DEVELOPING A GROUND RENTAL 'INDIFFERENCE' VALUATION MODEL

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Abstract

Ground rentals are commonly valued by applying a 'ground rental rate' as a percentage per annum to an assessed vacant land value.

This paper presents a ground rental valuation model to determine the appropriate 'ground rental rate' based on equating the long-term costs of building on leasehold land versus freehold land.

The model solves for a ground rental that produces equivalent net present values at differential freeholder's and lessee's required investment returns. These returns reflect the different risks and returns in ground leasing compared to outlaying capital to buy land for erecting a building as an investment property.

Keywords:

Ground leases –– ground rental valuation – land value – rental percentage – leasehold investment returns – leasehold v freehold investment – indifference

Contents

1. Introduction

1.1 Background – Ground Rental Models

This paper seeks to rationalise and respond to criticism of the use of various economic ground rental valuation models presented and applied in recent precedent-setting ground rental determinations, particularly in New Zealand.

These models conform to two broad types as described by Jefferies (1997a):

- *Lessor's return* (or supply) models that seek to determine a ground rental that will give a lessor a desired long-term real rate of return on the land value; and
- *Lessee's affordability* (or demand) models that seek to determine what ground rental a prudent lessee can fairly afford to pay for the use of the land.

These models which approach the problem exclusively from either a supply (lessor's) or demand (lessee's) side of the market fail to produce any equilibrium position. Paradoxically, they are usually promoted respectively – by advocates for lessees arguing how little lessors need to receive by way of rental due to annualising future returns from assumed land value capital gains; whilst equally puzzling – by advocates for lessors who argue from a position of seeking from the lessee a share of the income returns to be made from using the land.

Typically, lessor's return models are based on an assumption that the present value of the cash flows from ground rentals and future land value upon termination (or renewal) must equate the current land value. The author argues that where these cash flows are discounted at a lessor's expected or required rate of return this will not determine the current land value – but the lessor's interest in the land. It is widely recognised in practice that this will usually determine an asset value less than the unencumbered freehold land value.

This paper, presents a ground rental valuation model that is based on equating the long-term investment benefits and costs of developing leasehold versus developing freehold land. It is based on the hypothesis that an investor in a new building development would be *indifferent* as between being a freehold owner and buying the land at its current market value or alternatively becoming a leaseholder and leasing the land at a fair annual ground rental (subject to the terms of the lease). This is a bold assumption in that it assumes there is no ‘stigma’ or cultural aversion amongst investors to owning leasehold land interests rather than freeholds. In the model there is an implied assumption that these affects, if any, are reflected in the leaseholder’s risk premium.

1.2 Market Constraints, Returns and Fairness

In a free market both sides must agree resulting in a land sale or a new ground lease or the land remains in the hands of the owner – undeveloped or for the owner to develop.

With a new ground lease, the expected net rental income[1] after paying ground rent must reflect an acceptable return to the leaseholder for the changed risk as between investing as a ground lessee versus being a freeholder.

The owner-developer will weigh up the relative risks/returns compared to leasing versus owning the land.

The difference between the leasehold v freehold tenure including any impact of institutional leasehold ownership constraints is reflected in the respective required investment returns[2]. This difference will determine the ground rental that is affordable and fair making the decision *indifferent* as to lease or to buy the land.

Finding that fair annual ground rental, expressed as a percentage of the land value within real world market restraints and returns is the focus of this paper.

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[1] Assuming the ground lessee will ’on lease’ the completed development or where to be owner-occupied, notional rental equivalent benefits are assessed.

[2] The model implies that market efficiency exists in the local land market, that alternative sites are available for freehold purchase from which land value evidence is available. Where lessors hold monopoly or a few lessors hold oligopoly position on the supply of vacant land this may not be so and premium ground rentals may be able to be extracted from developers.

1.3 Structure of Paper

The main sections of the paper are as follows:

- A literature review
- An outline of the ground rental model debate
- A presentation of an indifference ground rental model proffered as a solution
- An outline of the steps necessary in the application of the model in practice
- The limitations and modifications necessary to apply the model
- International considerations, issues and conclusions
- Spreadsheet application of model in the Appendix. This is a spreadsheet template Short-cut DCF form of the model. The template contains a case study applying the model to solve a practical valuation problem. Sensitivity analysis is applied to test the responsiveness of the model to variations in key inputs.

2. Literature Review

Ground leases, of various types, are found in the United Kingdom, Netherlands, Sweden, Australia, New Zealand, United States (principally Hawaii) and other countries (Freeman, 1993).

Little is published in the international real estate, valuation or appraisal literature on the specific problem of ground rental valuation. Especially lacking are papers on ground rental rates and their determination or modelling.

Some older articles are merely anecdotal descriptions of specific ground lease renewals (Barth, 1974; Halper, 1973; Weiss, 1971). Others expound procedural advice that assumes the ground rental rate is given or simply based on current valuation practice or precedent (Kahn, 1974; Brooks, 1996; McMichael, 1925, 1974). Some articles describe local ground rental valuation practices and methodologies like those found in Victoria, Australia (Dickson & Carsile, 1994); San Francisco, United States (Carneghi, 1994) and New York, United States (Konikoff, 2004; Rothenberg, 2003).

There are passing references to different types of ground lease tenures, but not how ground rents are valued, in various countries in recent comparative international valuation texts (Adair et al, 1995; Gelbtuch, et al., 1997). Freeman (1993) started some research into comparative international ground rental valuation practices raising some of the methodological problems involved but did not complete the research to the point of offering any solutions.

Generally the ground rental rate is set, in New Zealand, by latest arbitration determination precedent; pragmatically adopting industry "ruling rates" (Bayleys Research, 1998 [3]). Valuers tend to increase (or reduce) these in line with rising (or falling) interest rates generally (Jefferies, 1995) with variations for different lease terms, types of land and locations.[4]

Various ground rental models are criticised and new models in response developed in a number of unpublished conference and research papers on the topic (Jefferies, 1992, 1995, 1997a & 1997b; Mitchell, 1997).

In New Zealand, in particular, there have been many major arbitration hearings to fix the rental under perpetually renewable ground leases with resulting awards setting valuation benchmarks and methodologies. On appeal to the Courts, the judiciary have also set legal precedents as to the manner in which leases can be interpreted that affect valuation practice and methodology. Some of these practices have been questioned on economic and financial grounds (Haslett, 1989; Brown, 1996) applying lessor's return type modelling. In arbitrations involving disputes over ground rentals the appropriateness of various ground rental valuation models has arisen, (Mitchell, 1997; Jefferies, 1992, 1995, 1997a). These criticisms have

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[3] as at November 1997 (still current)

Review Periods	Perpetual Lease (% per annum)
5 Years	6.0 %- 6.5%
7 Years	6.5% - 6.75%
21 Years	7.0% - 7.5%

Source: Bayleys Research

[4] In New Zealand terminating leases generally are set at 0.5% p.a. lower than perpetually renewable leases; residential ground leases at approx 1% p.a. lower than commercial and industrial leases; while there are regional differences tending to be slightly higher where some lessors hold monopoly land holding positions or where land

focussed on the limitations and perceived errors in the use of lessor's return models, whilst developing alternative models relating trends in interest rates to ground rental rates.

The seminal research work developing lessee affordability approaches to ground rental took place in New Zealand (Jefferies, 1995, 1997a). The approach used in the 1997 paper was based on finding an empirical relationship between trends in interest rates and lagged changes in ground rental percentages rates. Based on a critique of this paper the model was further developed in Sweden (Mandell, 1999). The New Zealand model had, however, been further independently developed (Jefferies, 1998) shifting the focus to apply a lease - or - buy lessee's affordability approach.

Application of finance theory and real option pricing models to real estate leases generally, where ground leases are a special application, have assumed a lessor's return type model (Grenadier, 2003; Dale-Johnson, 2001; Lally & Randall, 2004).

Grenadier deals with ground leases very briefly, within the context of modelling real estate lease options and his focus is on valuing leases using a game-theoretic variant of real options under demand uncertainty.

Dale-Johnson's model focuses on determining alternative contractual arrangements that would produce *optimum contract terms* as Pareto preferred by owners of the leased fee (lessor's) estate and the leasehold (lessee's) interest.

Lally & Randall focus on applying option pricing valuation methodology relying on the volatility in rural land prices to measure the impact of ratchet clauses on the ground rental rate (given exogenously) using rural forestry licence rental data in New Zealand. The effect of a full ratchet clause is found to reduce the ground rental rate by approx one percentage point and partial ratchets by 80% of that.

In this paper, the author further develops the lessee affordability model concept using a ground rental model on a lease-or-buy decision determined on the basis of a differential

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value growth expectations are lower than main centres.

between the required returns for freehold v leasehold ownership.

This has required consideration of not just the land (on which all previous models are solely based) but also buildings and/or improvements which would put the land into its most productive use and the required returns of investors in such buildings. Only one other author (Dale-Johnson, 2001) specifically does this in using a ground rental model, but not to determine the ground rental – but which he uses to analyse redevelopment options and incentives. Dale-Johnson's model takes the ground rental, land value, building rental, building value, capitalisation rate and required returns (without any difference in risk between leaseholder and freeholder) as exogenously given. The author's model herein is distinguished by only taking the land value, capitalisation rates and required returns (including a lessee's risk premium) as being exogenously given.

3. Outline of the Ground Rental Model Debate

3.1 Ground Rental Valuation Problems, Procedures and Errors

Though generally ground rental models can be useful in determining appropriate ground rental rates for new ground leases, the more common valuation problem arises, on review or renewal, where the parties are not in a free market position, being contractually bound by the terms of an existing ground lease.

Typically, a sitting lessee is either subject to a rent review or exercising a renewal imposed by the terms of the lease. In the latter case the sitting lessee is also a captive one, due to the high investment in buildings and improvements on the land, and must renew the lease to protect that investment. Typically there is no provision for compensation for the value of the improvements, should the lessee not exercise the right of renewal and/or the lease terminates. The rental needs to be determined in accordance with the lease provisions – normally by valuation and in event of dispute settled by arbitration (or other forms of dispute resolution).

In New Zealand such ground leases have usually been created over 21 or more years ago and may have been previously renewed for a number of similar terms. Intermediate rent reviews may apply at (variously) 5, 7, 11 year intervals to be fixed "at a fair annual rental excluding the value of any *(specified)* improvements" or words to similar material effect. Other definitions found in New Zealand include the ground rental being based on "unimproved value" or "land exclusive of improvements".

Complicating the practical valuation and rental determination process is that such lands are frequently held by lessors under statutorily defined powers, definitions, terms of lease constraints and procedures.

Similar types of leases are found in many countries, however this paper is focused on New Zealand "Glasgow leases" created around the turn of the 19th/20th Century through to the mid 1980's which provide for perpetually renewable terms (Jackson, 1999).

These ground leases pose unique problems as the freehold land never reverts to the lessor and thus intrinsic capital gains in land value can only be reflected in rental increases at review or renewal of the ground lease. This factor therefore invalidates the application of a *lessor's return* ground rental model that relies on a terminating lease assumption where the lessor's full capital gain through reversion of the land is assumed. When such future land value reversion is computed into the model (instead of a perpetually renewable steam of future ground rentals) to satisfy the lessor's assumed required return on the Lessor's asset value – it has the effect of reducing the ground rental calculated to be paid by the lessee. Hence its frequent use by lessee's advocates in ground rental disputes.

A more fundamental error, in a lessor's return ground rental model (i.e. Brown, 1996; Grenadier 2003; Lally & Randal, 2004) is that they are premised on the hypothesis that the current freehold land value at the commencement date is the same as the lessor's interest value[5] (which if properly valued produces an irresolvable circular argument). The ground lessor's required return applied to determine the value of the lessor's asset – the lessor's interest – is immaterial in determining the fair ground rental. Based on the lessor's required return, once the ground rental is set (or estimated in future reviews), the lessor's interest is capable of valuation. The latter asset value flows from the ground rental – not the other way round.

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[5] Intrinsically and intuitively this can't be true – as 'something' is 'missing' in a leasehold and 'gone' from the freehold by the very nature of the change in tenure. The 'right to use' is transferred to the lessee.

The land value upon which the ground rental is based is usually different from – usually higher than – the lessor's interest value[6]. Considerable empirical evidence exists for this (Jefferies, 1991, 1997b). Dale-Johnson (2001) also axiomatically acknowledges this, though his model does not distinguish between a leaseholder's and freeholder's (nor lessor's) required return as he adopts the same discount rate for valuing each respective owner's asset value, i.e. in his model the lessor's or lessee's interest.

Thus, it is argued by the author, that the answer to determining a fair annual ground rental rate, to be applied to a given land value, theoretically and in practice, is logically determined from the demand side or lessee's affordability type model and using a lease-or-buy model that follows valuation and financial theory.

Determining an appropriate and workable model has not been easy (Jefferies, 1992, 1995, 1997a, 1998; Mandell, 1999). This paper attempts to further advance this on-going search towards a valid and defendable solution.

3.2 Ground Rental Determination Methodologies

Traditionally, in most countries, valuers assess ground rentals by applying a "ground rental rate" or percentage per annum to the property's land value at the beginning of the review or renewal term. Disputes may arise over the appropriate basis for and value of the land itself, especially where in built-up areas where there is a paucity of vacant land sales, but that is not the problem dealt with in this paper. Disputes less frequently arise over the appropriate ground rental rate to apply, which is the focus of this paper.

It follows that once the appropriate land value (LV) and annual ground rental rate (GR%) is determined — the ground rental (GR) can be calculated as:

[6] Normally the lessor's interest value as a proportion of the land value will decline, where there is land value growth, during term and build up again as the next review or renewal is approaching. The exception is, when, during the term land values decline to such an extent that the ground rental paid is 'over-rented', the lessor's interest value can equal or exceed the then current land value but will decline as the next review or renewal approaches.

Ground Rental (per annum) = Land Value × Ground Rental Rate

or abbreviated to: $GR = LV \times GR\%$ (1)

There are other methodologies for valuing ground rents. A "classic" or comparative method relies on comparable open market or new ground rental evidence. A key practical problem is that market data is typically unavailable, of insufficient volume or on non-comparable lease terms. The validity of comparisons with any available recent reviews or renewals of comparable existing ground leased properties can be challenged as lacking an "objective" or "open market" test. Such ground rents, if in comparable locations and on similar lease terms, have invariably been determined on the above (Equation 1) basis. The "comparison" leads to a circular "valuer-led" or "umpire-determined" self-perpetuating ground rental rate basis that lacks fundamental market testing and objectivity (see Section 5.4).

Alternative approaches using residual ground rental calculations based on a hypothetical development of the land allowing for returns on the building investment are possible. These are, however, often criticised or rejected by umpires on the grounds that they are open to significant unreliability. The validity of land residual approaches is questioned, due to the number of assumptions required, i.e. building type, scale, cost, occupancy terms, rentals and operating expenses. An additional assumption is required as to the return on the capital invested in the building *only* that significantly affects the residual ground rental calculation. The resulting ground rental is highly sensitive to small variations in many of these inputs. The method suffers from being highly subjective and is not favoured as a reliable method of determining ground rentals. Additionally, these residual rental return approaches are not usually tested against the resulting land value assuming a freehold ownership, so that the methodology is firmly supported by market land value evidence.

The model developed herein, involves a hypothetical optimum building development but largely overcomes many of the above criticisms by the use of Capital Value to Land Value and to Improvement Value ratios, coupled with market capitalisation rates to calculate building rentals that are exogenously and reliably determined from empirical market evidence. The model also requires, as a first step, reconciliation of a defendable residual land value as being in line with current market vacant land sales evidence.

Some leases and, in some countries, legislation "prescribe" a formula for assessing the amount of the rental or a set percentage or ground rental rate to be applied to a defined land value (Jefferies, 1996a). In these circumstances the fairness or otherwise of the resulting ground rental is over-ridden by the contract or prescriptive provisions.

This paper specifically addresses the problem where no prescribed methodology or formula applies under the terms of the lease, nor by any governing legislation or regulation. Provided the land value can be determined, the problem reduces to the appropriate methodology to determine a fair ground rental rate.

4. An Indifference Ground Rental Rate Valuation Model

4.1 Concept and Outline

This ground rental valuation model equates the long-term benefits and costs of developing leasehold land *versus* freehold land. It assumes a prospective investor in buildings would be *indifferent* as between leasing land at a fair annual ground rental or buying the land.

The model is based on hypothetical freehold residual valuation methodology.

It is presented using established discounted cash flow valuation techniques but the technique used is not an essential feature of the model. It could equally be applied using other techniques such as option pricing valuation methodologies such as Dale-Johnson (2001) and Grenadier (2003) use.

It relies *firstly* on being able to justify, on a simplified freehold residual valuation methodology, a current market land value, satisfying a freeholder's required return.

It *secondly*, uses the same set of development assumptions, to derive a residual ground rental valuation subject to the terms of lease, satisfying a leaseholder's required return.

The model is structured to express the ground rental as a percentage rate of the freehold land value.

4.2 The Model Defined

This model 'solves' for the *ground rental rate* that equates as "indifferent" the net present value (NPV) of net cash flows from investment in buildings on leasehold land (LH) given specific lease terms – with the alternative of investing in buildings by purchasing the freehold land (FH), given a land value (LV).

Both scenarios' cash flows will be the same, *excluding* the ground rental in the case of the leaseholder and *excluding* the land outlay in the case of freehold land purchase.

The key feature is that it 'solves' for a ground rental rate using a *differential* lessee's required investment rate of return (Y_{LH}) from the freeholder's required investment rate of return (Y_{FH}). These respective rates of returns reflect the *different risks* in ground leasing land compared to outlaying capital to buy land for erecting a building as an investment property, the riskier leasehold investment requiring an added risk premium (rp) i.e. (Y_{LHrp}).

The basic *indifference* model is expressed using the above abbreviations:

PV of LH net cash flows (incl GR) ≡ PV of FH net cash flows (incl. LV) (2)

In net present value (NPV) terms, the cash flows are discounted at the respective leaseholder's required return (Y_{LH}) and the freeholder's required return (Y_{FH}). The ground rental that produces the indifference solution is found by solving for the GR in Equation 2 that makes this equal zero:

NPV of LH cash flows = NPV of FH cash flows = 0 (3)

Subject to: $Y_{LH} > Y_{FH}$; and $Y_{LHrp} > 0$

In both scenarios the potential highest and best (allowable) uses, estimated building costs, entrepreneurial risk, tenant demand or competing supply risks and thus estimated building net rental cash flows (excluding ground rental) will be the same.

A leaseholder will only benefit from any estimated land value growth during the review term due to the fixed term ground rental but the PV of this is computed into the ground rental paid. The lessee will pay increases in ground rentals as from future reviews or renewals. Offsetting that, the leaseholder does need to outlay the cost of buying the land. Both leaseholder and freeholder face the same uncertainties and risks for the demand for space, building costs, building rentals, vacancies and un-recovered costs.

This difference is determined by using risk-adjusted *leasehold v. freehold expected investment* returns as discount rates over the economic building life or term of lease (if terminating). For the NPVs of the LH and FH scenarios to equate and thus for the investor to be indifferent as between the lease-or-buy alternative, the differential present value of the estimated net building only cash flows should equate the land value at the commencement of the lease.

This is the *essence* of this model and distinguishes it from lessor's return models used by other authors (i.e. Haslett, 1989; Brown, 1996; Mandell, 1999; Dale-Johnson, 2001; Grenadier, 2003; Lally & Randall, 2004) and from previous affordability models (Jefferies, 1992, 1995, 1997a, & 1998).

Expanded freehold v leasehold scenarios and model implementation

In a typical **leasehold scenario** the present value of the ground rent at commencement of the ground lease is calculated by the following PVs discounted at the *leaseholder's* required rate of return:

1. CV_{cLH} = PV of the net cash flows from the fully let building (CV_{LH})
2. *Less* PV_{LHCom} = PV of building (outlay) (IV) at completion of the construction period (Com)
3. *Less* PV_{LHRU} = PV of rental vacancies from completion to being fully rented up (RU)
4. *Equals* the PV of the investment at commencement (PV_{LH}) including the PV of the ground rental in perpetuity (PV_{LHgr}).

When the land is to be developed to its optimum use which produces a freehold residual land value in line with market evidence then in NPV terms:

$$\text{NPV}_{\text{LH}} = \text{CV}_{\text{cLH}} - \text{PV}_{\text{LHCom}} - \text{PV}_{\text{LHRU}} - \text{PV}_{\text{LHgr}} = 0 \tag{4}$$

In a typical **freehold scenario** the residual value or present value of the land at commencement of a ground lease is calculated by the following present values (PVs) discounted at the *freeholder's* required rate of return:

1. CV_{cFH} = PV of the net cash flows from the fully let building (CV_{FH})
2. *Less* PV_{Com} = PV of building value (outlay) (IV) at completion of the construction period (Com)
3. *Less* PV_{RU} = PV of rental vacancies from completion to being fully rented up (RU)
4. *Equals* the PV of the investment at commencement (PV_{FH}) including the land value (LV_c).

When the land is to be developed to its optimum use which produces a freehold residual land value in line with market evidence then in NPV terms:

$$\text{NPV}_{\text{FH}} = \text{CV}_{\text{cFH}} - \text{PV}_{\text{Com}} - \text{PV}_{\text{RU}} - \text{LV}_{\text{c}} = 0 \tag{5}$$

The indifference model in Equation 3 i.e. $NPV_{LH} = NPV_{FH} = 0$ is therefore expanded as solving for the GR that equates the net present value of the leaseholder's and freeholder's cash flows that equal zero:

$$\text{CV}_{\text{cLH}} - \text{PV}_{\text{LHCom}} - \text{PV}_{\text{LHRU}} - \text{PV}_{\text{LHgr}} = \text{CV}_{\text{cFH}} - \text{PV}_{\text{Com}} - \text{PV}_{\text{RU}} - \text{LV}_{\text{c}} = 0 \tag{6}$$

Present values and indifference valuation methodology

A prospective investor should be indifferent as between ground leasing the land or alternatively buying land as a freehold investment over the estimated building's life. A ground rental set at a fair annual rental or buying the land should calculate to equal net present values, being zero where the land was available at fair market price (= LV_c).

If the land is used for its highest and best use, or optimum use, the calculated residual freehold land value should equate the fair market value of the land confirmed by comparative sales analysis.

In both the above leasehold v freehold scenarios, Items 1, 2, & 3 have the same estimated cash flows except the leaseholder's present values will be lower due to a higher leaseholder's required rate of return. As the CV_{LH} will be lower than the CV_{FH}, i.e. $CV_{LH} < CV_{FH}$, due to the higher leasehold capitalisation rate $E_{LH} > E_{FH}$, due in turn to the higher leaseholder's required rate of return $Y_{LH} > Y_{FH}$, there will be an initial comparative 'loss' on completion of the building to the leaseholder. This is built into the model in that the same IV at completion is used both to determine the building rentals and the PVs of the respective outlay on the building. Reflected in the differential between $PV_{LHCom} < PV_{FHCom}$.

As the frequency and timing of ground rental and building rentals will differ, and as the completion period and rent-up period will be in part years (or months), the model in equations 4, 5 & 6 are expanded to allow for both frequency and timing of cash flow. The present values of all the cash flows are calculated separately on the appropriate per payment period basis in the Excel template model. Allowances are made for time delays in cash flows from lease commencement to building start, to building completion with payments spread over the construction period and rental receipts over the vacancy period to being fully rented-up. A sample copy of this template model with a case study included is attached in the Appendix.

Required rates of return (required yields Y) defined

Given a freeholder's (FH) annual required return of Y_{FH} per annum and a leaseholder's (LH) required risk premium of Y_{LHrp} per annum, the leaseholder's annual required return is:

$Y_{FH} + Y_{LHrp} = Y_{LH}$ per annum.

If building rentals are paid b times per annum the respective freeholder's and leaseholder's per period effective required return rates are:

$y_{FHb} = (1+ Y_{FH})^{(1/b)} - 1$; and $y_{LHb} = (1+ Y_{LH})^{(1/b)} - 1$.

If the ground rental is paid p times a year the leaseholder's effective per period ground rental (outlay) discount rate is:

$y_{LHp} = (1+ Y_{LH})^{(1/p)} - 1$

Though this lessee's return or discount rate is used in the ground rental model, it can also be used to value the lessee's interest in the ground lease.

Similarly, once the lease is created the freeholder becomes a lessor and given a reduced lessor's required return rate of Y_{LO} per annum[7], the effective per period lessor's return is:

$y_{Lop} = (1+Y_{LO})^{(1/p)} - 1$

Though this lessor's return or discount rate is not relevant to, nor used in the ground rental model, it would be used to value the lessor's interest in the ground lease. It is included here for completeness only.

Estimated growth rates, present and future rental, capital, improvement and land values

The completed freehold value of the development fully let or capital value (CV) less the (then) land value (LV) gives the (then) added value of the buildings or improvements (IV): i.e. CV – LV = IV. The ratio of IV:LV represents the relative amount of the capital value contributed by these components of the completed freehold capital value.

The present value, as at the date of land purchase or date of ground lease commencement, of the capital value is defined as CV_c. Similarly the present value at commencement of the lease of the completed IV is defined as IV_c; and the present value of the LV as LV_c.

[7] The reduced risk arises from the terms of the ground lease, the increased security of the lessors' income return, reduced volatility in the potential income (ground rental) and added security of the lessees improvements on the land, in the event of failure by the lessee to pay the rental. Therefore $Y_{LO} < Y_{FH}$

Given an estimated land value growth rate of LV_g per annum, the effective land value growth rate per ground rental payment period is $lv_{gp} = (1+LV_g)^{(1/p)} - 1$; and per building rental payment period is: $lv_{gb} = (1+LV_g)^{(1/b)} - 1$

The current market building costs plus normal holding costs, (i.e. rates, unrecovered OPEX) plus normal expected builder's or developer's profit equate the added value of the IV on completion. Thus the CV_{FH} will be the estimated fully let net building rentals R_r capitalised at the freehold fully let capitalisation rate E_{FH},

i.e. $$\frac{R_r}{E_{FH}} = CV_{FH} \quad (7)$$

Financial holding costs are included due to the DCF discounting at the required return rate.

Local property market data should provide empirical evidence of a normal ratio of IV:LV and thus CV:LV. The market should similarly provide evidence of the required freehold rates of return and fully let capitalisation rates E_{FH}; or the latter can be calculated using short-cut DCF formulae (Equation 12) as used in the spreadsheet template model. Comparable sales provide evidence as to market land values LV_c as at the commencement date of a ground lease. It is not therefore necessary to explicitly estimate the R_r, IV, or CV as at the building completion date as they can be endogenously based on the land value at commencement, LV_c.

Given the number of years to the building being fully let as RF years then the number of discounting periods to completion is RF × b = rfb; the estimated fully let building rentals R_r and the building value IV can be expressed in terms of LV_c as follows:

$$R_r = (CV : LV \times LV_c \times E_{FH}) \times (1 + lv_{gb})^{rfb} \quad (8)$$

$$IV = (IV : LV \times LV_c) \times (1 + lv_{gb})^{rfb} \quad (9)$$

Therefore, the capitalised building rental value CV_{FH} is:

$$\frac{R_r}{E_{FH}} = CV_{FH} = (CV : LV \times LV_c) \times (1 + lv_{gb})^{rfb} \qquad (10)$$

This is the key relational equation from which the building rentals R_r drives the endogenous cash flows in the model.

The leasehold capitalisation rate is also derived but is only used to determine the completed leasehold building investment value.

Capitalisation rates

Leasehold capitalisation rate

The estimated building net rental annual growth rate is defined as R_g; the effective per period growth rate as $rgb = (1+R_g)^{(1/b)} - 1$; the building rental review terms as B_r years or $B_r \times b =$ brb rental periods; and the leaseholder's required return (as before) at y_{LHb} per period. Further, assuming rental payments in advance; then defining the per rental period market leasehold capitalisation rate e_{LHb} for a fully let building investment value (assuming nil ground rental) [8]can be calculated. This is achieved using the standard present value formula for the present value of an ordinary annuity when payments change at a compound rate following regular rent reviews as follows:

$$e_{LHb} = \left[y_{LHb} - \left(y_{LHb} \times \frac{(1+rgb)^{brb} - 1}{(1+y_{LHb})^{brb} - 1} \right) \right] \times \frac{1}{1+y_{LHb}} \qquad (11)$$

The second term $\frac{1}{1+y_{LHb}}$ in Equation 11 converts the capitalisation rate for the rental payments in advance. Thus the annual fully let leasehold building capitalisation rate is:

$e_{LHb} \times b = E_{LH}$

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[8] N.B. The PV of the leasehold ground rental, PV_{LHgr}, is deducted in the indifference model Equation 6.

Freehold capitalisation rate

Similarly calculated, using the freeeholder's required return (as before), y_{FHb} per period. Assuming the same net building rental payment frequency, payments in advance; and by defining the market capitalisation rate for a fully let leasehold building investment as E_{FH} per annum, the per building rental period freehold market capitalisation rate e_{FHb} is calculated as follows:

$$e_{FHb} = \left[y_{FHb} - \left(y_{FHb} \times \frac{(1+rgb)^{brb} - 1}{(1+y_{FHb})^{brb} - 1} \right) \right] \times \frac{1}{1+y_{FHb}} \tag{12}$$

Thus the annual fully let freehold building capitalisation rate is:

$e_{FHb} \times b = E_{FH}$

Ground rental capitalisation rate

The ground rent would normally be paid at different frequencies and review terms than the receipt of net building rentals. Given the ground rental is paid p times a year the present value of the ground rental to the lessee needs to be calculated.

Leaseholder's ground rental capitalisation (outlay) rate

The ground rental review terms is defined as Grr years or $Grr \times p = grp$ rental periods. Assuming payments in advance; given the effective per ground rental period leaseholder's required return rate as y_{LHp} (as before); and defining the leaseholder's ground rental capitalisation (outlay) rate as E_{gr} per annum; the leaseholder's effective per period ground rental (outlay) capitalisation rate e_{grp} is calculated as follows:

$$e_{grp} = \left[y_{LHp} - \left(y_{LHp} \times \frac{(1+lv_{gp})^{grp} - 1}{(1+y_{LHp})^{grp} - 1} \right) \right] \times \frac{1}{1+y_{LHp}} \tag{13}$$

Thus the annual freeholder's ground rental (outlay) capitalisation rate is:

$e_{grp} \times p = E_{gr} =$

The capitalised ground rental at the above E_{gr} rate, i.e:

$$PV_{LHgr} = \frac{GR}{E_{gr}} \tag{14}$$

This represents the present value of the ground rental outlays to the leaseholder in perpetuity.

Freeholder's notional ground rental capitalisation (outlay) rate

A similar calculation to the above, given the effective per ground rental period freeholder's required return rate as y_{FHp}; and defining the freeeholder's ground rental capitalisation (outlay) rate as E_{FHgr} per annum; the leaseholder's effective per period ground rental (outlay) capitalisation rate e_{FHgrp} is calculated as follows:

$$e_{FHgrp} = \left[y_{FHp} - \left(y_{FHp} \times \frac{(1+lv_{gp})^{grp} - 1}{(1+y_{FHp})^{grp} - 1} \right) \right] \times \frac{1}{1+y_{FHp}} \tag{15}$$

Thus the annual freeholder's ground rental (outlay) capitalisation rate is:

$e_{FHgrp} \times p = E_{FHgr}$

The capitalised ground rental at the above E_{FHgr} rate, i.e:

$$PV_{FHgr} = \frac{GR}{E_{FHgr}} \tag{16}$$

This represents the present value of the ground rental to the freeholder in perpetuity. This is purely a notional figure as the freeholder will in fact own the land and not pay any ground rental. Its relevance to the basic model is theoretical only as being the PV of the ground rentals if there is no leaseholder's premium and would compute to equal the LV_c (see the penultimate paragraph of Section 5.5).

Similarly, for completeness, the value of the ground lessor's interest, at commencement of the ground lease can be valued using the lessor's required return Y_{LO}, and using similar equations to 15 and 16 above, will produce a per ground rental payment period and annual lessor's capitalisation rate respectively of $e_{LOgrp} \times P = E_{LOgr}$. Thus the ground lessor's interest at commencement of the lease will be $PV_{LOgr} = \frac{GR}{E_{LOgr}}$.

5. Application of the Model

For the model to work in practice it requires a minimum of assumptions that materially affect the outcome. Nevertheless there a number of considerations required, some of which can be dismissed as not having a material affect on the lease-or-buy outcome as their discounted differential will show an immaterial affect on the differential NPVs.

This allows the model to proceed, in application, by making market based assumptions relying on the valuer's experience and judgement backed up by empirical evidence of those critical assumptions that drive the model. Each critical aspect is dealt with.

5.1 Step 1: Determining Building Density, Capital Value and Rental Income

Typically, the value of any existing building(s) on the land is to be disregarded in determining the rental under the terms of the ground lease. This is frequently a legal requirement to ensure the rental is assessed on the value of the land only, without regarding the existing building erected on the land or its current use. In determining the ground rental, however, the valuer needs to have regard to the hypothetical optimum "highest and best" or "most probable" potential use that justifies the current value of the land. This may require consideration of alternative uses and a range or mix of legally allowable uses. This normally introduces almost irresolvable complexity leading to inaccuracy if using a hypothetical land residual valuation approach (see under Section 3.2). In this ground rental model, provided empirically justified building density in terms of the IV:LV rate is adopted, the actual use and physical scale is largely immaterial as both lease-or-buy estimated cash flow scenarios are equal.

This simplification avoids the need and complexity of modelling a specific building and its scale, costs, uses and values. Given a market land value multiplied by such a ratio and applying a normal market based initial (fully let) freehold capitalisation rate, produces fully let market net building rentals.

The typical IV:LV ratio can be ascertained empirically based on analysis of comparable types of building developments in the market. Further, acceptable variance in this ratio is unlikely to have a material effect on the ground rental rate, as in PV terms both FH and LH scenarios are only marginally differentially affected, (see the Appendix).

5.2 Step 2: Confirming the Land Value – the PV of the Freehold Cash Flows

A data set of realistic and empirically based model inputs needs to be determined that results in a present value of the freehold investment cash flows that derives a residual land value approximating a market comparison based land value. This is an essential test of the model's ability to replicate the market and to give robustness to the model.

Alternatively, using an independently assessed market freehold land value as an initial outlay, other data inputs can be used falling within realistic parameters that produce a net present value (NPV) of zero, applying the freeholder's required return.

It is important that the land value is valid by comparison to direct available land value evidence from comparable freehold land sales. Trial and Error, (Goal Seeking or Solver spreadsheet) techniques within defined freehold investment risk and return criteria and other data input parameters (in a spreadsheet application) can be used to arrive at a realistic and feasible set of data inputs that produce a supportable current market land value (see case study in Appendix).

5.3 Step 3: The PV of the Leasehold Cash Flows

Once the above Step 2 above is achieved, then trial and error (Goal Seeking or other techniques) solve for the ground rental, using the same data inputs except the higher leaseholder's required return to meet the "indifference" test applying the model.

This will be the ground rental (GR) that equates the present value of the estimated net rental cash flows from the leasehold v. freehold scenarios as in Equation 2, or produces the NPV = 0 in Equation 3. From this ground rental the fair annual ground rental rate (GR%) is calculated as follows:

$$GR\% = \frac{GR}{LV_c} \times 100 \tag{17}$$

5.4 Fair Annual Ground Rental

The ground rental produced should satisfy the requirements of being the "fair annual ground rental" or meeting similar definitions, e.g. "market ground rental". It is fair that this should apply to the relevant review period or renewal term of the lease based on the information set existing at the commencement, review or renewal date.

When re-applying the model at subsequent reviews any changed outcomes from the pro-forma model will be replaced by the then future estimates thus adjusting for any market based and realistic input changes at that time.

The model is a forward looking 'expectations' model. It does not rely on the past performance of the ground lease investment, nor compensates for any past miss-pricing, but relies purely on future expectations. Any error in the estimated and required returns or movements in these inputs over the review terms are reflected in the risk element in the required returns for the term. At subsequent reviews the application of the model will re-balance the "indifference" between the leasehold and freehold scenarios. It will adjust for any changes in then future expectations while updating the rental for any actual land value growth since the last review date. The land value then applied in the model will result in a new fair ground rental to apply over the next review term, and so on to the termination of the lease or over perpetually renewable terms if that applies.

As the model is totally an expectations model, it is not encumbered by past ground rental settlement precedents that plague traditional valuation methodologies. It allows a fresh inquiry on reasonable basis and logically defendable as to what a prudent lessee could fairly afford to pay by way of ground rental as from the commencement of a new lease or renewing an existing lease instead of alternatively buying the freehold. This presents a rational way of beating the cycle of 'valuer-led' – 'umpire-determined' precedent setting or administrative cum legislative prescription based ground rental rate setting that has plagued some countries, especially New Zealand.

5.5 Required Leaseholder's and Freeholder's Return Analysis

The required risk-adjusted investment returns on the respective capital required for investment in the building(s) for a leaseholder, will differ from that required by a freeholder for investment in the land plus building(s).

The leaseholder's risk premium (Y_{LHrp}) reflects the building development and investment risk transferred from the freeholder to the leaseholder when creating the lease. The lessee is usually obligated to undertake development of the land (if not already improved) subject to the lessor's approval of use, type, timeframe, etc.

From the leaseholder's perspective the premium is required compensation for the building development and investment risk, without the offsetting compensation of the land value growth and its prospective capital gain to offset long-term building depreciation.

The lessee is bound to pay the rental irrespective of the degree of success or changes in the entrepreneurial risks and outcomes in carrying out and/or managing the development on the land. Such rental is normally unable to be deferred or postponed and if not paid the lessor can re-enter and take possession of the lessee's improvements and terminate the lease – without compensation under typical lease terms in New Zealand. This provides a very secure income stream for the lessor who faces very low risk but equally increases the risk to the lessee. (See earlier footnote 7 under Section 4.2 – Required rates of return).

In addition, leaseholders are likely to face increased financing costs as lenders will impose stricter mortgage terms, often involving an increase in mortgage lending interest rates compared to a freehold security, and/or lower loan-to-value mortgage ratio, especially where the lessor will not subordinate their interest to the mortgagee in event of the lessee's default under the mortgage. North American lenders usually impose additional conditions on leasehold borrowers (Rothenberg, 2003; Kronikoff, 2004). This aspect, in itself will justify a higher leaseholder's required return to cover the increased interest rate on the borrowing required for the building development.

The creation of leasehold tenure splits the returns related to the land and the building investment and in one sense leasing the land has an aspect of cheaper financing than for the freehold. However, that comes at an increase in risk partly due to the potential imbalance between land value growth and building income growth and the usually inevitable aging and obsolescence in the building, particularly as the building reaches the end of its economic life. To the leaseholder this is not offset by increases in land value. Further there is the risk that land value growth LV_g will exceed building rental growth R_g, adding to the disparity of the returns between a freeholder and a leaseholder.

The model assumes that the ratio of required returns between the freeholder and leaseholder remains constant during the review term of the lease, but assumes any rebalancing will be adjusted at each review or renewal.

This increased risk can only be reflected in a higher required leaseholder's rate of return compared to a freeholder's, i.e. by the leaseholder's risk premium, for the same intensity of capital investment in the building component of the prospective development.

The existence of and extent of leaseholder's risk premium is the most critical input factor in the model. As is shown later in the Appendix the ground rental is very sensitive to changes in this risk premium.

The leaseholder's risk premium determines the magnitude of the differential present values of the leasehold v freehold net building rentals over the economic life of the building(s). This in turn affects the level of the affordable fair annual ground rental.

Ideally this risk premium should be able to be derived from DCF analyses of sales of comparable types of leasehold versus freehold properties. This can present practical problems especially where there is thin trading in improved ground leaseholds also where, due to the owner/occupier nature of sales of otherwise comparable leasehold properties, sales based return analysis is not possible or purely hypothetical.

The required returns, where sufficient sales evidence exists, are derived from market data for fully let leasehold building capitalisation rates (initial income returns after ground rental). The methodology required applies the same long term growth assumptions as reflected in alternative fully let building capitalisation rates (Equations 11 & 12).

A measure of the leaseholder's risk premium can be indicated[9] by the corresponding (offsetting) reduced ground lessor's interest returns shown by analysis of sales of ground lessor's interest investments compared to freehold (land and building) investments. Ground lessors do not take on the entrepreneurial building and management risk that a freehold or leasehold investor does. (See footnote 7 earlier, leading to an assumption of a freeholders risk premium Y_{FHrp} compared to a lessors required return, with $Y_{FH} = Y_{FO} + Y_{FHrp}$).

Empirical evidence from research in New Zealand (Jefferies, 1997b) of ground (only) lessor's interest returns compared to overall returns from prime freehold (land and building) investments indicates that this differential is within a range of 1% to 3% p.a. By implication, to allow for increased risk, lessees' required returns would intuitively show a greater premium, i.e. as between freehold and leasehold building investment.

The leaseholder's risk premium is the most important factor in this model as it drives the differential and thus the fair ground rental rate required to meet the "indifference" test between the leasehold and freehold scenarios. This is an area for further empirical research to determine the extent of this premium in the market in applying this model in any particular case.

In the highly unlikely event that there is no leaseholder's risk premium then the leaseholder's and the freeholder's required returns will equate and the ground rental rate will be the same freeholder's ground rental capitalisation rate, i.e:

Equation 13 = Equation 15, i.e. $E_{gr} = E_{FHgr}$

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[9] This does not mean that the freeholder's risk premium is equivalent to the leaseholder's risk premium. Logic would indicate that the latter is likely to be higher, i.e. $Y_{LHrp} > Y_{FHrp}$

Under these conditions the indifference model will collapse to be similar to (but not the same as) the lessor's return model, with the important difference that is a freeholder's and not a lessor's required return that is used to compute the ground rental rate. Where, implicitly, the freeholder's return is higher than a lessor's required return the ground rental rate will be higher than a lessor's return model will calculate.

The author cannot, however, conceive how a leasehold investment in buildings only on leasehold land for which there is a priority ground rental payment outlay obligation, no long term enjoyment of land value growth and increased entrepreneurial risk would not require a greater return than freehold investment on the same land and in the same buildings. Thus a leaseholder's risk premium should intuitively and logically always apply. This is the crux of this model as compared to a lessor's return model and earlier forms of the lessee's affordability model.

6. Limitations and Modifications to the Model

6.1 Limitations of the Model

The model, like traditional approaches, seeks to replicate the "market" in a normative and hypothetical approach. It theoretically assumes a willing but not over anxious leaseholder and a willing but not over anxious freeholder, both with similar expectations and relying on the same existing data set. It implies, ipso facto, that there is also a willing and not over-anxious lessor – or a landowner who is indifferent to selling or leasing the land at a fair price or fair ground rental on the lease terms assumed.

One continuing limitation of this model compared to the traditional comparative methodologies is that it requires assumptions as to long-term growth in building rentals and land values. In addition, risk and return assumptions need to be explicitly reflected in the leaseholder's and freeholder's long-term required returns. Traditional methods, by comparison, simply accept the future growth potential as being computed into present land values and the added risk to a leaseholder being by implication reflected in the ground rental rate. This model seeks to "unpack" those assumptions by assessing and allowing specifically for those expectations and their impact on the ground rental rate.

One of the especially difficult tasks facing the valuer or analyst is making expectations as to long-term rental and land value growth rates required for the model. The model implies the use of mean long-term compounding growth assumptions that can accurately reflect those typical of the market investor's expectations. No specific allowance for the effect of building obsolescence on rental growth or its corollary for a building depreciation recovery is built into the form of model presented. This does not present a material problem where the model is based on market based capitalisation rates that determines building rentals and also where long-term growth rates are conservatively estimated. With short-term terminating ground leases specific allowance should be made for these factors if considered material. Fully explicit DCF (or other) valuation techniques should be used in those circumstances in applying the model rather than the short-cut DCF or direct capitalisation techniques used in the application in the perpetually renewable ground lease case study in the Appendix.

In some markets there may be systematic non-financial benefits or non-tangible costs, risk, uncertainty or insecurity associated with leasehold tenures not reflected in the risk premium. When faced with the prospect of, or 'in the throws of' leasehold reform, enfranchisement or government intervention in existing ground lease contracts, additional uncertainty will adversely affect leasehold prices and the attractiveness of leasehold investment. An example is the reform of Maori leasehold land tenures in New Zealand (Boyd, 1997, 1998; Jefferies, 1996a). The effect of these types of interferences in normal mean reverting equilibrium market assumptions underlying this model may make its practical application difficult or inappropriate in certain states and individual cases or classes of land.

6.2 Modifications Required to Model

Where the lease restricts the use of the land, i.e. for a specific development, type or class of use, then the model will need modification to limit the inputs to reflect those use limitations and criteria. This will result in a residual land valuation that reflects the allowable use, rather than the unencumbered freehold land value and such 'limited use' land values should be checked for reasonableness with sales of land in similar uses, if available.

The model will have little or no application in specific ground rental reviews where ground rentals are determined by administrative regulation, legislation or other prescriptive means. However, valuers and property advisers will be able to use the model to help shape public policy when advising government or administrative authorities seeking to determine fair ground rental rates to prescribe, or in developing leasehold reform proposals.

As previously indicated, some of these long-term assumptions can be relaxed or ignored as transversally not seriously affecting the differential present value results of the leasehold v freehold scenarios. This is because they affect both sides of the basic indifference equations almost equally and thus largely netting out and not materially affecting the validity of the model.

In the case of perpetually renewable leases an assumption should, theoretically, also be made as to the respective lessee's right of renewal value and the deferred redevelopment option in the land at the end of the hypothetical building's economic life. Due to the long-term unknown and deferred nature of these assumptions this factor can be ignored as having an immaterial effect on the initial ground rental rate.

Unknown costs affecting both the leasehold and freehold scenarios, for example, refurbishment requirements during the life of the building(s) and eventual demolition costs at the end of the building's life will be the same. As the differential present values of these will be minimised, due to discounting over a long period into the future, they will largely cancel out in the indifference model and can therefore be ignored as having an immaterial effect.

The model should be able to be applied to a wide range of rental residential apartment, retail, industrial, tourist, recreational and rural production classes of land uses. Its application to owner-occupier classes of land uses such as owner-occupier housing will be more difficult, but feasible, requiring the use of housing ownership cost (rental-equivalent) indifference models.

This model should be equally applicable (in principle) to rural (farming) ground leases. However, the implications and techniques required of productive valuation methodologies and their inputs and required rural investment required rates of return in the rural real estate market will require adaptation and modifications to the way the model is applied in practice.

7. International Comparisons, Issues and Conclusion

Despite differences in legislative and institutional factors affecting ground rental leasehold tenures in different countries, some similarities do exist and the problem of how to determine a fair ground rental rate under different lease terms and conditions is an international one.

Ground leaseholds (erfpacht) exist in The Netherlands, e.g. in Amsterdam where the land value (grondwaarde) reflects the allowable use of the land and the ground rental rate (canonpercentage) is determined by the Central Council (*Land Leasing in Amsterdam*, 1994). Five-year reviews are adjusted by indexing to the purchasing power of the Dutch guilder. At the end of the typical 50-year lease term the new ground rental is determined on the basis of the land value and ground rental rate applying. There are provisions for a change in the ground rental consequent on a change of use.

These are distinguishable from the typical 21-year perpetually renewable type common in New Zealand, where the land value and ground rental rate is reviewed without regard to the actual use of the land. A change of use does not[10] trigger the lessor's ability to accordingly review the ground rental.

In a number of other countries ground rental rates are determined by a variety of processes, mainly administratively, legislative prescription, executive decision, precedent or customary valuation practice and negotiation.

In some countries the setting of ground rental rates where land is leased from the state, government or municipal agencies, seems to be partly politically or administratively

[10] Normally, unless there is a restrictive use clause and redevelopment/or change of use requires a lessor's specific consent – that could be reasonably withheld.

"determined". This is particularly so where negotiations are not really open to market forces or effective challenge and independent determination.

With an increasing pressure, world-wide, to deregulate government institutions and to let market forces price the use of capital, pressure will be exerted to remove ground rentals from administrative or prescribed formulae to market based determinations. This is exemplified in the proposed reform of Maori (or indigenous) leasehold land in New Zealand (Boyd, 1997, 1998; Jefferies, 1996a) where the Maori Reserved Land Act has (subsequently) been amended in late 1997 and early 1998. This reform provides for Maori lessors to have ground rentals determined at market rentals at seven-year reviews replacing the previous twenty-one year reviews at prescribed ground rental rates (of 4% - 5% p.a.). In the process, compensation is to be paid by the Crown to lessees for the effect of the increased ground rental costs. Considerable protests and a great debate raged over the adequacy of the compensation model. Consequential debates in future arbitrations will undoubtedly occur over the proper basis for determining market ground rental rates so as to achieve "market ground rentals" in the absence of any new leasing market evidence.

At time of updating this paper the implications of introducing market rentals for Crown Pastoral leases, replacing prescriptive leases, under the Land Act 1948 and the Crown Pastoral Land Act 1998 is raising highly relevant methodology issues for which this paper should be of assistance.

It is hoped that this research and the ground rental model presented will provide an opportunity for the underlying issues to be examined and for a rational resolution to the problems to be achieved.

It is hoped that the ground rental valuation model presented will be helpful and find counterpart applications in other states. The model is flexible enough to adjust for different leasehold terms and conditions. It is hoped that its use will help in determining ground rental rates that are fair and truly reflect the advantages and disadvantages of leasehold land tenure compared to freehold or other forms of land ownership, tenure or land use rights.

8. Spreadsheet Application of Model and Case Study

8.1 Excel^{TM} Ground Rental Valuation Model

A Excel^{TM} spreadsheet template version of the model is attached in the **APPENDIX** .

8.2 Case Study

The case study applies the model to a 21 year perpetually renewable ground lease where the assumed ratio of improvements value to land value (IV:LV) was 2.4:1 with a 1.5 year total delay for construction and letting up period to achieve full letting. A land value of $1.0m is assumed. The freeholder's required return (Y_{FH}) is 11% p.a., the leaseholder's risk premium (Y_{LHrp}) of 1% p.a. resulting in the leaseholder's required return (Y_{LH}) of 12% p.a. Given an estimated growth in land values (LV_g) of 3.0% p.a. and building rental growth rates (R_g) of 2.5% p.a., resulted in a NPV of the FH Investment very close to zero. Solving techniques were used determine a set of inputs to give NPV=0, in this case by slightly reducing the effective IV:LV ratio (to 2.393:1).

By trial and error or clicking on a button "Solve GR% to give NPVLH = NPVFH = 0" runs a macro using Excel's Goal Seek utility to give an equilibrium ground rental rate (GR%) of 7.089% p.a of the land value (LV_c) as from the commencement of the lease term.

8.3 Leasehold and Freehold Present Values

The leasehold building capital value CV_{LH}, is calculated as the present value of the building net cash flows from occupancy rentals when fully tenanted (excluding deduction for ground rental). The spreadsheet application discounts the CV_{LH} to the lease commencement CV_{cLH} by discounting at the leaseholder's required rate of return over the building construction delays and rent-up period.

Similarly, the freehold building capital value is discounted to the to the lease commencement CV_c by discounting at the freeholder's required rate of return over the building construction delays and rent-up period.

Item 3 allows for any vacancies or other leasing costs over the subsequent rent-up period as from the building completion date to the building being fully let. In practice this may often be safely ignored especially when it is estimated that the space will be pre-leased. In other cases effective building rentals are used that decapitalise any leasing incentives such as rent-free periods or lump sum incentives paid to attract tenants. In many cases such costs are usually short-lived and the differential present values as between the leasehold and freehold scenarios will likely be immaterial in any case.

The Excel short-cut DCF template model that follows shows all the model's definitions along with the endogenously derived factors in the attached spreadsheet both as annual and on a per payment period basis.

The **bold (red)** outlined cells are data input cells into which the user inserts the exogenous market data or lease terms. Clearing all inputs and resetting the model is achieved by clicking on the button "Clear all Inputs" which runs a macro and sets the defaults.

The **first step** then involves solving for the IV:LV ratio that produces and confirms the current freehold residual land value LV_c at the commencement of the lease, review or renewal date, i.e. to give a $NPV_{FH} = 0$. This is achieved using trial and error techniques or the Goal Seek utility which is run by a macro on clicking on the appropriate button "Solve for IV:LV to give $NPV_{FH} = 0$". This should be within the market range evidenced by the analysed empirical evidence. This step is necessary to bring mathematical accuracy to the model and the resulting ground rental calculation.

The **second step** is to solve for the ground rental that satisfies the indifference test. This is achieved using the Goal Seek utility which is run by a macro on clicking on the appropriate button "Solve GR% to give $NPV_{LH} = NPV_{FH} = 0$".

The spreadsheet template shown in the Appendix utilises a mixture of simple short-cut DCF and direct capitalisation techniques. It is suitable for a single tenant property or building with a small number of tenants on similar lease terms, uses, rental growth rates and regular rent reviews. If necessary, the Excel™ template model can be applied to multiple tenancies by treating each tenant separately with different lease terms and estimates on separate worksheets. These can then be consolidated onto a summary worksheet within the same workbook, to combine with the building outlays to calculate the total net cash flow and to solve for the ground rental.

8.4 Sensitivity analysis

The model has been re-run using changed inputs and assumptions to check the sensitivity of the resulting ground rental rate for variations in the following inputs:

- The leaseholder's risk premium Y_{LHrp}

The model was re-solved holding constant all data inputs except with changes of 0.5% in the risk premium and the following resulted:

LHrp	0.00%	0.50%	**1.00%**	1.50%	2.00%	2.50%	3.00%
GR%	9.61%	8.34%	7.08%	5.83%	4.58%	3.34%	2.12%
Total Diff	- 2.53%	- 1.26%		1.25%	2.50%	3.74%	4.97%
Diff	1.27%	1.26%		1.25%	1.25%	1.24%	1.23%

For each 0.5 percentage point change in the leaseholder's risk premium this analysis shows a resulting 1.25 percentage point change in the ground rental percentage, illustrating how sensitive the GR% is to changes in the Y_{LHrp}.

- The ground rental review term

The model was re-solved holding constant all data inputs except changes in the rental review terms found in New Zealand as shown below:

Term Grr	3 yrs	5 yrs	7yrs	11 yrs	14yrs	21 yrs
GR%	6.05%	6.20%	6.34%	6.59%	6.76%	7.08%

This shows overall a change of 1.03 percentage points from a 21 year to a three year term or an average of 0.57 percentage points per year difference. This is similar to New Zealand practice (see footnote 1, Bayleys Research, 2001) which shows an average of 0.94 percentage points per year difference, and lines up well with but slightly lower than current commercial rates (supplied by Barratt-Boyes, Jefferies Ltd, Registered Valuers, Auckland) which shows a

0.063 percentage points per year difference as below:

Term Grr	5 yrs	7yrs	11 yrs	14yrs	21 yrs
GR%	6.50%	6.75%	7.00%	7.25%	7.50%

- The frequency of ground rental payments (in advance).

The model was re-solved holding constant all data inputs except with changes of payment frequency and the following resulted (for a 21 year term):

Frequency p	monthly	3 monthly	6 monthly	Yearly
GR%	6.89%	6.96%	7.08%	7.33%

This represents an average of 0.037 percentage points per month difference.

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APPENDIX

Case Study using the Excel[TM] model applied to a commercial ground leased property.

Indifference Ground Rental Model Template	Enter data in Red outlined cells only			
Inputs: where: FH=freehold; LH=leasehold	Definition	**Inputs**	Definition	Effective pp rate
Ground lease rent review (inYrs)	Grr	21 yrs	grp	42 periods
Frequency period of ground rent payments (in Months)	Per	6 mths	p	2 periods
Payment basis ; EOP(0); BOP(1) **Clear All Inputs**	Pay	1	lv_{gpb}	= 0.2466%pp
Land value growth rate p.a.	LV_g	3.00%	lv_{gp}	= 1.4889%pp
Building lease rent review (in Yrs)	Br	2 yrs	brb	24 periods
Frequency period of building rent payments (in Months)	Ber	1 mths	b	12 periods
Building rental growth rate p.a.	R_g	2.50%	r_{gb}	= 0.2060%pp
Risk free rate (ie equiv to a Govt Stock rate for a 21 term)	GS	7.50%		
FH building investment market premium	Fmp	3.50%		
= FH required risk adjusted return (yield) p.a.	Y_{FH}	11.00%	y_{FHb}	= 0.8735%pp
LH required extra risk premium (c/- freehold)	LH_{rp}	1.00%	lh_{rpp}	= 0.0830%pp
= LH required risk adjusted return (yield) p.a.	Y_{LH}	12.00%	y_{LHb}	= 0.9489%pp
Calculated FH fully let capitalisation rate p.a. = (e_{FHb}xb)	E_{FH}	8.1244%pa	e_{FHb}	= 0.6770%pp
Ratio IV/LV (?:1) **Enter first factor only** **Solve for IV:LV to give NPV_{FH} = 0**	I:V	2.393:1	y_{LHp}	= 5.8301%pp
Land value at commencement date	LV_c	$1,000,000		
PV of fully let Improvements Value @ commencement date	IV_c	$2,393,470		
PV of fully let Capital Value @ commencement date	CV_c	$3,393,470		
Ground rental rate p.a. **Insert Estimate** [**Default 5%p.a.**]	GR%	7.0829%		
Ground rental ex Comm	GR	$70,829 p.a.	grpp	$35,414 pp
Construction period (in Yrs)	Con	1.00 yrs	conp	12 periods
Delay to construction start (in Yrs)	Del	0.25 yrs	delp	3 periods
Years to construct	Com	1.25 yrs	comp	15 periods
Rent up period after building completion (in Yrs)	RU	0.25 yrs	rub	3 periods
Years ex Comm to fully tenanted	RF	1.50 yrs	rfb	18 periods
Net building rental - fully tenanted	Rr	$286,100 p.a.	rrb	$23,842 pp
FH Capital Value - fully tenanted	CV_{FH}	$3,521,517		
FH Improvements Value on completion - fully tenanted	IV	$2,483,784		
PV of FH value - fully tenanted	CV_{cFH}	$3,011,240		
PV of FH building outlay @ completion	PV_{Com}	-$2,042,357		
PV of vacancies during rent-up	PV_{RU}	$31,118		
PV of FH investment at Commencement incl land value	PV_{FH}	$1,000,000		
Land value at commencement date	LV_c	$1,000,000		
NPV of FH investment in building = (PV_{FH} – LV_c)	NPV_{FH}	$0		
LH rent before GR - fully tenanted (= Rr)	LHRr	$286,100 p.a.		
Calculated LH building capitalisation rate p.a. = (e_{LHb} x b)	E_{LH}	9.0349%pa	e_{LHb}	= 0.7529%pp
Calculated LH ground rental capitalisation rate p.a. = (e_{grp} x p)	E_{gr}	10.6933%pa	e_{grp}	= 5.3466%pp
LH capital value - fully tenanted nil ground rental	CV_{LH}	$3,166,606		
PV of LH Capital Value - fully tenanted nil ground rental	PV_{cLH}	$2,671,573		
PV LH building outlay @ completion	PV_{LHCom}	-$2,039,955		
PV LH vacancies during rent-up **Solve GR% to give: NPV_{LH} = NPV_{FH} = 0**	PV_{LHRU}	$30,748		
PV LH ground rental in perp	PV_{LHgr}	-$662,365		
NPV LH investment in building	NPV_{LH}	$0		
Difference between NPV_{LH} & NPV_{FH}		$0		