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Authors

Liu, Peng
Edelstein, Robert H.

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The Economics of Commercial Real Estate Preleasing

Robert H. Edelstein¹ · Peng Liu²

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Abstract Preleasing of to-be-built commercial real estate space is a pervasive world-wide practice. Although such preleasing is an extensive and significant activity, it has not received adequate attention in the real estate economics and finance literature. Using an equilibrium micro-economic agency model, this paper examines the economics of commercial real estate preleasing. The equilibrium prelease contract rent is a function of several variables, including the expected spot market rent, financing benefits from preleasing, developer-lessor and tenant-lessee risk-hedging behavior, the interplay between lessor and lessee default options, and the market capitalization rate. Our paper demonstrates how the distribution of risk preferences for lessees (and lessors) generates separating market equilibrium for the prelease and spot lease. We also consider the impacts of developer default and the lessee cancellation clause on the prelease rent equilibrium.

Keywords Prelease · Rental price risk · Leasing · Commercial real estate · Capitalization rate

JEL Classification R33 · L85 · G13

Introduction

Commercial real estate preleasing, transacted via a lease contract between tenant (lessee) and landlord (lessor) that specifies a future rent and date when occupancy will

✉ Peng Liu
peng.liu@cornell.edu

Robert H. Edelstein
edelstei@haas.berkeley.edu

¹ Fisher Center for Real Estate & Urban Economics, Haas School of Business, University of California at Berkeley, 602 Faculty Bldg., #6105, Berkeley, CA 94720-6105, USA

² Center for Real Estate and Finance, School of Hotel Administration, Cornell University, 465B Statler Hall, Ithaca, NY 14850, USA

commence, is a common international practice, often utilized for to-be-constructed commercial real estate.¹ Essentially a forward lease contract, preleasing provides benefits for the lessor and the lessee. It is frequently required by lenders and investors to ensure that a building will retain collateral market value in the event of builder default. Preleasing contracts are used for all types of commercial real estate, including office, industrial, and retail space.² Although preleasing is an important and integral activity in the world of real estate, it has received relatively little attention in the academic literature. Our study is one of the first papers to address the theoretical determinants for preleasing economic equilibrium.

Preleasing arrangements for to-be-built real estate involve tradeoffs for lessees, lessor-developers, and third-party capital sources (including construction and permanent lenders). By preleasing, the lessee satisfies future space use requirements, but also gains both an option and a hedge. Depending on the terms of the prelease agreement, the lessee may choose to default on occupancy if market rents in the future decline significantly, but the pre-lease simultaneously protects the lessee against market rental increases. On the other hand, the preleasing lessee faces a risk of non-performance by the lessor-developer (i.e., failure to deliver the building in a timely fashion). By arranging for future tenancy before the completion of the building, the developer creates a guaranteed level of cash flow for the real estate project. Abstracting from lessee default, the prelease contract would in principle be risk-reducing for the developer and the lender and provide the developer with access to capital on terms and conditions that either would not be otherwise available or would be more costly. Lenders frequently require some preleasing for properties before they are willing to deliver loan proceeds. Prelease conditions may be specified in loan covenants. If prelease requirements are not satisfied, the lender may seek remedies such as requiring the loan to be re-margined, vacating the loan in favor of a stand-by take-out loan, or rescinding the loan offer.

In summary, preleasing can reduce lessee search risks and costs, provide a lessee default option, and hedge against unanticipated future market rent increases. From the landlord-investor's point of view, preleasing reduces cash flow risk. Finally, the debt lender will use preleasing conditions to reduce the risks of lending. Of course, the various risks of default complicate preleasing for all three parties. In particular, the lessee may not be able or willing to take possession. On the other hand, the developer may be unable to perform, causing lessee occupancy disruption as well as adversely affecting the lender's position.

In the next section of the paper, we provide a selective review of the related literature. In subsequent sections, we develop a theoretical framework for preleasing economic equilibrium for understanding the economic incentives and optimizing behavior for lessees, owner-developer-investors, and lenders. We examine how the interlinked preleasing options for lessees and lessor-developers affect commercial real

¹ Our paper focuses on preleasing for to-be-built (new) commercial real estate projects. The analysis is applicable, with relatively simple modifications, to other commercial preleasing arrangements for existing properties as well as lease renewal options.

² Although they are popular in retail development, prelease contracts for anchor tenants such as department stores frequently contain significant rent discounts because (1) the anchors bring positive externality to the shopping center and (2) anchor tenants simplify and enhance the renting of space to other tenants. For detailed review of the role of the anchor tenant in the retail real estate setting, please refer to Liu and Liu (2013).

estate market outcomes. Our model provides insights into the conditions that generate a separating equilibrium for the existence of preleasing and “spot” leasing.

Research Context: Selected Literature

The existing finance and real estate literature about real asset leasing is extensive. In finance, the vast majority of leasing research focuses on the role of taxation in determining the choice between leasing and owning real assets. Virtually any standard finance and investment textbook analyzes the lease-own decision using a discounted cash flow model as well as an attendant analysis relating to the complex options associated with real asset user choices. Redman and Tanner (2001), using corporate real estate executive surveys, provide information about the real estate leasing versus ownership decision-making process. In their analysis, they identify various motives and techniques for leasing and ownership of real estate assets.

The real estate finance and economics literature offers a relatively large set of empirical studies that emphasize the determinants of rental rates for commercial real estate as well as the adjustment dynamics for rental and vacancy rates. In general, the joint adjustment between rents and vacancy are found to be functions of the macro-economic environment, the local employment market, and the commercial real estate supply, including new development. The classic article by Wheaton et al. (1997) is an excellent source for exploring the relationship between rents, vacancy rates, and the interplay of local employment rates. Sivitanidou (2002), among many others, stresses the importance of taking into account spatial variation in supply and demand and other idiosyncratic market characteristics for specifying the rental market. Her analysis focuses on the adjustment towards equilibrium, which in many markets may be gradual, suggesting that prevailing rents may deviate from implicit long-run equilibrium levels for sustained periods of time. She concludes that ignoring the sluggish rental adjustment process may produce misleading inferences about the determinants of long-run equilibrium values for rents and vacancy rates. These econometric analyses usually evaluate the rental-vacancy adjustment process at the MSA level, and are macro in nature; and do not explicitly focus upon the details of the lessee-lessor rental interactive process.

A small but burgeoning literature emphasizing the micro-organization of real estate markets has emerged for explaining the linkages between the lessor and the lessee for determining lease rates and market values. Papers in this stream of the literature are more closely related to our research. Deng and Liu (2009) summarizes the impacts of presale or forward market on real estate transaction and financing in China. They conclude that presale transactions present a significant risk in Chinese real estate market, especially in economic downturn. Wong et al. (2007) focus on the interrelationship between the real estate spot and forward markets for residential sales for the Hong Kong housing market. They find that the forward and spot markets are interrelated, as would be expected, with economic shocks in the forward market being transmitted to the spot market. Edelstein et al. (2012) and Chan et al. (2012) are among the recent studies that focus on the theoretical underpinning of the presale market. Mooradian and Yang (2002) devise a theoretical commercial real estate model with asymmetric information between tenants and landlords. In their analysis, depending upon the nature of the asymmetric information, the tenant and landlord negotiate gross versus net leases.

The three papers that are most similar to ours include two by Grenadier (1995, 2005) and one by Buttimer and Ott (2007). Grenadier (1995), using a real option approach, characterizes commercial development with stochastic lease rates and occupancy. In his model, the commercial property owner leases vacant space at a rental rate that is determined by a stochastic downward-sloping lessee demand curve. Tenants are always available, but because of the downward-sloping demand, lessors may not choose to offer vacant units. The demand lease rate is stochastic, and there is a lease rate that will trigger a change in vacancy for individual buildings. Lease rates also determine individual property development decisions, but only upon completion of the building will the owners rent the optimal amount of space based on demand. Grenadier (2005) modifies his earlier analysis to include, among other things, the possibility of preleasing. The Grenadier models are driven primarily by the aforementioned assumption of the downward-sloping stochastic lease demand faced by the individual property developer-lessor.

Buttimer and Ott (2007) develop a leasing occupancy commercial real estate model that is in many ways similar to that of Grenadier, but differs insofar as the model assumes that the market is competitive and lessors are price takers. Uncertain lessee demand enters the model through a search framework, whereby the frequency of tenant arrivals and ability to pay are key mechanisms for clearing the market. Depending on the exact nature of tenant arrivals and the distribution of the ability to pay rent, Buttimer and Ott permit preleasing to occur, and the developer may thereby hedge the risks of leasing rental rates and vacancies.

Micro-leasing market papers generally utilize a real options approach to determine leasing market implications. The underlying workings of the economic actors are implicit, essentially taking the form of a black box. In the Grenadier models, the downward-sloping stochastic demand curve is the key to the developer decision-making process. In the Buttimer and Ott analysis, however, the price-taking nature of the developer is the crucial assumption. In this paper, we employ a utility-maximization economic model in which the developer and tenants determine an equilibrium between the preleasing and spot leasing markets. The choices between leasing in the spot market and preleasing are determined by the interaction of the preferences of the tenants and developers. By using our micro-economic lessor and lessee framework, we can derive an explicit equilibrium for preleasing activity and lease rates as well as the conditions for generating a well-defined separating equilibrium.

The Model Setup and Principles for Equilibrium Pricing

In our model, the commercial real estate developer faces rent uncertainty for to-be-built space. The model has one period with two dates: a prelease date, $t=0$, and the completion date, $t=1$. We assume that the commercial real estate lease rate (rent per square foot) at $t=1$ follows a normal distribution:

$$L_1 = \mu + \tilde{\varepsilon}, \quad (1)$$

where μ is the expected rent, $\tilde{\varepsilon}$ is a random variable unknown to lessees and is normally distributed with mean equal to zero and volatility of σ .

There are two types of economic agents: a quasi-monopolist developer (lessor) and many lessees (tenants) who require space for business operations. We assume that the lessees and the developer-lessor are risk-averse with Constant Absolute Risk Aversion (CARA) utility.³ (A risk-neutral lessee and a risk-neutral lessor-developer are special cases that are discussed in Section 4.1.)

Endowed with a permit to develop a commercial real estate property, the developer commences building at $t=0$ and completes construction for occupancy at $t=1$.⁴ The developer finances the project with a construction loan, which requires that a portion of the to-be-built space be preleased before the construction is completed. The remaining space in the building will be leased at $t=1$ at the prevailing spot market rent, which is determined, in turn, by the supply of and demand for space on the lease spot markets.⁵ The developer is the lessor during the construction period. Figure 1 outlines the timeline for both the lessor-developer and the lessees.

The Lessees

Tenants are naturally heterogeneous along a number of dimensions, such as business operation, market power, and space requirements. For analytical tractability, we assume that the tenant characteristics are summarized in the risk-aversion parameter. Following Dumas (1989), Wang (1996), and Chan and Kogan (2002), we model the heterogeneity of the lessee's risk aversion explicitly: There exists a continuum of tenants $\gamma \in [0, \infty)$, with CARA utility indexed for lessee i using γ^i . Each lessee minimizes the loss of expected utility caused by rental expenditures by either prelease ($j=0$) or spot lease ($j=1$) contracts.

$$\text{Min}_{j=0,1} EU^i(L_j) = -1/\gamma_i E[\exp(\gamma_i L_j)] \quad j = 0, 1 \quad (2)$$

The Lessor-Developer

As a local monopoly, the developer can determine the prelease rents for the new development project. However, upon completion of her development, the spot rent will be determined by the local space market. The total number of units to be developed is assumed to be nonrandom.⁶ Assuming for convenience that the developer finances the project with a construction loan maturing at $T=1$, the total investment cost is I and the loan amount is M . The interest rates are r_1 , and r_2 for prelease and spot lease projects, respectively. Because preleases secure future cash flows, the developer obtains

³ Although CARA utility does not contain a wealth effect, the main insights for our analyses do not depend on the choice of the particular utility function. It can be shown that the same results obtain if we model the maximization of consumer surplus. Another form of utility function frequently used is Constant Relative Risk Aversion (CRRA), which engenders similar results.

⁴ The scale of the development is pre-determined.

⁵ The spot market rent is treated as an effective rent that takes vacancy into consideration.

⁶ If the quantities of production are allowed to vary, along with the scale of forward hedging, the results remain unchanged. as established by Feder et al. (1980), in the presence of the forward market a complete separation is maintained between the production decision and the hedging (forward-selling) decision. Edelstein et al. (2012) also find that pre-committed sales do not affect a developer's production decision.

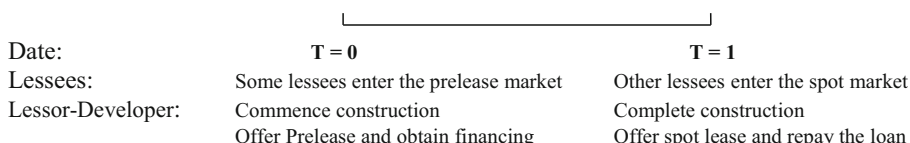


Fig. 1 The timeline in the economy

more favorable financing terms with a lower interest rate for the project by preleasing some space (i.e., where $r_1 \leq r_2$).

Upon completion, the developer either sells the building to an investor or becomes the owner-lessor.⁷ The developer's net profit (X) equals the capitalized rents less the total costs of development, which are computed as a periodic lease rate (L_j) divided by a market capitalization rate (Cap), minus the total costs of investment (I) and the financing cost (r_jM).

$$X_j = \frac{L_j}{Cap} - (I + r_jM) \quad j = 0, 1 \tag{3}$$

Assume that the developer maximizes the utility of profit at the building completion date. If the developer's utility function is CARA over X_j with risk-aversion parameter (g), the developer's expected utility of profits from an average lessee can be expressed as the weighted average of expected utilities of profits from prelease contracts and spot market lease contracts:

$$\begin{aligned}
 \underset{L_0^*}{Max} EU(L_0, L_1) &= \frac{-1}{g} \exp(-gX_0(L_0)) \cdot D_0(L_0) \\
 &+ E \left[\frac{-1}{g} \exp(-gX_1(L_1)) \right] D_1(L_0) \tag{4}
 \end{aligned}$$

where $D_0(L_0)$, and $D_1(L_0)$ represent the market demand for preleases and spot leases, respectively.

The Basic Principles for Equilibrium Pricing

The market equilibrium will produce two important results: 1) the market-clearing rent for the prelease contract and 2) the scale of prelease demand.

The strategy for solving this equilibrium model involves jointly maximizing the utilities for lessees and developers. We assume there exists an optimal prelease rent and then calibrate the equilibrium market-clearing rent that maximizes the developer utility function. In the first step, we solve the lessee's maximization problem assuming the spot rent and the prelease rent are given. Since there is a continuum of heterogeneous lessees, the marginal lessee, who is indifferent between renting the space on the spot market or the prelease market, determines rental market equilibrium. The critical level of risk-aversion, γ^* , is a

⁷ A commercial lease usually contains non-disturbance and lease assignment clauses, which require that tenants continue to occupy the building and pay the rents irrespective of changes in ownership.

function of the optimal rent for preleases, and divides to-be-developed commercial space into two tiers: the prelease market (D_0) and the spot market (D_1). Specifically, if a given lessee is more risk-averse than the marginal lessee is, she will choose to rent the space via the prelease market, and vice versa.

Therefore, the lessee’s renting decision rule can be summarized as:

- A. Rent the space on the prelease market if $\gamma_i > \gamma^*$ or $E[U_F(L_0)] < E[U_S(L_1)]$;
- B. Rent the space on the spot market if $\gamma_i < \gamma^*$ or $E[U_F(L_0)] > E[U_S(L_1)]$;
- C. Be indifferent between the prelease or spot market lease if $\gamma_i = \gamma^*$ or $E[U_F(L_0)] = E[U_S(L_1)]$.

We further assume that the distribution of lessee risk aversion is exponential,⁸ with a mean risk aversion of $1/\lambda$.

$$f(\gamma, \lambda) = \begin{cases} \lambda e^{-\lambda\gamma} & \text{for } \gamma \geq 0 \\ 0 & \text{for } \gamma < 0 \end{cases} \tag{5}$$

Figure 2 displays the scale of demand for prelease and spot real estate transactions. The market demand for a prelease contract is $e^{-\lambda\gamma^*}$. That is, the proportion of $D_0 = e^{-\lambda\gamma^*}$ lessees will choose renting via a prelease contract at $T=0$. Similarly, the proportion of spot market commercial space will be $D_1 = 1 - e^{-\lambda\gamma^*}$.

In the second step, we derive the endogenous equilibrium for the market rent for preleases. The developer decides at $T=0$ what portion of the space is to be preleased and how much is to be charged for the prelease. The equilibrium rent for the prelease is determined by maximizing the expected utility of profit from the prelease and spot lease. The lessor-developer’s control variable is the prelease rental rates. With the scale of demand for the prelease and spot markets solved in the first step, the developer’s maximization problem determines the “market price” for prelease contracts. Since the market scale is a function of the prelease rent, the monopoly developer balances the tradeoff from income generated by preleases and spot market rentals.

The Basic Model Without Lessor Default or a Lessee Cancellation Clause

As a benchmark scenario, we assume the lessor and the lessees will fulfill the lease contract. That is, the lessees will not terminate the preleases, and the developer will complete the project and deliver space on time for the tenants. To gain a graduated understanding of the impact of default on prelease behavior, we consider developer default in Section 5 and tenant cancellation in Section 6.

⁸ Explicitly introducing lessee risk heterogeneity makes the scale of the market equilibrium demand for prelease contracts endogenous.

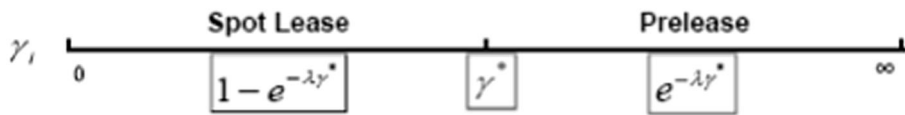


Fig. 2 The market demand for commercial real estate prelease

Let $U^i_F(L_0)$ and $U^i_S(L_1)$ be tenant i 's (dis)utility functions derived from rental expenditure for the prelease and spot lease, respectively.

$$EU^i_F(L_0) = \frac{1}{\gamma_i} \exp(\gamma_i L_0) \tag{6}$$

$$E[U^i_S(L_1)] = \frac{1}{\gamma_i} E[\exp(\gamma_i L_1)] = \frac{1}{\gamma_i} \exp\left[\gamma_i \mu + \frac{1}{2} \gamma_i^2 \sigma^2\right] \tag{7}$$

The “marginal lessee,” γ^* , is indifferent between renting space through the spot or prelease markets; she would derive the same utility from either the prelease transaction or the spot market lease. Equating Eqs. (6) and (7) yields the following:

$$\gamma^*(L_0) = \frac{2(L_0 - \mu)}{\sigma^2} \tag{8}$$

The critical value of a lessee’s risk aversion is an increasing function of the prelease rent, as shown in Eq. (9). This equation implies that the demand share from lessee preleases, D_0 , is decreasing when the equilibrium prelease rent increases. Equation (8) further indicates that the demand-rent sensitivity is an inverse function of rental market risk (i.e., rent volatility).

$$\frac{\partial \gamma^*}{\partial L_0} = \frac{2}{\sigma^2} \tag{9}$$

The lessor-developer’s combined expected utility of profits from the prelease and spot lease markets will be:

$$\begin{aligned} \text{Max}_{L_0^*} EU &= \frac{1}{g} \exp\left(-\frac{gL_0}{Cap} - g(I + r_0M)\right) \exp(-\lambda\gamma^*) - \frac{1}{g} \tag{10} \\ &E\left[\exp\left(-\frac{gL_1}{Cap} - g(I + r_1M)\right)\right] (1 - \exp(-\lambda\gamma^*)) \end{aligned}$$

The first-order condition for the developer’s optimal leasing strategy is

$$-\exp\left(-\frac{gL_0}{Cap} + gr_0M\right) \left(\lambda \frac{\partial \gamma^*}{\partial L_0} + \frac{g}{Cap}\right) + \exp\left(-\frac{g\mu}{Cap} + \frac{g^2\sigma^2}{2Cap^2} + gr_1M\right) \left(\lambda \frac{\partial \gamma^*}{\partial L_0}\right) = 0 \tag{11}$$

From Eqs. (8) and (9), the equilibrium prelease rent for the developer can be derived and expressed in the following equation:

$$L_0^* = \mu - Cap \cdot \Delta r \cdot M - \frac{g\sigma^2}{2Cap} + \frac{Cap}{g} \log\left(1 + \frac{g\sigma^2}{2\lambda Cap}\right) \text{ where } \Delta r = r_1 - r_0 \tag{12}$$

From Eq. (12), the market equilibrium rent for one unit of commercial space in the prelease market, L_0 , is jointly determined by:

- (1) Expected market average rent μ .
 L_0^* is a positive linear function of μ . Higher average market rents induce higher prelease rents.
- (2) Financing benefit from preleases $\Delta r \cdot M$.
 Since the developer is assumed to be able to obtain a lower interest rate for construction financing for preleased space, she is willing to provide a rent discount to lessees who sign preleases. Larger financing benefits, $\Delta r \cdot M$, create lower prelease rents.
- (3) Developer-lessor risk-hedging discount $\frac{g\sigma^2}{2Cap}$.
 If the developer-lessor is risk-averse, she is willing to hedge future rental market risk by providing a rent discount to lessees who choose to sign prelease contracts. Higher levels of developer risk aversion (g) and greater levels of market risk (σ^2) generate lower prelease rents.
- (4) Lessee risk-hedging premium $\frac{Cap}{g} \log\left(1 + \frac{g\sigma^2}{2\lambda Cap}\right)$.
 If lessees are more risk-averse on average than the lessors are, they will wish to secure space in the newly-developed building by signing preleases. Higher average lessee risk aversion ($\frac{1}{\lambda}$) or larger market rental risk (σ^2) will raise the prelease rental rate.

Other factors that influence the market equilibrium preleasing rents include but are not limit to the following:

- (5) The capitalization rate (Cap).
 The market capitalization rate transforms the value of risk hedging and financing benefit into cash flows (rents). Because the Cap influences three terms in Eq. (12), the impact of the cap rate on the equilibrium prelease rent is non-monotonic.
- (6) Macro-economic factors.
 Other macro-economic factors also play important roles in determining the equilibrium rents. In our model, those factors reflect overall economic conditions and influence the preleasing activities through the channel of the interest rate (r), and rental volatility (σ).

The market share for prelease demand is

$$D_0 = \left(1 + \frac{g\sigma^2}{2\lambda Cap}\right)^{\frac{-2\lambda Cap}{g\sigma^2}} \exp\left(\frac{\lambda g}{Cap} + \frac{2\lambda Cap \Delta r M}{\sigma^2}\right) \tag{13}$$

The Special Cases of Risk-Neutral Lessees and a Risk-Neutral Lessor

In our model to this point, we have assumed that the lessees and the lessor are risk-averse. The optimal prelease rent, determined by Eq. (12), depends on the distribution of risk aversion among the lessees and the lessor, among other factors. What if at least one of the contracting counterparties is risk-neutral? What if both are? We now discuss scenarios involving risk-neutral agents as special cases.

Risk-neutral lessees: Taking the limit with the average risk-aversion parameter $(1/\lambda)$ to zero, Eq. (12) will determine the optimal prelease rent with a risk-neutral lessee:

$$L_0^* = \mu - Cap \cdot \Delta r \cdot M - \frac{g\sigma^2}{2Cap} \tag{14}$$

Since the developer is concerned about the future vacancy, she will offer preleasing discounts to risk-neutral tenants in order to guarantee future cash flows. In this case, all lessees will prelease, that is

$$D_0 = 1.$$

Risk-neutral lessor: Taking the limit in Eq. (12) with the developer risk-aversion parameter g tending to zero creates the optimal prelease rent in Eq. (15):

$$L_0^* = \mu - Cap \cdot \Delta r \cdot M + \frac{\sigma^2}{2\lambda} \tag{15}$$

The equilibrium prelease rent for the risk-neutral lessor is greater than the rent would be if the lessor were risk-averse, because the lessor risk-hedging discount vanishes (compare Eqs. (12) with (15)). Under this scenario, the lessees would be willing to pay a premium to hedge against any future real estate rental-rate risk. The market demand for preleases is reduced to

$$D_0 = \exp(2\lambda Cap \Delta r M / \sigma^2 - 1).$$

Risk-neutral lessees and risk-neutral lessor: Combining risk-neutral lessees with the risk-neutral lessor yields the following optimal prelease rent:

$$L_0^* = \mu - Cap \cdot \Delta r \cdot M \tag{16}$$

The equilibrium prelease rent when both lessees and the lessor-developer are risk-neutral contains only two components. Without hedging demand, the value of prelease cash flow is equal to the capitalized future expected rents minus the financing benefit the developer enjoys through the use of preleases. Again in this case, all lessees will prelease the commercial space, that is $D_0=1$.

The Equilibrium Prelease Rent and Market Risk

The equilibrium lease-risk function for the commercial real estate prelease rent varies with levels of risk aversion associated with lessees and the developer-lessor. To understand the rent-risk relationship in the prelease market, we simulate the rental market dynamics with the base rent of \$10 per square foot and cap rate of 10 % (unless otherwise specified). The three panels in Fig. 3 highlight three comparative statics analyses. As shown in Fig. 3, when rental market risk increases, the prelease rent varies directly with the relationship of the lessees’ risk aversion to that of the developer. The prerelease rent is greater than the expected future spot rent if the average lessee’s risk aversion is greater than that of the lessor-developer. The above pattern is not surprising, because the prelease rent will reflect the fact that risk-averse lessees are typically willing to “insure” against the future rental risk. The converse is true if the lessor is more risk-averse and willing to hedge her risk by providing a prelease discount.

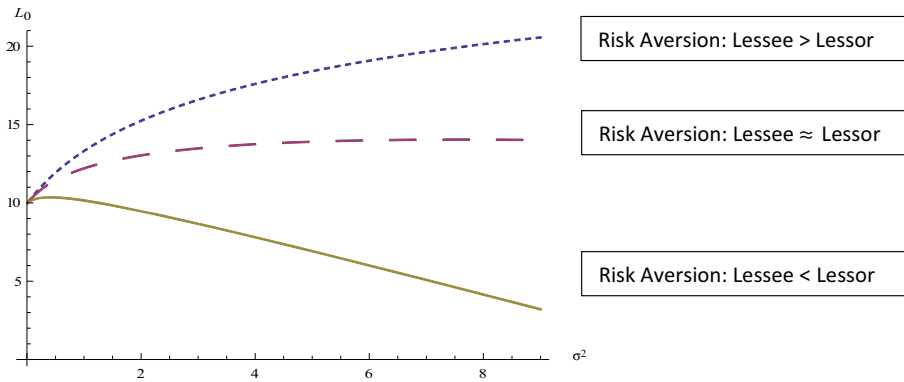


Fig. 3 Commercial real estate leasing market risks and equilibrium rent of prelease contract by different risk aversion levels of lessees and lessor. Other parameters: average rent=10, cap rate=10 %, no-default

As shown in Eq. (12), the equilibrium prelease rent is a non-monotonic function of commercial leasing risk σ^2 . When lessees are more risk-averse than the developer- lessor, i.e., $1/\lambda \geq g$, the optimal prelease price L_0^* is a concave function of rental risk σ^2 . The maximum optimal prelease rental rate is achieved when the volatility of the real estate leasing rates satisfies the condition in Eq. (17):

$$\sigma^{*2} = \frac{2Cap(Cap-\lambda g)}{g^2} \tag{17}$$

The corresponding prelease rental rate is generated by Eq. (18):

$$L_{0,max}^* = \mu + \lambda - \Delta r \cdot M + \frac{Cap}{g} \left(\log\left(\frac{Cap}{\lambda g}\right) - 1 \right) \tag{18}$$

The market capitalization rate plays an important role in equilibrium prelease pricing by linking real estate space market equilibrium cash flow to the real estate asset market valuation. As shown in Fig. 4, which assumes that the lessor and the lessees have equivalent levels of risk aversion, the equilibrium prelease rent increases monotonically with the cap rate, because higher cap rates translate into lower market asset values. The wedge of prelease rents between the high cap rate and the low cap rate is larger when rental market risk is larger, because the lessor-developer needs to set a higher risk premium for the prelease rent to compensate for increased risk.

Assuming the lessor and the lessees have equivalent levels of risk aversion, the financing benefit from the preleases include a lower interest rate, or a higher loan-to-value ratios (thus a larger loan amount), or both. As shown in Fig. 5, and as would be expected, the greater the financing benefit, the lower the equilibrium prelease rent.

Effects of Developer-Lessor Default

The base case analysis highlights the impact of risk-hedging behavior on the part of the lessees and the lessor-developer, and the financing benefits created by prelease contracts. In reality, the developer may not be able to deliver the preleased premises on time. Developer default can occur because of insufficient construction capital, (a

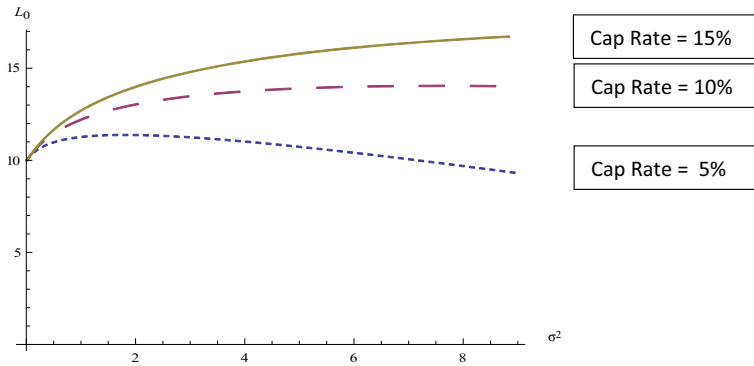


Fig. 4 Commercial real estate leasing market risks and equilibrium rent of prelease contract by different cap rates. Other parameters: average rent=10, equivalent risk-aversion level between average lessee and lessor, no default

common occurrence during the recent financial crisis of 2008–2009 in the U.S.), unexpected increases in construction costs, harsh weather, or other unforeseen circumstances that dramatically change the market environment. As discussed earlier, preleasing affects project financing, which in turn determines the feasibility of a project. The developer may choose to default if preleasing was not successful. We, however, do not consider the developer default from this reason in our model, because a monopolistic developer can always obtain prelease tenants by reducing prelease rents.⁹ (Moreover the preleasing market is likely to break down due to moral hazard issues, if the lessees know that the landlord will strategically default.)

Of course, developer default may have significant impacts on preleased tenancy to the extent that it interrupts the planned move-in and business operation at the new site. In some circumstances, the lessees will be forced to search for alternative space on the spot leasing market at the planned move-in date. The lessee’s inconvenience and costs caused by a possible lessor default should be incorporated into the equilibrium prelease rent contract. In this section, we explicitly consider developer-lessor default.

We assume that the developer’s failure to deliver the real estate space at the planned move-in date, $T=1$, is exogenous. Let the default probability of the monopoly developer be p . The financial loss incurred by the lessee due to developer default is assumed to be a linear portion of the prelease rent, αL_0 .¹⁰

For a prelease lessee, the total rental expenditures will be $\alpha L_0 + L_1$ if the developer defaults, and L_0 if the developer does not default. Therefore, the prelease lessee i ’s utility function is modified to form Eq. (19):

$$EU_F = -1/\gamma \exp[(1-p)\gamma L_0 + p\gamma(\alpha L_0 + L_1)] \tag{19}$$

⁹ Assuming that the developer or the local real estate development authority has done a thorough feasibility analysis before the development permit was issued; we should not expect a sudden shift in space market demand.

¹⁰ For expositional simplicity, we assume that lessee transaction and search costs caused by the lessor default are nil and that there are no litigation actions.

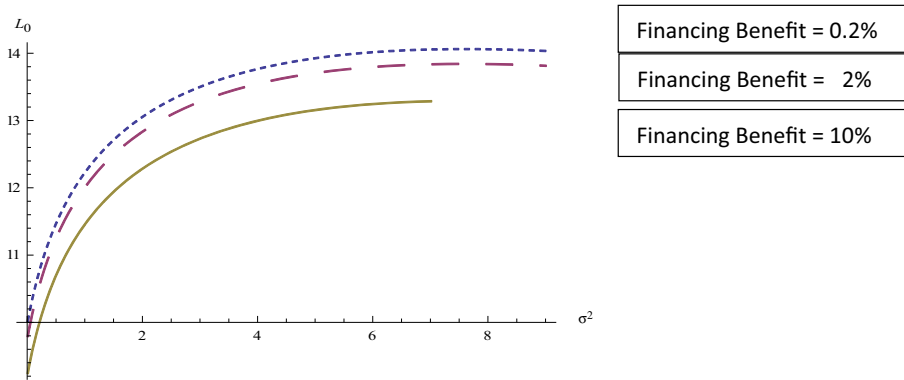


Fig. 5 Commercial real estate leasing market risks and equilibrium rent of prelease contract by different developer financing benefits. Other parameters: average rent=10, equivalent risk-aversion level between average lessee and lessor, cap rate=10 %, no-default

Equating the expected utility of a prelease contract, Eq. (19), with the expected utility of the spot market lease, Eq. (7), we derive the critical level for lessee risk aversion for market equilibrium with exogenous developer default:

$$\gamma^* = \frac{2(L_0 - \mu) + kL_0}{\sigma^2} > \gamma^*(base) \text{ where } k = \frac{2\alpha p}{1-p} \tag{20}$$

The optimal prelease rent can be solved by maximizing the developer’s utility of profits.

$$L_0^* = \mu - Cap \cdot \Delta r \cdot M - \frac{g\sigma^2}{2Cap} + \frac{Cap}{g} \log\left(1 + \frac{g\sigma^2}{2\lambda k Cap}\right) \tag{21}$$

where $\Delta r = r_1 - r_0$ and $k = \frac{2\alpha p}{1-p}$

When there is no default risk ($p=0$) or there is no measurable financial loss caused by the developer default ($\alpha=0$), k vanishes and the critical level of risk aversion and optimal prelease rent revert to those in the base case. Furthermore, k increases as the developer-default probability increases or the financial loss conditional upon default increases. Therefore we can regard the parameter k ($k \geq 1$) as the developer default impact parameter.

Equation (20) implied that a higher default impact k will lead to a reduced prelease demand, D_0 .

$$\frac{\partial D_0}{\partial p} \leq 0; \frac{\partial D_0}{\partial \alpha} \leq 0 \tag{22}$$

This outcome is caused by the lessee’s being reluctant to prelease in the light of developer default risk. Equation (21) implies that a higher default impact k will lead to a decreased equilibrium prelease rent L_0 . The lessee’s hedging premium is reduced when she faces a developer default risk.

$$\frac{\partial L_0}{\partial p} \leq 0; \frac{\partial L_0}{\partial \alpha} \leq 0 \tag{23}$$

Figure 6 illustrates the impact of the developer default probability upon the equilibrium rent-risk relationship, while Fig. 7 demonstrates the impact of the lessee loss,

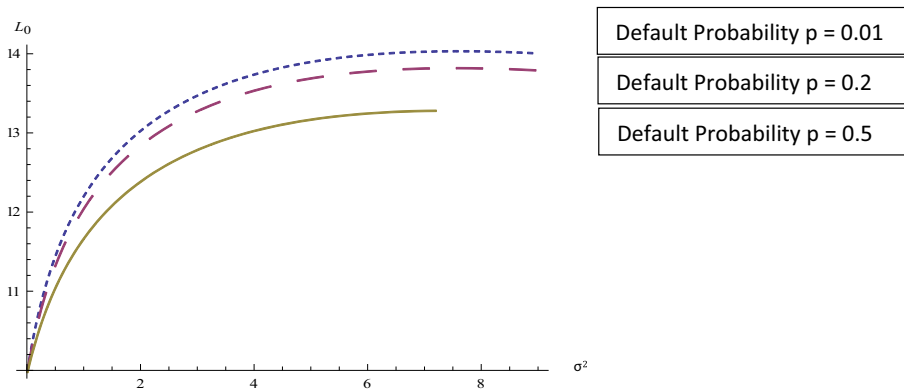


Fig. 6 Commercial real estate leasing market risks and equilibrium rent of prelease contract by different developer default probability. Other parameters: average rent=10, cap rate=10 %, equivalent risk-aversion level between average lessee and lessor, loss given default=0.5

conditional upon developer default, on the equilibrium rent-risk relationship. Figures 6 and 7 illustrates the results from Eq. (23); the higher the likelihood of developer default or the greater the lessee loss, conditional upon default, the lower will be the equilibrium prelease rent.

Effects of a Lessee’s Prelease Cancellation Clause

A prelease contract with a tenant cancellation clause creates added flexibility for the lessee by creating an option for non-occupancy, and simultaneously protects the lessee from market rent increases in the new building. Mooradian and Yang (2002) analyze the importance of the tenant cancellation strategy in the corporate real estate leasing decision. By including a lessee cancellation clause in the prelease contract, the lessor is essentially issuing a put option.

If the prelease contract requires a cash deposit (αL_0) to obtain the right (but not the obligation) to rent the commercial real estate space in the future, the prelease lessee can “walk away” by forfeiting the deposit (the option premium) for any reason, including if the future market rent L_1 decreases sufficiently.¹¹ When the lessee decides to exercise the cancellation clause in the prelease contract, the maximum liability is equal to the amount of the deposit.¹²

The optimal exercise of the cancellation clause occurs when $L_1 < (1 - \alpha)L_0$; In that instance, the lessee will exercise the cancellation option and the lessor loses the prelease rent commitment. When $L_1 \geq (1 - \alpha)L_0$, the cancellation option

¹¹ There are certainly other reasons that a tenant does not honor the prelease contract such as tenant default or down-sizing, or alternative location choice, etc. On the other hand, there may some hidden costs of cancellation for the lessees. Therefore the proportional loss α should be interpreted as an effective economic threshold for exercising the cancellation clause.

¹² We abstract from additional lessee search costs and lessor space marketing expenses.

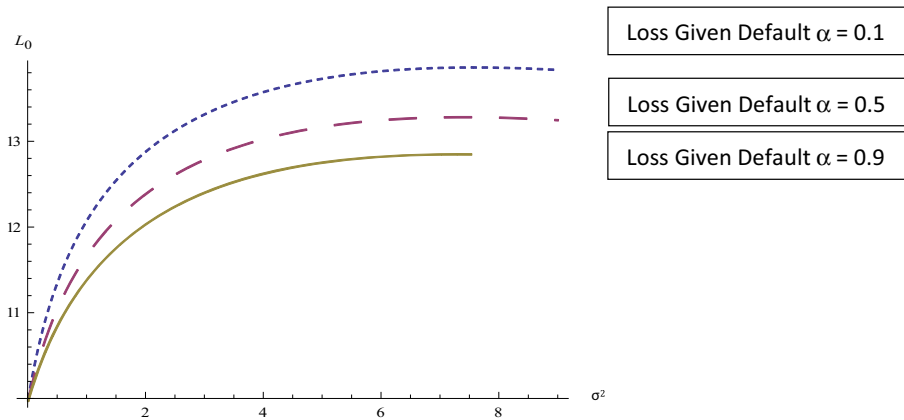


Fig. 7 Commercial real estate leasing market risks and equilibrium rent of prelease contract by different loss rates given default. Other parameters: average rent=10, cap rate=10 %, equivalent risk-aversion level between average lessee and lessor, developer default probability=0.5

will not be exercised and the lessees will honor the prelease contract (*ceteris paribus*). The tenant’s utility with the prelease cancellation option is equal to or greater than that of the base case.

$$U^i_F = \min \left\{ -1/\gamma e^{\gamma L_0}, -1/\gamma e^{\gamma [L_1 + \alpha L_0]} \right\} \tag{24}$$

The critical value of risk aversion becomes¹³

$$\gamma^* = \frac{2(L^*_0 - \mu - G)}{\sigma^2} < \gamma^*(\text{base})$$

where $e^{\gamma G} = \frac{1 - e^{\gamma \alpha L_0} N(d - \gamma \sigma)}{N(-d)}$, and $d = \frac{(1 - \alpha)L^*_0 - \mu}{\sigma}$ (25)

Clearly, offering a prelease cancellation option increases prelease demand and decreases the critical value for risk aversion vis-à-vis that of the base case.

The equilibrium prelease rent should implicitly price the lessee cancellation option. The developer maximizes the following expected utility from the combined prelease and spot lease markets:

$$U(L_0, L_1) = \left\{ -1/g \exp \left[-\frac{gL_0}{Cap} + g(I + r_0M) \right] [1 - I_A(L_1)]^{-1} / g \exp \left[-g \frac{\alpha L_0 + L_1}{Cap} + g(I + r_0M) \right] I_A(L_1) \right\} \left\{ \exp(-\lambda \gamma^*) + 1/g \exp \left[-g \frac{L_1}{Cap} + g(I + r_0M) \right] \right\} (1 - \exp(-\lambda \gamma^*))$$

(26)

where $I_A(L_1)$ is an indicator function $I_A(L_1) = \begin{cases} 1 & \text{if } L_1 \in A \text{ or } L_1 < (1 - \alpha)L_0 \\ 0 & \text{if } L_1 \notin A \text{ or } L_1 \geq (1 - \alpha)L_0 \end{cases}$.

¹³ Note that G is a function of γ . Therefore Eq. (25) is an implicit definition of γ .

Equation (26) shows that when the spot market rent at $T=1$ is significantly lower than the prelease rent, lessees who have signed a prelease contract will forfeit the deposit by walking away from the commitment and rent space in the spot market. The equilibrium prelease rent is solved by the developer's maximization Eq. (27):

$$L_0^* = \underset{L_0}{\operatorname{argmax}} \left\{ \begin{array}{l} e^{-\lambda\gamma^*} \left[-\exp\left(-\frac{gL_0}{Cap} + gr_0M\right)N(-d) - \exp\left(-g\left(\frac{\alpha L_0 + \mu}{Cap} - r_1M\right) + \frac{g^2\sigma^2}{2Cap^2}\right)N(d + g\sigma) \right] \\ -\exp\left(-g\left(\frac{\mu}{Cap} - r_1M\right) + \frac{1}{2}\left(\frac{g\sigma}{Cap}\right)^2\right)(1 - \exp(-\lambda\gamma^*)) \end{array} \right\}$$

where γ^* , and d are functions of L_0

(27)

The cancellation option scenario does not have a closed-form solution. We therefore employ numerical methods to deduce implications. Following the same frameworks as in Figs. 3, 4 and 5, the three panels in Figs. 8, 9 and 10 display the prelease function for various commercial real estate leasing market variables. It is not surprising that the equilibrium values for the prelease rent with the tenant cancellation option are higher than are those of the base case, because the lessor has to be compensated for the increased risk of adverse rent movements.

Figure 8 compares three prelease rent curves with different pairs of values for risk aversion for lessor and lessee. In contrast to Fig. 3, the prelease rent increases with market volatility under these three scenarios of lessee-lessor risk-aversion relationships. Because the cancellation option is considered as part of the prelease rent in equilibrium, higher expected rental market risk will result in higher prelease rents. The prelease rent is higher when lessees are more risk-averse than the lessor because the prelease rent includes an additional risk premium created by the cancellation clause. Figure 9 illustrates the prelease rent function for a range of capitalization rates. Figure 10 shows the prelease rent function for varying levels of financing benefits. If the developer-lessor attains a greater financing benefit by preleasing, she is willing to secure lower prelease rents. However, the prelease rents are still higher than the expected spot market rent. If the financing benefit is sufficiently large (for example, there is a 10 % financing

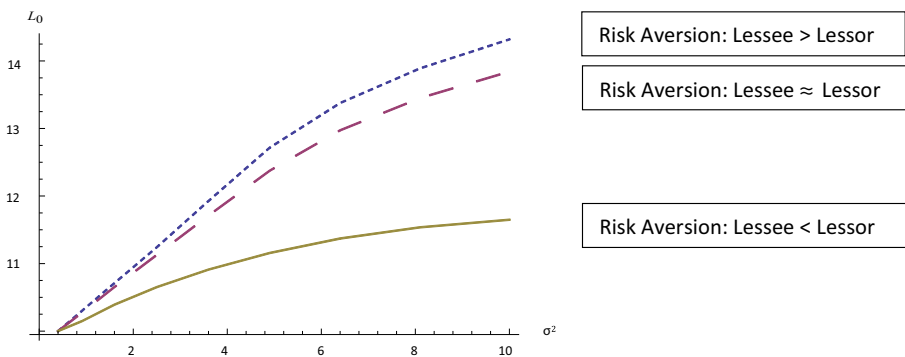


Fig. 8 Commercial real estate leasing market risks and equilibrium rent of prelease contract by different risk aversion levels of lessees and lessor. Other parameters: average rent=10, cap rate=10 %, considering the Lessee's Cancellation Clause

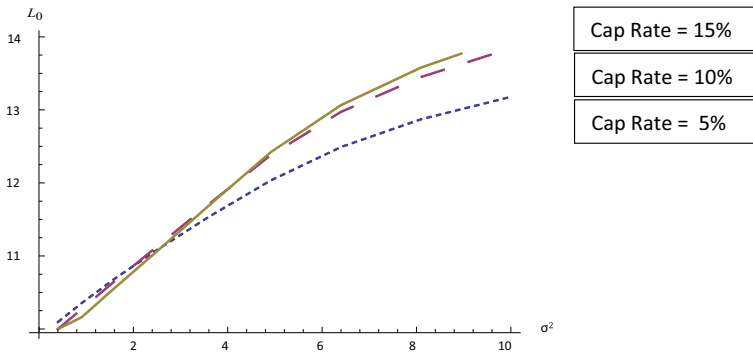


Fig. 9 Commercial real estate leasing market risks and equilibrium rent of prelease contract by different cap rates. Other parameters: average rent=10, equivalent risk-aversion level between average lessee and lessor, considering the Lessee’s Cancellation Clause

benefit), the developer-lessor could charge zero premium, because the value of financing benefit has well offset the cost of writing an option to the lessees.

Conclusion

Research on commercial real estate has been accelerated due to the availability of commercial databases such as *Real Capital Analytics* (e.g., Plazzi et al. 2010) and *CoStar* (e.g., Gatzlaff and Liu 2013). Commercial real estate preleasing is a common international practice, surprisingly few studies have investigated the economics of preleasing. This study has examined preleasing contracts for to-be-built commercial real estate, using a set of equilibrium micro-economic agency models. The key analysis focuses on the lessee’s desire to hedge future rent increases while also creating an option for non-occupancy in the future, the lessor’s desire to hedge against future rent declines, and the generation of an option for default—non-delivery of the premises to tenants in a timely fashion.

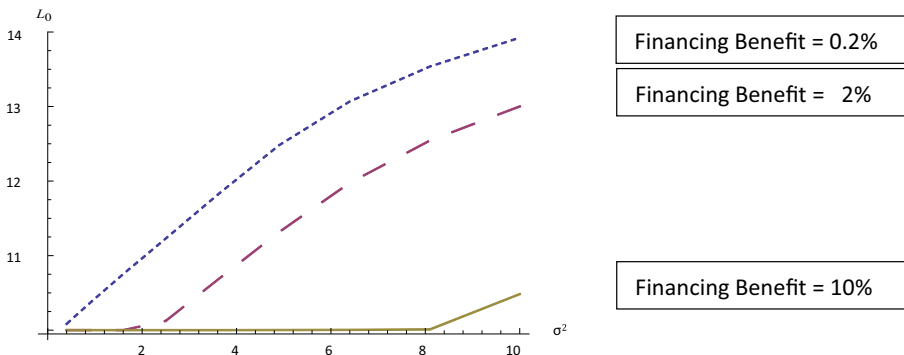


Fig. 10 Commercial real estate leasing market risks and equilibrium rent of prelease contract by different developer financing benefits. Other parameters: average rent=10, equivalent risk-aversion level between average lessee and lessor, cap rate=10 %, considering the Lessee’s Cancellation Clause

Our paper derives the conditions for generating a stable separating market equilibrium for prelease contracts and spot market leases, assuming heterogeneous risk preferences for lessees (and lessors). We are also able to determine the level of prelease activity as well as the prelease market-clearing rental rate. While our analysis has focused on to-be-built commercial real estate markets, the approach for our preleasing model, with minor modification, is applicable to other situations, including the preleasing of existing buildings as well as lease renewals.

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