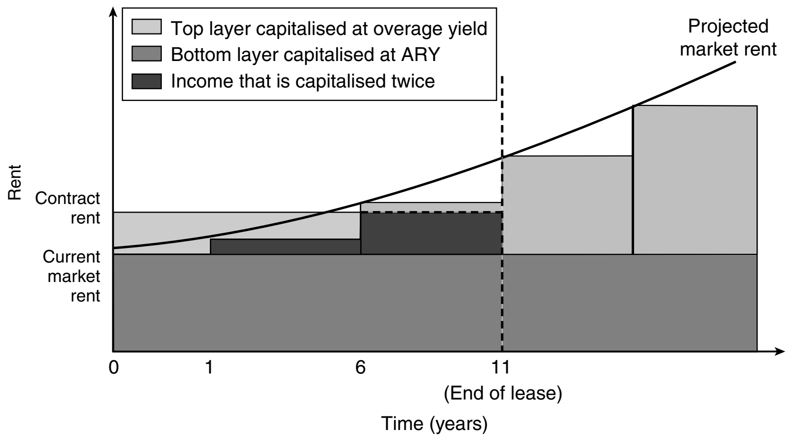

Figure 5.4 Over-rented property.

Continuing the example above, using a growth rate of 5.57% per annum, implied from the ARY of 6% and the target rate of 11%, the MR will grow to the following amounts at the next two rent reviews:

$$£200\,000 \times (1+0.0557)^1 = £211\,140$$

$$£200\,000 \times (1+0.0557)^6 = £278\,868$$

So the MR overtakes the contract rent between the first and second rent reviews and the growth-explicit short-cut DCF valuation is as follows:

Term (contract rent) (£)	250 000	
YP 6 years @ 11%	4.2305	
		1 057 625
Reversion to MR (£)	200 000	
FV 6 years @ 5.57%	1.3843	
YP in perpetuity @ 6%	16.6667	
PV 6 years @ 11%	0.5346	
		2 466 828
Valuation (£)		3 524 453

The valuation is lower than the layer approach above because the double-counting has not occurred and the use of a target rate to capitalise the term rent means that the problem of using a rack-rented ARY to value a bottom layer where the reversion is closer does not arise. A drawback of the growth-explicit DCF approach is the lack of comparable evidence to support the choice of rental growth rate and TRR which may need to be adjusted to reflect the covenant strength of the tenant, the length of the remaining lease term and the extent of the overage (Crosby, 1991). In between rent reviews rent is only subject to tenant (default) risk and if the contract rent is very high in comparison to MR for long periods (e.g. beyond the first rent review) then it is exposed to a greater degree of tenant risk. As such it may be more characteristic of a corporate bond-type investment issued by the tenant (Brown and Matysiak, 2000).

A property let at a headline rent is, in effect, over-rented and should, arguably, be valued as such. Revisiting the property described in the Section 4.2.1 on rent-free periods in Chapter 4, assume that a write-off period of 15 years (the lease term) is appropriate. This equates to a growth rate of 2.62% per annum which we can insert as an explicit growth rate into the capital valuation. If we also assume an ARY of 7% and a target rate of 10% the valuation of the freehold investment interest using a short-cut DCF technique would be as follows:

Headline rent (£)	200 000	
YP 13.5 years @ 10%	7.2382	
PV £1 1.5 years @ 10%	0.8668	
		1 254 814
Reversion to MR (£)	175 721	
FV £1 15 years @ 2.62% pa	1.4739	
YP perpetuity @ 7%	14.2857	
PV £1 15 years @ 10%	0.2394	
		885 763
Valuation (£)		2 140 577

To investigate the impact that the rent-free period has on capital value, assume the property has no rent-free period (apart from the normal fitting out period of 6 months), it is let at the real rent of £175 721 per annum (calculated in Chapter 4) and the ARY is 7%:

MR (£)	175 721	
YP perpetuity @ 7%	14.2857	
PV 0.5 years @ 7%	0.9667	
Valuation (£)		2 426 705

For the valuation of the property let at MR to equate to the DCF valuation of the property let with the rent-free period, the MR would have reduced from £175 721 to £155 002 per annum. So, because of the yield impact on capital value, incentives such as rent-free periods are preferable to reductions in the headline rent (Crosby and Murdoch, 1994).

Key points

- At the beginning of the twentieth century valuers would capitalise rent at an evidence-based initial yield. Initial yield evidence was obtained from the market and comparable to gilts plus a risk premium as there was no rental growth or inflation. By the mid-1970s rent reviews were introduced so that landlords could benefit from rising rents. The relationship between gilts and property yields was broken – property was now regarded as a growth

Key points (continued)

investment like equities but with a peculiar income growth pattern. A simple initial yield approach was no longer appropriate, particularly for valuations between reviews, therefore term and reversion, hardcore and top-slice and equivalent yield methods were devised.

- Structural changes in the economy during the 1990s brought about by low inflation, increased uncertainty, changing business structure, developments in ICT and globalisation led to a decrease in lease lengths, increased use of break clauses and other options, plus increased use of incentives. All of this leads to more complex valuations. Investors may now be faced with two options; investing in much shorter leases with break clauses or investing in sale and leasebacks to corporate occupiers. The latter may be 25-to 35-year leases and on inflation-linked rent reviews.
- In terms of valuation there are problems with the ARY technique when valuing properties let on flexi-leases, over-rented property and properties not let at MR due to inducements. A short-cut DCF technique solves many of the problems associated with the ARY technique and is mathematically consistent and explicit regarding the target rate and growth assumptions, at least until the first review. Its inputs are also largely derived from market evidence and should therefore produce a market valuation (Havard, 2000).
- With a full DCF, more assumptions have to be made and reliance on simple market ratios and other information is reduced – the valuation starts to become an appraisal. Such a method may produce a wider variation of answers depending on the assumptions made. Consequently a full DCF may be appropriate when valuing complex properties with few comparables.

5.4 Advanced property investment valuation techniques for dealing with uncertainy in valuations

5.4.1 *Valuation accuracy, variance and uncertainty*

Because of the market imperfections and inefficiencies in the property market referred to in Chapter 1, the expertise and experience of a valuer is required to form an opinion of value based on an assessment of value-significant influences. These influences may change and therefore a valuation is not a permanent part of the property. Analysis of market data only suggests what happened in the past and it is for the valuer to interpret these data to assess current market value. Valuers do not operate with perfect market knowledge, they must follow client instructions, make judgements, analyse information and respond to different pressures when preparing a valuation and all these factors influence the final valuation figure. Values can be difficult to assess due to the heterogeneity of property and the number of transactions that occur at prices that do not represent market values. Although the profession has sought to enforce more rigorous mandatory standards and practice statements, backed by detailed guidance notes, valuations of the same property conducted by different valuers will not always be the same and the valuation(s) may not necessarily equate to the agreed exchange price. The disparity in valuations of the same property is referred to as valuation variance and the discrepancy between a valuation figure and the exchange price is referred to as valuation inaccuracy. Valuation uncertainty is a recently coined phrase used to acknowledge the fact that valuation variance and valuation inaccuracy are inevitable consequences of the valuation process and recent research has attempted to quantify the degree of uncertainty that surrounds valuation. Market conditions and the type and location of property investments will influence the degree of uncertainty. There have been a number of studies that have investigated the degree of valuation inaccuracy and extent of valuation variance that occurs in typical property investment valuations and the Royal Institution of Chartered Surveyors (RICS) has considered ways of reporting valuation uncertainty when it is deemed appropriate.

5.4.1.1 *Valuation accuracy*

Brown (1985) examined the accuracy of valuations by regressing valuations on exchange prices for 29 properties where the sale price and preceding valuation were known and found a high correlation between valuations and prices. In 1988 similar regression techniques[1] were applied to a much larger sample of 1442 valuations and sale prices taken from the IPD (IPD/Drivers Jonas, 1988). This study and its update (IPD/Drivers Jonas, 1990) both found that valuations and prices were highly correlated. There have, however, been criticisms of the statistical validity of the regression analysis in these studies, particularly in relation to the problem of heteroskedasticity[2] (Lizieri and Venmore-Rowland, 1991). A longitudinal study of the accuracy of valuations is now funded by the RICS and conducted using IPD data. In 2004 RICS and IPD conducted an analysis of 984 valuations and subsequent sale prices of properties in the IPD databank.[3] The overall average price-value difference was 9.5% and 79% of valuations were within 15% of sale prices (RICS, 2005). These results were similar to those achieved in the preceding 2 years of the study and it may be tempting to suggest that valuation accuracy has reached its ceiling, but the results could also be explained by the rapidly rising market conditions over the past 2–3 years and valuations, which are backward-looking, failing to keep pace. It should also be noted that the IPD databank typically contains prime assets for which market evidence might be expected to be more readily available and of a more consistent nature than for lower grade property investments where incentives might be prevalent. Force is added to this argument when the valuations are weighted by value; the variation was smaller, producing an average difference of 8.1% instead of 9.5%, suggesting that valuations of higher value properties have been closer to sale prices. Regression analysis was used to detect any bias in the data, such as a tendency to over- or under-value. According to the regression analysis of the IPD data over the past 5 years, valuers consistently under-value and there may be several explanations for this: the market value assumptions preclude bids by special purchasers, vendors may selectively dispose of properties when bids are received above the valuation figure, vendors actively 'present' properties for sale to enhance bids, the growth assumptions used in the analysis may not pick up rapid market movements, or valuers may be inherently conservative and backward-looking.

5.4.1.2 Valuation variance

Hagar and Lord (1985) conducted a small experiment on ten valuers to investigate how much their valuations of a sample of two properties varied and to test their hypothesis that the range would be ±5% around the average valuation. Actually Hagar and Lord did not calculate an average but asked a valuer with experience of valuing the two properties to perform 'control' valuations instead. Their results showed valuation variance much greater than ±5% but, due to the sample size, the results cannot be regarded as conclusive. Brown (1985) examined valuation variance by taking a sample of 26 properties which had been valued by two different firms of valuers over a 4-year period. It was found that the valuations from one firm were a good proxy for the valuations of the other and that there was no significant bias between the two firms' valuations. Hutchison *et al.* (1996) undertook research into variance in property valuation, involving a survey of major national and local firms. The average overall variation was found to be 9.53% from the mean valuation of each property. They also found evidence to suggest that valuation variation may be a function of the type of company that employs the valuer and, specifically, whether it is a national or local firm. The study revealed that national practices produced a lower level of variation (8.63%) compared with local firms (11.86%) perhaps due to the level of organisational support, especially in terms of availability of transactional information.

Over the last few years there has been a significant amount of research into the causes of valuation variance. Kinnard *et al.* (1997) found that valuers conducting valuations for lending purposes experienced significant pressure from certain types of client, especially mortgage brokers and bankers. Gallimore and Wolverton (1997) found evidence of bias in valuations resulting from knowledge of the asking price or pending sale price. Gallimore (1994) found evidence of confirmation bias where valuers make an initial valuation, 'anchor' to this estimate of value and then find evidence to support it. The initial opinion of value or asking price was found to significantly influence the valuation outcome. In a survey of 100 lenders, finance brokers, valuers and investors Bretten and Wyatt (2001) found that the majority of factors believed to cause variance related to the individual 'behavioural characteristics' of the valuer. Variance can enter the valuation process at any stage from the issuing of instruction letters and negotiation of fees through to external pressure being exerted on the valuer when finalising the valuation figure. Following the Carsberg Report (RICS, 2002) the RICS Red Book now contains strict guidelines to reduce the likelihood of external pressure and the adoption of quality assurance systems in the workplace can help maintain acceptable standards. For example, terms of engagement must include a statement of the firm's policy on the rotation of valuers responsible and a statement of the quality control procedures in place. If a property has been acquired within the year preceding the valuation and the valuer or firm has received an introductory fee or negotiated the purchase for the client, the valuer/firm shall not value the property unless another firm has provided a valuation in the intervening period.

The courts have adopted the margin of error concept (the legal manifestation of valuation variance) as a means of establishing whether a valuer has been negligent. It has been established in UK courts since the first case on this point (*Singer and Friedlander v John D Wood and Company, 1977*) that a margin of ±10% around the subsequent transaction price (or some other notion of 'correct' market value) would be permissible. Crosby *et al.* (1998) is the recognised authority on the findings that link valuation variance, margin of error and the legal position adopted by UK courts: 38 High Court valuation negligence cases between 1977 and 1998 in which the margin of error had been an issue were investigated and the authors found the majority of judgements on the size of the bracket lie at 10% (26.1%) and between 10% and 14.99% (30.4%). Three causes for this variation were suggested. First, expert witnesses are unfit to present themselves as 'experts'. Second, the margin of error principle and the 'brackets' applied are too onerous a test for negligence, indicating that the margin should be increased. Third and regarded as the most likely, is because expert witnesses are being 'influenced' to produce a valuation to suit their client's particular need. Crosby *et al.* (1998), noted that

> judges sometimes reach a finding as to the true value of the property in question which agrees entirely with the opinion expressed by one of the expert witnesses. On other occasions, the judge's ruling may fall somewhere between the figures which the opposing expert witnesses have proposed.

The 'correct' valuation is therefore arbitrary and raises concerns over the reliability of the margin of error principle as a test of negligence. It also confirms the occurrence of variance by virtue of the imprecision displayed by experts and the subsequent judgement deemed necessary by the court. The continuing adoption of the margin of error principle provides formal recognition of the inevitability of valuation variance. Crosby *et al.* (1998) concluded that

> the margin of error principle, as it is presently applied by the English courts, is lacking in any empirical basis and indeed runs counter to the available evidence. Its use as a means of establishing negligence by a valuer is fundamentally flawed.

The standard of conduct expected of a professional valuer is not onerous but the courts continually fail to examine the processes involved in the calculation of the valuation and focus instead on the outcome. The authors suggest that the margin of error should be used as an early warning rather than a test of negligence.

5.4.1.3 Valuation uncertainty

Guidance Note 5 of the RICS Appraisal and Valuation Manual (RICS, 2003) suggests that valuation uncertainty can arise because of the inherent features of the property, the market place or the information available to the valuer. The following are examples of where valuation uncertainty is likely to arise:

- If the location or the physical characteristics of the property are unusual;
- The property is of a type for which there is little or no comparable evidence;
- Because of the number of input variables, properties undertaken using the profits or residual methods are very sensitive to the underlying assumptions.

Despite acknowledging these cases of what the RICS terms 'abnormal uncertainty', the RICS does not see the need for a quantitative measure of the degree of valuation uncertainty that a valuer might ascribe to a valuation, such as a confidence statistic, a range, or a mean and standard deviation. Instead, the RICS considers that the single estimate valuation could be accompanied by a qualitative comment in cases where uncertainty is thought to materially affect the valuation. The comment would indicate the cause of the uncertainty and the degree to which it is reflected in the reported valuation. The valuer might also comment on the robustness of the valuation, perhaps noting the availability and relevance of comparable market evidence, so that the client can judge the degree of confidence that the valuer has in the reported figure. Only for some properties does the RICS consider it appropriate to express the valuation as a range between upper and lower limits but, if a valuer can reasonably foresee that different values may arise under different circumstances, a preferable approach would be to provide alternative valuations on the basis of special assumptions reflecting those different circumstances. On other occasions where uncertain market conditions or other variable factors could have a material impact on the valuation, it may be prudent to provide a sensitivity analysis to illustrate the effect that changes to these variables could have on the reported valuation. This will be particularly appropriate where a residual method has been used.

Rather than express valuation uncertainty qualitatively, Lizieri and Venmore-Rowland (1991) argued that a valuation should not be regarded as a single value but rather as a point estimate within a range of values. Lavers *et al.* (1996), on the other hand, found that, with regard to commercial property valuations for lending purposes, the majority of lenders wanted the valuation expressed as a single figure. French and Mallinson (2000) suggested that, as well as reporting abnormal uncertainty, being explicit about uncertainty under normal valuation conditions is also potentially very useful to clients and valuers and they list items of information which should be conveyed when reporting uncertainty: the valuation figure, range and probability of the most likely observation and any skewness in the probability distribution. This suggestion and the view of Lizieri and Venmore-Rowland was confirmed by the findings of Bretten and Wyatt (2001) who found support amongst valuers and their clients for the reporting of a valuation figure in the context of a range rather than a point estimate.

It is to these quantitative measures of valuation uncertainty that we now turn. The range of enhancements to property investment valuation approaches discussed so far presume that the future or, more accurately, valuers' expectations of the future, can be predicted with a high level of confidence. Yields, MRs, the exercising of break options and the lengths of void periods are all input as single estimates. If the future were that predictable life would be pretty boring. Fortunately it is not and we need to consider ways to reflect this in our valuation models – more so now than ever before because of the greater diversity of lease arrangements flexi-leases produce. The first thing to point out is that input variables in a valuation cannot always be selected as absolutes. We have already thought about this when considering what might happen at the end of a short lease or at a break option in a lease – something that happens more and more frequently nowadays, but there are other ways too. Some of the techniques described in the sub-sections below will be considered in greater detail in Chapter 6 when we look at development appraisal but we need to have a look at them here too because those same techniques are being applied to the valuation of existing property investments (standing investments) as well as to new developments.

5.4.2 Sensitivity analysis

Sensitivity analysis investigates the impact of uncertainty on key input variables such as rent, target rate, ARY and rental growth rate by examining the degree of change in the valuation caused by a pre-determined change in one or more of the key input variables. Usually a margin of 10–20% either side of the expected values of the key variables is tested to measure the effect on value. A more sophisticated analysis may apply more realistic variations to the key variables; for example, more upside variation in rent in a rising market. Or different positive and negative percentage changes may be applied depending on the variable; for example, plus or minus 10% for rental value and plus or minus 2% for rental growth. Sensitivity analysis does not consider the likelihood of particular outcomes and the input variables are usually altered one at a time. The technique tends to confirm what we already know; that, because the ARY is an *all-risks* yield, small movements in it lead to large shifts in the valuation, but the process does require the valuer to think about the realistic limits on shifts in the input variables and does produce a range of valuations within which the actual price would be expected to fall.

To help demonstrate how sensitivity analysis works, let's just recap on where we have got to in terms of valuing freehold rack-rented and reversionary property investments, because we will use these as a basis for what follows. Table 5.11 provides some initial input values for key variables relating to ARY and DCF valuation techniques.

Table 5.11 Key variables.

Market information	
All-risks yield (ARY)	8.00%
Market rent (£)	250 000
Explicit-growth rate	2%
Property information	
Years to reversion (term)	4
Term (contract) rent (£)	200 000
Rent-review period	5
Term and reversion method	
Term yield	7.00%
Reversion yield	8.00%
Equivalent yield method	
Equivalent yield	7.96%
Core and Top-slice method	
Core yield	8.00%
Top-slice yield	8.50%
DCF method (short-cut and full)	
Target rate of return	10.00%
Implied growth rate	2.33%
Exit yield	8.00%

The valuations below use the information provided in Table 5.11 to produce a series of single point estimate valuations. The first valuation is of a rack-rented freehold property investment.

MR (£)	250 000	
YP in perpetuity @ 8%	12.5000	
Valuation (£)		3 125 000

The next valuation uses the term and reversion approach to value a reversionary freehold property investment.

Term (contract) rent (£)	200 000	
YP for initial term of 4 years @ 7%	3.3872	
		677 442
Reversion to estimated MR (£)	250 000	
YP in perpetuity @ 8%	12.5000	
PV £1 4 years @ 8%	0.7350	
		2 296 968
Valuation (£)		2 974 411

The equivalent yield is then determined using spreadsheet interpolation ('Goal Seek' in Excel). The result is an equivalent yield of 7.96% and this yield can be fed back into the valuation as a check.

Term (contract) rent (£)	200 000	
YP for initial term of 4 years @ 7.96%	3.3150	
		662 995
Reversion to estimated MR (£)	250 000	
YP in perpetuity deferred 4 years @ 7.96%	9.2457	
		2 311 416
Valuation (£)		2 974 411

For the sake of completeness this reversionary freehold is also valued using a core and top-slice approach.

Core rent (£)	200 000	
YP in perpetuity @ 8%	12.5000	
		2 500 000
Top-slice: uplift to estimated MR (£)	50 000	
YP in perpetuity @ 8.5%	11.7647	
PV £1 4 years @ 8.5%	0.7216	
		424 455
Valuation (£)		2 924 455

Then, moving from the ARY approaches to the DCF technique, the reversionary freehold is valued using the short-cut DCF approach.

Term (contract) rent (£)	200 000	
YP for initial term of 4 years @ 10%	3.1699	
		633 973
Reversion to estimated MR (£)	250 000	
Compounded over 4 years @ 2.33% pa	1.0965	
PV £1 4 years @ 10%	0.6830	
YP in perpetuity @ 8%	12.5000	
		2 340 481
Valuation (£)		2 974 454

And lastly the rack-rented freehold is valued using a full DCF.

Year	Net cash-flow (£)	Growth rate of 2.33%	Estimated cash-flow (£)	PV £1 @ target rate of 10%	Discounted income
1	250 000	1.0000	250 000	0.9091	227 273
2	250 000	1.0000	250 000	0.8264	206 612
3	250 000	1.0000	250 000	0.7513	187 829
4	250 000	1.0000	250 000	0.6830	170 753
5	250 000	1.0000	250 000	0.6209	155 230
6	250 000	1.1221	280 526	0.5645	158 349
7	250 000	1.1221	280 526	0.5132	143 954
8	250 000	1.1221	280 526	0.4665	130 867
9	250 000	1.1221	280 526	0.4241	118 970
10	250 000	1.1221	280 526	0.3855	108 155
10-perp	250 000	1.2591	3 934 728[a]	0.3855	1 517 008
Valuation (£)					3 125 000

[a]This is the projected rent capitalised in perpetuity at an exit yield of 8%, that is, (250 000 × 1.2591)/0.08.

We are going to concentrate on the reversionary investment first and look at the impact on the valuation of plus and minus 5% and 10% shifts in the MR estimate and the ARY estimate in the ARY equivalent yield model. We will then look at the same magnitude shifts in the target rate, MR and growth rate estimates in the short-cut DCF model. This sort of analysis can be set up on a spreadsheet and Table 5.12 shows the results of the downside or pessimistic shifts in the key variables using the ARY (equivalent yield) and Table 5.13 shows the results using the short-cut DCF.

So we can see how sensitive the valuations are to changes in these input variables. The ARY valuation is very sensitive to movements in the ARY whereas the DCF valuation is much less sensitive to changes in the target rate.

5.4.3 *Scenario testing and discrete probability modelling*

Scenario testing extends sensitivity analysis by taking a range of possible values for the key variables and combining them to produce a range of possible valuations. The difference between sensitivity analysis and scenario testing is that the latter examines the impact on value of changes to several variables simultaneously and therefore begins to give a more realistic representation

Table 5.12 Sensitivity analysis of reversionary freehold valuations (ARY equivalent yield).

Variable	Change (%)	Value change	Valuation	Change in valuation (%)
	–5	237 500	2 858 840	–3.89
MR	—	—	2 974 411	—
	–10	225 000	2 743 269	–7.77
	+5	8.36%	2 826 143	–4.98
ARY	—	—	2 974 411	—
	+10	8.76%	2 691 038	–9.53

Table 5.13 Sensitivity analysis of reversionary freehold valuations (short-cut DCF).

Variable	Change (%)	Value change	Valuation	Change in valuation (%)
	+5	9.50	2 970 854	–0.12
TRR	—	—	2 974 454	—
	+10	9.00%	2 967 146	–0.25
	–5	237 500	2 857 430	–3.93
MR	—	—	2 974 454	—
	–10	225 000	2 740 406	–7.87
	–5	2.21%	2 963 420	–0.37
Rental Growth	—	—	2 974 454	—
	–10	2.10%	2 953 408	–0.71

of how the key variables might respond to economic changes. It creates specific pictures (scenarios) of the future as a means of reflecting uncertainty. It is usual to test optimistic, realistic and pessimistic scenarios but special attention is paid by investors and lenders to the pessimistic scenario because, for obvious reasons, they are particularly concerned with the downside of the investment.

Let us look at the rack-rented freehold investment that has been valued using a full DCF model shown above. The rack-rent is £250 000 per annum, the target rate is 10%, the ARY (and exit yield) is 8% and the implied rental growth rate is 2.33% per annum. The valuation is £3 125 000. Now consider some discrete scenarios where the shifts in estimated MR, growth rate, ARY and exit yield shown in Table 5.14 are assumed.

This is an improvement on sensitivity analysis and allows the valuer to 'bookend' the valuation but it still does not give any idea of the likelihood that any of these discrete outcomes might actually occur. To do that we need to enter the scary world of probabilities! If we assign some measure of probability or likelihood to each scenario we could calculate a weighted average valuation. Take the three valuations in the scenario summary above, round them and add two more scenarios that fall in between the two extremes, as shown in Table 5.15. Note that neither the distribution of valuations nor the probabilities themselves have to be symmetrical about the middle or realistic valuation – in fact here we have a distribution of valuations that is skewed towards pessimism and a counter-balancing set of probabilities that are

Table 5.14 Scenario summary.

	Realistic	**Optimistic**	**Pessimistic**
Changing variables			
ARY (%)	8.00%	7.80%	8.20%
MR (£)	250 000	260 000	240 000
Growth rate (%)	2.33%	3.00%	1.50%
Exit yield (%)	8.00%	8.00%	9.00%
Valuation (£)	3 125 000	3 291 995	2 803 269

Table 5.15 Discrete scenarios with probabilities.

Scenarios	**Valuations**	**Probability (%)**	**Weighted valuation (val'*n* × probability)**
Pessimistic	2 800 000	2	2 800 000 × 0.02
Slightly pessimistic	3 000 000	18	3 000 000 × 0.18
Realistic	3 125 000	60	3 125 000 × 0.60
Quite optimistic	3 200 000	15	3 200 000 × 0.15
Optimistic	3 300 000	5	3 300 000 × 0.05
Weighted average valuation (£)	(Sum of weighted valuations)		3 116 000

Table 5.16 Risk and discrete probability modeling.

Property 1			Property 2		
Valuation (£)	**Probability (%)**	**Weighted valuation**	**Valuation (£)**	**Probability (%)**	**Weighted valuation**
2 800 000	2	56 000	–80 000	5	–4 000
3 000 000	18	540 000	2 000 000	20	400 000
3 125 000	60	1 875 000	3 500 000	50	1 750 000
3 200 000	15	480 000	3 700 000	20	740 000
3 300 000	5	165 000	4 600 000	5	230 000
Weighted average valuation (£)		3 116 000	Weighted average valuation (£)		3 116 000

skewed towards optimism. This highlights the main drawback with this type of analysis – a lack of objective market evidence on which to base selection of probabilities, even if the scenarios have been very carefully constructed.

The approach still relies on subjective assessments of scenarios and associated probabilities but the process does focus the mind on the likelihood of achieving predicted returns. For example, a prime shop property and an old factory may yield the same return but how likely is the latter to be achieved relative to the former? In other words, how risky is the return? Discrete probability modelling does not properly reflect the uncertainty or risk that might be associated with the expected cash-flows – it calculates an expected value rather than a measure of variation or uncertainty. To illustrate what this means, consider the property investment in Table 5.15 alongside another, these are named Property 1 and Property 2 in Table 5.16.

The weighted average valuations are identical and, at first glance, the most probable outcome for Property 2 is £3 500 000 compared to £3 125 000 for Property 1, but closer inspection reveals that the range (volatility) of valuations for Property 1 is £500 000 and for Property 2 it is £4 680 000 and with a 5% probability of making a loss! Clearly Property 1 is more attractive to the risk-averse investor. Such an extreme would rarely occur but it serves to make the point about the limitation of calculating a weighted average from a set of discrete outcomes.

5.4.4 *Continuous probability modelling and simulation*

It is unrealistic to assume a small number of discrete possible valuation outcomes. In reality there would be a range of outcomes best represented by a probability curve. If the frequency distributions or probability curves for predicted valuation outcomes for Properties 1 and 2 are assumed to be 'normally distributed' around the mean, Property 1 would have a narrower, more peaked curve indicating lower volatility whereas Property 2 would have a flatter, wider curve indicating higher volatility. Standard deviation measures this volatility; the smaller the standard deviation of a distribution the less volatile it is. See Appendix 5B (See Appendix 5B at www.blackwellpublishing.com/wyatt) for a little refresher on measures of central tendency, dispersion and probabilities.

Let's assume that we have asked 50 valuers to value Properties 1 and 2 from Section 5.4.2 and the mean valuation for Property 1 was £3 200 000 with a standard deviation of £500 000 and for Property 2 the mean valuation was £3 500 000 but with a much higher standard deviation of £1 000 000. The 'coefficient of variation' is a useful measure of volatility because it gives a percentage variance for one standard deviation either side of the mean and is useful for comparing projects whose expected values (means) are not equal. It measures dispersion relative to the mean. The coefficient of variation for Property 1 is 15.63% and for Property 2 it is 28.57%. Property 1 is less volatile by both standard deviation and coefficient of variation measures.

So far we have looked at assigning probabilities to the valuation outcomes but what about the values chosen for the key input variables? At the moment they are point estimates but could they not take one of a possible range of values with some more likely than others (Sayce *et al.*, 2006)? Would they not be better modelled as probability distributions? Now we enter a whole world of concurrent probability distributions of variables that might be correlated and our tiny little brains fail to cope with such complexity. We need computer power to help in the form of a simulation programme. Simulation enables valuers to assign probabilities to input variables in the valuation and run simulations of most likely combinations of values of these input variables in order to produce a probability distribution and associated confidence range for the output valuation. Statistics that quantitatively summarise the uncertainty surrounding the valuation output can then be calculated. Most notably these would include a mean valuation and a measure of dispersion, usually the standard deviation.

Simulation involves a series of steps:

Build a valuation model and identify key variables. The valuation might be constructed using an ARY or DCF technique and the best estimates of the input variables are likely to be used when constructing the model. These input variables can be classified as either deterministic variables, which can be predicted with a high degree of certainty, or stochastic variables, which cannot be predicted with a high degree of certainty. Generally the stochastic variables that have a significant impact on the valuation are the ones on which simulation is likely to be run. Deterministic variables might include the rent review period, purchase and management costs. Key stochastic variables will include the ARY, MR, rental growth rate and exit yield. The TRR is unlikely to vary. When looking at flexi-leases in particular it may be wise to simulate different void periods and associated costs too.

Ascribe a range of probable values or probability distribution for each key input variable. The key variables need to be represented as a probability distribution rather than a point estimate. A probability distribution is a device for presenting the quantified risk for the variable. Ideally the estimation of probability distributions for key variables would be based on empirical evidence but often the data are not available in a sufficient quantity to allow this. A pragmatic alternative is to gather opinions of possible values of each variable, along with their probability of occurrence, from experts. These expert opinions could then be used to select an appropriate probability function, of which there are many. The probability functions that are typically chosen are the continuous 'normal' distribution (in which case a mean and standard deviation would need to be specified) and the closed 'triangular' distribution (in which case the mode, minimum and maximum values would need to be specified). A useful characteristic of the triangular distribution is that, unlike the normal distribution, symmetry does not have to be assumed; the maximum and minimum values do not have to be equally spaced on each side of the mode. In this way the triangular distribution might offer a more realistic representation than the normal distribution if more upside or downside risk is expected.

The input variables may also be independent or dependent. An independent variable is unaffected by any other variable in the model whereas a dependent variable is determined in full or in part by one or more other variables in the model. Different degrees of interdependence can significantly affect the simulation result. It is therefore necessary to specify the extent to which the input variables are correlated. Sayce *et al.* (2006) note that significant research is needed in this area to establish an empirical base for correlation assumptions, particularly, as Byrne (1996) points out, correlations may be non-linear. This is especially pertinent in the case of development valuation, which we will look at in the next chapter, because, unlike the valuation of standing property investments, which typically involves a small number of key variables, development valuation can incorporate a large number of correlated input variables. McAllister (2001) points out that, in general, as correlation reduces, the mean and standard deviation increase, but this is not proportionate since the covariance also increases.

Run simulation. Having selected the key variables and their probability distributions the simulation can begin. Simulation refers to the method whereby the distribution of valuation outcomes is generated by recalculating the valuation model many times, each time using different randomly sampled combinations of values from within the parameters of the probability distributions of the key stochastic variables.[4] In other words, because some values of key variables will have a greater probability of being achieved than others, the sample selection procedure ensures that these values are simulated more frequently. This simulation process determines the range and probability of the valuation outcome.

Output. When setting up the simulation program the uncertain output variable in the valuation model would have been specified; invariably, this will be the valuation figure. The simulation results will provide information about the distribution of the output variable, including its central tendency (mean, median, mode), spread (range, standard deviation) and measures of symmetry (skewness) and peakedness (kurtosis). Regression analysis is also undertaken to rank the input variables in terms of their impact on the output valuation.

Let us look at two examples using the @RISK simulation software add-in to Microsoft Excel. The first example is a short-cut DCF valuation of a rack-rented freehold property investment recently let on conventional lease terms. Our best estimates of the key variables are an ARY/exit yield of 8%, a MR of £50 000 per annum and a rental growth rate of 2.5% per annum. An ARY valuation would produce a capital value of £625 000 and, assuming a TRR of 10%, a point estimate DCF valuation would generate a figure of £628 593 – a higher figure because the explicit growth rate of 2.5% was used instead of the rate of 2.33% implied by an ARY of 8% and a target rate of 10%.

MR (£)		50 000	
YP 5 years @ 10%		3.7908	
			189 539
Reversion to MR (£)	50 000		
Growth rate over 5 years @ 2.5%	1.1314		
		56 570	
YP in perpetuity @ 8%		12.5000	
PV £1 for initial term @ 10%		0.6209	
			439 054
Valuation (£)			628 592

We are now going to introduce some uncertainty into three key variables in the above valuation. The exit yield has a triangular distribution with a mode of 8%, a minimum value of 6.5% and a maximum of 9%. Both the MR and rental growth rate are normally distributed with a mean of £50 000 and standard deviation of £5000 in the case of the former and 2.5% and 1% respectively for the latter. Correlations between these variables are subjectively chosen and specified in Table 5.17.

The second example is an identical property but this time recently let on flexi-lease terms that incorporate a break option at the end of year 5. If we value this property using a short-cut DCF and assume a void of 1 year at

Table 5.17 Correlation matrix.

	ARY/exit yield	Market rent	Growth rate (explicit)
ARY/exit yield	1		
Market rent	–0.5	1	
Growth rate (explicit)	–0.5	0.5	1

the end of year 5 but keeping the values of all other variables the same, the valuation would be as follows:

MR (£)		50 000	
YP 5 years @ 10%		3.7908	
			189 539
Void for 1 year			
Reversion to MR (£)	50 000		
Growth rate over 6 years @ 2.5%	1.1597		
		57 985	
YP in perpetuity @ 8%		12.5000	
PV £1 for initial term plus void @ 10%		0.5645	
			409 135
Valuation (£)			598 675

Clearly, uncertainty surrounds the exercise of the break option and so simulation can allow this uncertainty to be quantified by representing the length of any void period that may occur after the end of year 5 as a probability distribution, here based on a normal distribution with a mean of 1 year and a standard deviation of 1 year.

Ten thousand iterations were run and the valuation outputs from the conventional and flexi-leased properties are shown below. The optimistic skew of the exit yield distribution has increased the mean valuation of both properties approximately £15 000 above the original point estimates. In both cases the standard deviation around the mean was just under £100 000. Figure 5.5 and the skewness value in Table 5.18 reveal that both output distributions are positively skewed, the property let under standard lease terms slightly more so. This is because the exit yield, which is itself positively skewed, explains more of the variation in value of the standard let investment, as shown in Table 5.19.

The 'regression' columns in Table 5.19 report standardised regression (β) coefficients for the input variables. A coefficient of 0 indicated no significant relationship between the input and the valuation while a coefficient of +1 or

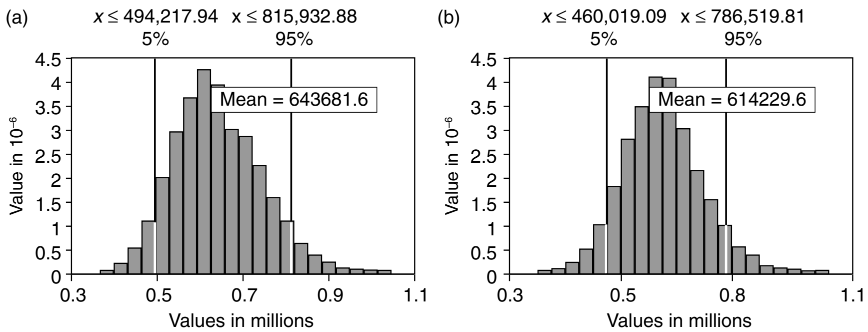

Figure 5.5 Valuation probability distributions: (a) distribution for valuation of standard lease and (b) distribution for valuation of flexi-lease.

Table 5.18 Summary statistics.

	Standard lease	Flexi-lease
Mean (£)	643 682	614 230
Std Dev (£)	98 214	99 581
Skewness	0.3573	0.3134
Kurtosis	3.1323	3.1511

Table 5.19 Sensitivity.

	Standard lease		Flexi-lease	
	Regression	Correlation	Regression	Correlation
Market rent	0.651	0.918	0.612	0.875
Exit yield	–0.314	–0.737	–0.290	–0.710
Growth rate (explicit)	0.224	0.686	–0.265	–0.220
Void period	—	—	0.247	0.681

–1 indicates a +1 or –1 change in the standard deviation of the valuation for a +1 or –1 change in the standard deviation of the input. The 'correlation' columns report Spearman's rank-order correlation coefficient which can also vary between –1 and +1. These two extremes would indicate a perfectly negative and a perfectly positive correlation respectively whereas a coefficient of 0 indicates no correlation at all. It is important to examine the signs of the coefficients to be sure that the correlation is in the right direction. If the R^2 value reported by the regression results is high the relationship between the input and output variables is linear. If the R^2 value is low the relationship is non-linear and rank-order correlation should be analysed to determine the sensitivity of the model. Remember, though, that this is an illustration and, because of the lack of evidence to support the correlations between the input variables, it should not be regarded as a practical application.

5.4.5 Arbitrage

Simulation techniques allow the impact of uncertainty surrounding key input variables to be examined. One variable was not considered to be uncertain, however, and this was the TRR. The assumption was that the investor would know what this was and would stick to it. But what if the target rate is not set in stone over the holding period for the investment? Different portions of forecast cash-flows – the rent agreed for the first 5 years and the rent agreed at the first rent review for example – may have different levels of risk and therefore different target rates (Appraisal Institute, 2001). To consider the valuation implications of this we can use an option pricing technique known as arbitrage.[6]

The arbitrage valuation technique was first applied to property investment by French and Ward (1995) and is based on the premise that each part of a cash-flow from any investment should be valued by comparing it with other assets with similar risk characteristics (Havard, 2000): think of how you might 'lay off' a bet. Like the short-cut DCF valuation technique, when applied to property, the arbitrage valuation technique adopts a term and reversion approach. But, instead of using a yield based on property risk factors to capitalise the term income, the arbitrage approach uses a low discount rate that is based on tenant risk factors. In other words the term income is regarded as comparable to income from an illiquid bond based on the tenant's default risk. The value at reversion is based upon the capitalisation of the rent at an ARY, representing a notional sale at this point. The arbitrage technique differs from the short-cut DCF technique in its approach to the deferral of this notional sale value and the rental value on which it is determined.

The short-cut DCF technique uses a constant (average) growth rate to project the MR at the review date and a single target rate to discount all cash-flows, and this can distort the risk profile into the future by putting less relative weight on distant cash-flows (Crosby, 1996). The arbitrage approach questions the appropriateness of using a single target rate and suggests that it should be based on debt and equity components of the financing package used to purchase the investment. French and Ward (1995) derive two target rates that can be used to discount the term and reversion components of a reversionary property investment. Two rates are justified on the basis that the term income is known and therefore certain, whereas future reversions must be estimated. From the tenant's viewpoint the term rent is certain over the initial term and so the financial liability is equivalent to interest payments on any fixed income loan and can therefore be valued using a discount rate appropriate for such payments. From the landlord's viewpoint an additional risk premium might be appropriate to reflect illiquidity and tenant default risk.

Consider a rack-rented freehold property investment let at £100 000 per annum and for which the ARY is 8%. From the tenant's perspective there is a contractual obligation to pay £100 000 per annum rent for the first 5 years. If the bank lending rate is 10% per annum, then

$$\pounds 100\,000 \times \text{YP 5 years @ 10\%} = \pounds 379\,079.$$

In valuing the second term the tenant is not certain of the rent in 5 years' time but needs to estimate the amount that should be invested now to provide funds to offset the rent liability when known. Arbitrage principles suggest that the tenant should find an asset with the same risk characteristics as the rent liability and then value the second term by investing in that asset at today's price. The arbitrage investment is to invest in a similar freehold and, to match the liability of the second 5-year term, the tenant would notionally invest in the proportion of the freehold which would provide the first 5 years of rent, that is, £379 079/£1 250 000[7] or 30.326% of the value of the freehold. This notional investment is 'held' for 5 years and then 'sold'.

Whatever the value of the freehold the sum realised will, assuming constant yields and rates, be sufficient to offset the financial liability of the second term. So if the tenant owns 30.326% of the freehold he would receive 30.326% of the rent each year, that is, £30 326 per annum which, when capitalised for 5 years at 10%, equals £114 961. The total cost of the investment is therefore £379 079 - £114 961 = £264 118. This process can be repeated to value subsequent terms but if, as French and Ward (1996) suggest, we assume that the arbitrage valuation must equal a more conventional valuation then we can use the following formula to derive a reversion rate known as the 'deferred capital yield' (DCY) either by iteration or by formula.

By iteration. A conventional ARY valuation of the property, assuming an ARY of 8% and a MR of £100 000 per annum, would produce a capital value of £1 250 000. This valuation needs to be broken down to differentiate the target rates used to capitalise the known and unknown cash-flows. As before, assume a discount rate of 10% for the known rent over the first 5 years. Knowing the capital value of the cash-flow over the first 5 years (£379 080), the overall valuation (£1 250 000) and that the rent on reversion will be capitalised into perpetuity at ARY of 8%, it is possible to calculate the appropriate DCY by iteration (Havard, 2000).

Term (£)	100 000	
YP 5 years @ 10%	3.7908	
		379 080
Reversion (£)	100 000	
YP perpetuity @ 8%	12.5000	
PV £1 5 years @ 7.49%[a]	0.6967	
		870 920
Valuation (£)		1 250 000

[a] Rate obtained by iteration

By formula.

$$1 + \text{DCY} = \text{Term}\sqrt{\frac{1}{1-(r_a \cdot \text{YP term}, r_f)}} \quad [5.13]$$

where Term = period to revision

r_a = ARY

r_t = low-risk TRR

Substituting the values as above into Equation 5.11 the DCY is 7.49% (French and Ward, 1996).

To recap, the arbitrage valuation technique is based on the assumption that the value of the whole is equal to the sum of the term and reversion components. The capital value of the unknown rent after the first review is calculated by capitalising the term rent using a low-risk yield and deducting this from the total capital value of the subject property or a comparable. The resultant reversionary value can be analysed for the DCY. An arbitrage valuation thus proceeds as follows:

$$\text{PV} = (\text{CR} \times \text{YP for term}) + (\text{MR} \times \text{YP in perpetuity} \times \text{PV for term})$$
$$= \left[\text{CR}\times\left(\frac{1-(1+r_t)^{-n}}{r_t}\right)\right]+\left[\frac{\text{MR}}{r_a(1+\text{DCY})^n}\right] \qquad [5.14]$$

where

CR = contract rent for term
MR = Market rent
r_t = TRR
n = period to next rent revision

French and Ward (1996) show how the arbitrage method can also be applied to the valuation of reversionary property investments. A comparable (but this time reversionary) freehold property investment let one year ago at £80 000 per annum has been valued using a short-cut DCF technique. The target rate is 12% and the ARY is 8%, giving an implied rental growth rate of 4.63% per annum.

Term rent (£)	80 000	
YP 4 years @ 10%	3.1699	
		253 590
Reversion to MR	100 000	
PV 4 years @ 7.494%	0.7490	
YP perpetuity @ 8%	12.5000	
		936 190
Valuation (£)		1 189 780

However, the DCF approach still fails to recognise the different risk profiles of the known and unknown cash-flows. Using the DCY calculated above for the rack-rented comparable, the arbitrage valuation is

Term rent (£)	80 000	
YP 4 years @ 12%	3.0373	
		242 984
Reversion to MR	100 000	
Growth @ (1.0463)^4	1.1985	
PV 4 years @ 12%	0.6355	
YP perpetuity @ 8%	12.5000	
		952 058
Valuation (£)		1 195 042

This is a growth-implicit arbitrage valuation. A growth-explicit arbitrage valuation can be produced by inflating the DCY at the implied rental growth rate g (4.63%) to produce a capital yield (CY) as follows:

$$(1 + CY) = (1 + DCY) \times (1 + g) \quad [5.15]$$
$$(1 + CY) = 1.07494 \times 1.0463$$
$$CY = 12.47\%$$

And the valuation would be as follows:

Term (£)	80 000	
YP 4 years @ 10%	3.1699	
		253 590
Reversion (£)	100 000	
Growth @ 4.63% pa	1.1985	
YP perpetuity @ 8%	12.5000	
PV £1 4 years @ 12.47%	0.6250	
		936 328
Valuation (£)		1 189 918

Table 5.20 compares full growth-explicit DCF valuations of the reversionary property investment assuming (1) target rates based upon arbitrage principles and (2) a constant TRR.

Table 5.20 Growth-explicit DCF and arbitrage valuations.

		(1) Arbitrage		(2) DCF	
Year	**Rent (£)[a]**	**YP**	**PV (£)**	**YP @ 12%**	**PV (£)**
0–3	80 000	4 years @ 10% = 3.1699	253 589	4 years @ 12% = 3.0373	242 987
4–8	119 859	5 years @ 10% discounted @ 12.47% for 4 years = 2.3687	283 912	5 years @ 12% discounted @ 12% for 4 years = 2.2909	274 584
9–13	150 316	5 years @ 10% discounted @ 12.47% for 9 years = 1.3159	197 812	5 years @ 12% discounted @ 12% for 9 years = 1.300	195 399
14–18	188 514	5 years @ 10% discounted @ 12.47% for 14 years = 0.7310	137 823	5 years @ 12% discounted @ 12% for 14 years = 0.7376	139 049
19–23	236 418	5 years @ 10% discounted @ 12.47% for 19 years = 0.4061	96 026	5 years @ 12% discounted @ 12% for 19 years = 0.4185	98 950
24–perp	296 495	Perp @ 8% discounted @ 12.47% for 24 years = 0.7441	220 629	Perp @ 12% discounted @ 12% for 24 years = 0.8235	244 163
Valuation (£)			1 189 791		1 195 132

[a]Growing at 4.63% per annum.
Source: French and Ward (1995).

Although the valuations are roughly the same, the values of each term differ. The arbitrage value for the first term is higher because the income is discounted at the low-risk yield of 10% rather than the uniform target rate of 12%. Then, in the arbitrage approach, subsequent terms are discounted at 12.47% rather than 12%. It could be argued that if the rent passing was significantly below MR the discount rate applied to the term could be even lower to reflect the reduced risk of tenant default. The arbitrage approach thus requires consideration of the risk profile of the term and reversion incomes. When valuing rack-rented freeholds both approaches will produce the same answers.

The arbitrage method of property valuation has not been widely adopted in practice. The selection of an appropriate target rate for the known initial term rent is subjective (French and Ward, 1996) and the technique still requires good comparable evidence, although not so much if the period to reversion is long and therefore a significant part of the rental value is capitalised at a bond rate (Havard, 2000). Simulation and arbitrage valuation techniques push the boundaries of market data analysis to the limits. That is no reason to dismiss them; rather it should act as a spur to the continued improvement of property data so that these techniques may be developed and refined.

Key points

- Valuation variance has been identified in empirical studies of valuation practice. The courts accept that a degree of variance is inevitable through the adoption of the margin of error principle. To an extent, because of the expert witness process in the courts, it is axiomatic that valuers also accept the existence of valuation variance. Indeed, Crosby *et al.* (1998) state that the margin of error principle was conceived by expert witnesses who are, by definition, experienced valuers.
- A valuation accuracy of 100% is an unattainable goal. Annual research funded by the RICS helps quantify the extent of valuation inaccuracy and demonstrates a degree of openness that is to be applauded. Only by learning more about the nature and extent of valuation inaccuracy, can methods to deal with valuation uncertainty be developed.
- Simulation is a logical extension of sensitivity analysis, scenario testing and discrete probability modelling that adds a quantitative measure of risk to a single point estimate of value. It does this by assigning probability distributions to key input variables. The drawback with this type of analysis at the moment is the lack of evidence on which to base these distributions and any correlations between them. Nevertheless, the discipline of building a 'risk aware' simulation model can lead to a deeper understanding of the nature of the property investment under consideration.
- Short-cut DCF and arbitrage approaches go some way to assigning the correct value of to various parts of the cash-flow but do not address the issue of volatility of future cash-flows.

Notes

1. Ordinary least squares but this time regressing price on value, normalising for size by using price or value per unit area as last time but, unlike Brown, using these in their untransformed state rather than taking logs.
2. When using statistical techniques such as ordinary least squares regression a number of assumptions are typically made. One of these is that the error term has a constant variance. This will be true if the observations of the error term are assumed to be drawn from identical distributions. Heteroskedasticity is a violation of this assumption.
3. The valuations were adjusted for market movement between the valuation date and sale agreement date by increasing or decreasing the valuation according to movements in the IPD capital growth index for the relevant market sector. Percentage difference between valuation and sale price was found by applying the following formula: Difference = (price – adjusted valuation)/price.
4. Havard (2000) provides a useful illustration of how this process works in the case of two variables; annual rental growth rate and exit yield to which discrete probabilities have been assigned. The simulation programme randomly selects from the cumulative probability distribution for each variable. If we assume 22 was randomly selected for rental growth and 67 for the exit yield this would equate to 3% rental growth rate and an exit yield of 9.25%. These sample values are then input into an iteration of the valuation model.
5. Rank-order correlation calculates the relationship between two data sets by comparing the rank of each value in a data set. To calculate rank, the data are sorted from lowest to highest and assigned numbers (ranks) that correspond to their position in the order.
6. Arbitrage refers to the activity of market traders who compare the prices of similar assets, selling or buying to realise profits if the prices are out of line with one another. The principle is best known in foreign exchange markets.
7. Market rent of £100 000 per annum capitalised at an assumed freehold ARY of 8%.

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