

timing and intensity of redevelopment given certain constraints. A key constraint for the lessor is the form of the ground lease contract.

THE RESULTS

The study explores alternative contract designs that may provide incentives to the lessee to undertake upgrades at a time and intensity that would result in a second best solution for the lessor. The first best or optimal outcome for the landowner would be redevelopment at a time and intensity identical to that which the fee owner would undertake if the fee were not subject to a ground lease.

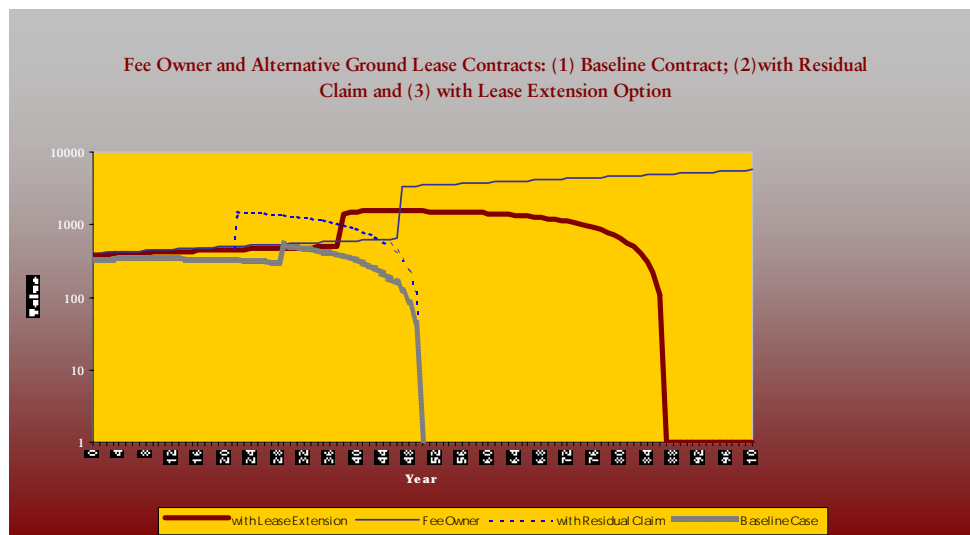
The following are specific contract alternatives considered. Each outcome is compared to the optimal scenario for the fee owner:

- 1. Baseline contract**
 In this structure, leases are assumed to mark-to-market every five years. If redevelopment occurs, the base rent adjusts and a new five year clock begins as of the date of redevelopment for determining the time of the next step-up.
- 2. Step-up rents (with a residual claim)**
 At termination of the ground lease, the lessee has a claim equal to the depreciated value or undepreciated value of the improvements.
- 3. Lease extension (step-up rents, no residual claim)**
 In this case the lessee may redevelop at any point in the first fifty years (the initial lease term) but may extend the lease by the number of years expired in the initial lease. E.g., if lessee chooses to redevelop in year 40, the lease is extended 40 years becoming a 90 year lease. Lease extension contract.

CONCLUSIONS

The baseline ground lease contract results in redevelopment at relatively low intensity well before the date at which the fee owner would redevelop. The rationale is that the lessor has no residual claim so he will build at lower density sooner to recoup the incremental cash flows over as long a period as possible. If the value of the depreciated asset is a residual claim of the les-

sions that may lead to more palatable outcomes as ground leases age. This research suggests that if downstream redevelopment and maintenance are important to the landowner as market conditions evolve, innovation with respect to the terms of the ground lease contract is appropriate. Some promising options are illustrated.



sor, redevelopment occurs still earlier but at a much higher intensity. Clearly, terms of the lease contract have a great deal to do with the value of the ground lease and the timing and intensity of redevelopment. While maintenance is not addressed in this short paper, maintenance of the property by the lessee would likely be enhanced by any contract that compensated the lessee for the 'value' of the improvements at termination. A lease extension is also a promising element of the contract if the goal is to incentivize the lessee to act as if he were the fee owner. The contract extension option results in slightly later redevelopment but at an intensity close to what would have been the case for the fee owner.

While the paper is not intended to provide a solution for the County Board of Supervisors with respect to the management of the Marina del Rey lands, it does suggest some contractual provi-

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Real Estate Research Brief

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Real Options, Ground Lease Contracts and Marina del Rey

Ho-hum. Long term ground lease you say. What could be as dull? Well, consider the plight of the County of Los Angeles. The County owns most of the land on which Marina Del Rey was developed in the late '50s and early 1960s. The Board of Supervisors, at that time chose to enter into long-term ground leases with developers of the various parcels. Several efforts had been undertaken since the late 1800s to create a commercial harbor in the Playa del Rey estuary. With San Pedro ultimately winning the battle to be the home of Los Angeles' harbor, the Marina area was to remain either a haven for duck hunters or be developed into a recreational harbor. Formally opened in April 1965, the harbor area is home to over 5000 boat slips and according to www.marinadelrey.com has the highest density restaurant seating outside New York City. So what is the County's plight if it owns this valuable land generating income in perpetuity for the County?

"We're anxious to have some of those old buildings and apartments taken down and rebuilt with new apartments. . . . We can't afford to have the Marina turn into a slum area," said former Supervisor Deane Dana.

While the issues are complex, the County leases have been bathed in controversy throughout the last decade. Most of the original leases were forty to sixty years in duration with an initial twenty-one year term followed by a series of ten year renewal options. Most of the controversy has surrounded the rental amounts and the condition of some of the improvements in the Marina. In a series of Los Angeles Times articles in 1992, a consultant argued that a renewal negotiated at that time 'killed any possibility of getting fair market rent for the land for the next 22 years (Rabin, 4/14/92, p. A24). In the same article, then Supervisor Deane Dana said, 'We're anxious to have some of those old buildings taken down, apartments taken down and rebuilt with new apartments. Some were only designed to last 30 or 40 years. We can't afford to have the Marina turn into a slum area.' For the most part, other than development of a number of expensive homes on hitherto vacant land and a proposed new development near the Marina's southeast corner, the Marina remains unchanged today. While this brief will not resolve all of the issues, it will provide some insight into why ground lessees may not behave in the way lessors wish they would. As always, the devil is in the details and, in this case, the details are in contract.

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Long-term ground leases are tricky contracts. There is significant uncertainty as to the future outcomes that may influence the value of the contract. Hart (1995), for example, argues that when significant investment is likely it is best for the investment decision-maker to own the

asset to which the investment is directed. Also, he argues that complementary assets should be under common ownership. Typically, the landowner (ground lessor) leases land to a developer (ground lessee) for a long period of time (usually more than thirty years). The ground lessee develops the land in an agreed upon fashion and the lessor and lessee share the resultant cash flows. At the end of the lease, the improvements revert to the landowner (ground lessor). During the intervening lengthy period, the lessee controls the property even though the lessor retains the residual ownership right. Thus it is important to the landowner that the contract contain incentives that cause the ground tenant to maximize the net present value of the underlying asset not only at the outset but also throughout the life of the lease. This would counter the potential problems alluded to by Hart.

The problem in the Marina is that while redevelopment appears rational to the County and other observers, some lessees seem unmotivated to proceed, presumably because the appropriate incentives aren't there in the existing leases. In an ongoing research project at USC, various contractual provisions of ground leases are being explored that may yield better outcomes for the lessor but that also make economic sense for the lessee.

Standard DCF valuation methodologies treat projects in the following way: managers choose an alternative from among a number of options and then wait to see what happens. For many capital projects including real estate projects where development and redevelopment is possible, this is not very realistic. In fact, managers may make a decision to invest, wait to see what happens and then make a further investment or not. In this latter case, the manager has an option to undertake or not undertake some future investment. This provides the manager with flexibility that has value. This flexibility has created a revolution in standard capital budgeting procedures in which option pricing techniques have been combined with traditional capital budgeting techniques in what has become known as the 'real options' approach. Unlike financial options, 'real options' are, for example, opportunities for a manager to expand, contract or change a productive activity at some future date by employing more capital

or less capital. See Trigeorgis (1996). The techniques that have evolved to assist decision-making in these situations turn out to be helpful in assessing alternative contractual features of long-term ground leases.

It is well known that the property rights associated with ground leases yield the owner of those rights less value than fee simple ownership. First, the lessee has no rights to the property at the termination of the lease. That is, the terminal value to the lessee is zero. Second, during the life of a lease, the redevelopment option is less valuable to the lessee because any capital expenditure has zero terminal value. Researchers (Capozza and Sick, 1991) have found that faced with the prospect of redevelopment, the lessee will redevelop sooner and at lower density than would the fee owner. When the lessee is faced with multiple redevelopment opportunities, the same will likely occur more often (Williams, 1997).

Usually when a ground lease is initially negotiated, it is in the interests of both the landlord and ground tenant for the property to be developed to the highest and best use. That is, the use that yields the highest land residual or the most profitable use. The landlord has the leverage to have the site developed at highest

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and best use because the landlord can withhold from agreeing to a contract with any party that will not commit to the development the landlord believes is the highest and best use. However, most ground leases are silent about the issue of redevelopment even though during the thirty or more year term of a typical contract, the likelihood that a higher and better use will arise is very real. Hence, the research project from which this short brief is derived explores alternative contractual arrangements which may lead to behavior on the part of the lessee that is more consistent with what the fee owner would do in the same economic circumstances. A landowner would, in a perfect world, like to negotiate a ground lease that yielded to him a rental stream consistent with the value of the underlying asset (the land) in highest and best use. This implies that the landlord would like the lessee to redevelop at the same time and at the same intensity as he would have. This would be the first best outcome. Exploring alternative contractual arrangements permits the identification of second best alternatives.

Typical Contractual Form of Long Term Ground Leases

In the typical North American ground lease, land is leased by the owner to a tenant for a period of at least 50 years. That 50 year term is usually comprised of an initial ten or twenty year term with options for two or three ten year renewals. Longer leases (over 99 years) are viewed as sales from a tax perspective in the US and are seldom used. The length of the lease is designed to allow sufficient time for return of capital invested in leasehold improvements and amortization of debt in the case that leasehold improvements are financed with debt.

This type of lease has been commonly used by public agencies including ports, airports and local governments. Such contracts provide revenues, albeit risky, not affected by changes in the law or tax base. A participation feature may provide inflation protection as well as income enhancement. This may allow a public agency to recoup subsidies, including the write-down of land, over time without unduly burdening the project during the development and start up periods when cash flow may be critical to the project. Thus ground leases may be an effective tool in public/private partnerships. Similar leases are employed by private landowners that want long term revenue from land but lack the interest or expertise to develop and manage the improvements to the land

Key Rental Streams In a Participating Ground Lease are the Following:

1. MINIMUM RENT (sometimes BASE RENT), is the least risky ongoing revenue source for the ground lessor. The actual payment should be computed on a notional amount equivalent to the land value in highest and best use (presumably the existing use) at the time the lease begins. The base rent may adjust periodically (usually every five or ten years).
2. PERCENTAGE RENT (of Gross Income), an amount determined as a percentage of the rents received from and/or gross sales by the occupying tenants payable annually in the amount, if any, by which percentage rent exceeds the minimum rent.

OVERVIEW OF OUR APPROACH AND MODEL

Future development of land creates an option that has value to the individual who has the right to use the land. In the case of a ground lease this is an option granted to the lessee but restricted by the term of the lease. Option pricing theory combined with Monte Carlo simulation modeling procedures allow the valuation of alternative ground lease contracts in an uncertain future environment.

The research assumes a rental growth rate and variance along with a development technology. The model for the fee owner and the ground lessor is created to simulate the redevelopment decisions faced either. The ground tenant leases the land from the landlord and then leases the building to the space users. When the current land use is no longer at its highest and best use, the ground tenant needs to decide if and when it is optimal to redevelop (convert) the land to its best use. In general, this will occur when the present value of future cash flows in the new use less the costs of construction exceeds the present value of the cash flows in the existing use. Even though the

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property may not be at highest and best use, the lease contract may not provide the same incentives for the ground tenant to redevelop the property as in the case of the fee owner particularly if significant time has passed and the lease termination date is approaching.

In a certainty model (with perfect foresight), the ground tenant tries to maximize the net present value of the project at time 0. The NPV consists of four elements: net rent flow before and after the redevelopment, the cost of redevelopment, and the compensation value or the residual value, if any, when the lease expires. Under certainty, the analysis simply requires a laborious comparison of the NPV of each redevelopment alternative at each point during the life of the lease.

To find the optimal solution under uncertainty, Monte Carlo methods (random sampling procedures) are used to simulate multiple scenarios where the rental growth rate is assumed to vary in a random fashion around a trend limited by an assumed variance. Then, genetic optimization is employed. Within each scenario, an optimal solution of redevelopment timing and density is found by using numerical optimization methods as above in the certainty case. Since multiple scenarios have been simulated, the final optimal solution is the one that maximizes the expected mean net present value. In effect, by simulating hundreds of alternative development scenarios for the lessor or the fee owner, one is able to identify the most profitable