

**On the Efficiency of the *UPREIT* Organizational Form:  
Implications for the Subprime Crisis And CDO's**

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## **On the Efficiency of the *UPREIT* Organizational Form: Implications for the Subprime Crisis And CDO's**

**Abstract:** This paper studies optimal real estate organizational forms as a means of enhancing real estate values in the ongoing subprime crisis. We model the organizational response to stakeholder conflicts and regulatory changes to show how they evolve to an optimal form and undertake an optimal capital structure to enhance the welfare of investors. Using the examples of the REIT and RELP organizational forms, we show how the rivalry between taxable and institutional investors shapes the UPREIT form. We employ a two-period partial equilibrium model to demonstrate that UPREITs adapt to regulatory changes by (i) meticulously acquiring a hybrid form (containing the desirable features of both REITs and RELPs), and (ii) efficiently trading off debt claims (between their constituent investor bases). This adaptation enhances welfare by mitigating administrative costs, agency costs, bankruptcy costs, illiquidity costs and taxes.

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## I. INTRODUCTION

*"Although the existing theories (of a firm) have delivered very important and useful insights, they seem to be quite ineffective in helping us cope with the new types of firms that are emerging."*

(Luigi Zingales, 2000, pg. 1623)

The efficient structure of organizations is of interest to academics, policy makers and practitioners. Organizations typically evolve to the form that helps them survive the competitive environment to deliver the products demanded by their customers at the lowest prices by mitigating transaction costs (see Coase, 1937; and Alchian, 1950).

A critical analysis of how efficient real estate organizational forms reinforce optimal employment of both real and financial resources is the need of the hour. This is because the ongoing subprime crisis has devastated property values and the capital base of financial institutions funding them on both sides of the Atlantic. It has also thrown global financial markets in a wild tailspin. This adverse economic situation has led policy makers to search for innovative ideas to foster the recovery of the real estate sector of the economy. One such solution contemplated is setting up special real estate organizational forms to attract capital, increase liquidity in the sector and revive the beleaguered financial markets and institutions to jump start the global economy (see Boston, 2008). This behavior is akin to that of American policy makers who initiated similar reforms during the post Savings and Loans crisis of the 1980s and 1990s, which had a damaging impact on real estate values as described below.

The real estate industry in countries such as Australia, Belgium, Finland, France, Germany, Hong Kong, Italy, Japan, Netherlands, Singapore, Spain, and United Kingdom have successfully lobbied their respective governments to allow them to structure closed-end type property funds (termed Real Estate Investment Trust, REIT, in the U.S.).<sup>1, 2</sup> The government subsidies help economic development by harnessing the competition between taxable individuals and non-taxable institutions. The purpose of this study is to investigate the

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1 REITs are similar to mutual funds as they provide investors with diversification, liquidity and professional management. They facilitate diversification of a portfolio of properties without direct ownership or management. They provide liquidity as their shares are traded on a stock exchange. Furthermore, they are not taxable at the entity level as they are structured as a Trust or a Corporation (defined below) subject to the following constraints: (i) They invest at least 75% of their assets in real estate, mortgages or cash equivalents (receivables, government securities etc.); (ii) They derive at least 75% of their gross income from real estate activity and distribute at least 90% of this in the form of dividends; and (iii) They are owned by a minimum of 100 shareholders such that not more than 50% of the outstanding shares are owned by five or fewer investors (see Goolsbee and Maydew, 2002).

2 A "Trust" is a legal entity, where assets are held by the "trustee" for the interest of the "beneficiary."

dominance of a new form of REIT called the Umbrella Partnership REIT (UPREIT).<sup>3, 4</sup> This issue is intriguing, as UPREITs gained their prominence after the passage of the Omnibus Budget Reconciliation Act of 1993 (OBRA '93) by the 103<sup>rd</sup> U.S. Congress on August 10, 1993. This act was passed to encourage institutional (especially pension fund) investment in the moribund real estate sector of the economy, which had eroded the collateral of many financial institutions and the tax base of metropolitan areas nationwide (see Downs, 1998).<sup>5</sup>

The public finance literature explains organizational forms from two perspectives. The first group of studies examines the contractual structure of various organizational forms that contributes to their survival and discusses the features of residual claims as a means of controlling agency problems (Fama and Jensen 1983a, b). The second group of studies, however, investigates the impact of tax as well as non-tax factors on organizational forms. Notable studies in this group are described as follows. Gravelle and Kotlikoff (1989) use simulation to estimate the extent to which firms' choice of organizational form changes in response to differences between corporate and personal tax rates.<sup>6</sup> Gordon and MacKie-Mason (1994) use simulation to study the effects on equilibrium allocations of differences in personal tax rates across investors and differences in taxable income across industries. MacKie-Mason

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3 A Limited Partnership is an organization formed by two or more investors, where one of them is designated the general partner (GP), while the remaining are classified as limited partners (LPs). The GP manages the business and assumes all liability of the partnership, while the LPs are liable only for their original investment, i.e., they have limited liability. The LPs have a preferred status over the GP on the dissolution of the partnership (see Scholes et al. 2002).

4 An UPREIT is a combination of a REIT and a Real Estate Limited Partnership (RELP). It is viewed as an "umbrella partnership," where the "investors" (i.e., REIT shareholders or capital contributors) serve as a GP while the "sponsors" (i.e., property contributors) constitute the LP of the Operating Partnership (OP) owning all the properties (see Capozza and Seguin, 2003; Sinai and Gyourko, 2004; and Section IV for further details).

5 Institutional interest in REITs began with their extensive participation in the KIMCO REIT Initial Public Offering (IPO) in 1991. In November 1992 (prior to the passage of OBRA '93) precedence was set by the Taubman REIT IPO, which led to the restructuring of the REIT industry to the current UPREIT form, as explained below.

Taubman had a large debt position that was maturing. Selling off part of the portfolio to repay the debt would have triggered significant tax liabilities. Thus, by structuring the IPO as an umbrella partnership, Taubman was able to raise the crucial capital needed to repay the loan without triggering capital gains. Following the private letter rulings from the Internal Revenue Service (IRS) approving the new UPREIT form, the majority of REIT IPOs in the 1990s adopted the structure. Finally, in the mid-1990s, a number of existing REITs recognized that they were at a competitive disadvantage to the new REITs and thus converted to the UPREIT form.

6 Regular U.S. Corporations (referred to as C-Corporations) distinguish themselves with the following features: centralized management, limited liability, unlimited life, and transferability (liquidity) of their shares. However, stockholders of corporations are subject to double taxation of income (first at the corporate level and second at the investor level on distributed dividends) and taxation on any realized capital appreciation. In contrast, S-Corporations are limited liability corporations, taxed as pass through entities. However, they face restrictions on the number of shareholders and class of stock (see Scholes et al. 2002).

and Gordon (1997), empirically investigate the Gordon and MacKie-Mason (1994) hypothesis to ascertain that profitable firms shift out of the corporate sector when the distortions due to double taxation are large (and vice versa) for firms with tax losses. Finally, Goolsbee (2004) empirically documents that relative tax rates (of corporate versus personal income) significantly impact on the share of economic activity that is performed by corporations.

Missing from the above literature is conclusive evidence relating organizational form to the tax status of entities, their clienteles and their capital structure. Specifically, there are few studies examining the evolution of real estate organizational forms in a dynamic regulatory environment. Lentz and Fisher (1989) [Collins and Bey (1986)] conclude that it is better to use the corporate form in contrast to a Real Estate Limited Partnership (RELPs) [Publicly Traded Partnership, PTP, and its forerunner the Master Limited Partnership, MLP] for real estate investments that produce large tax losses and/ or that are eligible for tax credits. This conclusion is empirically corroborated by Damodaran et al. (1997), who find that financially troubled real estate entities reorganize to a more flexible corporate form, while profitable ones convert to a restrictive structure (in terms of assets, income, dividend distribution policy and ownership restraints) of a REIT.<sup>7, 8, 9</sup>

Organizational form is interrelated to its capital structure as a lender can expropriate away the tax advantage of debt by charging a high interest rate (see Miller, 1977). This leads us to conclude that the pricing of debt undertaken by organizations in equilibrium (after incorporating their exogenous taxes) is distinct and *endogenous*. This issue is empirically corroborated by Geunther (1992) for C-Corporations and MLPs.

In contrast to numerous studies on the capital structure for industrial firms, there is limited (and inconclusive) research on the capital structure of REITs, RELPs and their hybrid UPREITs. Here too, the literature explains the issue from two perspectives. The first group of

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7 Although both REITs and RELPs possess the pass through (conduit) features in the tax code, there are some contrasting features stemming from their legal framework. RELPs are endowed with less institutional restrictions in terms of assets, income and dividend distribution policies as opposed to REITs, while simultaneously being allowed to pass through qualified tax losses to unit-holders (see Lentz and Stern, 1991; Guenther, 1992; Gentry, 1994; Damodaran et al., 1997; and Gentry and Mayer, 2002).

8 Changes in tax laws or IRS rulings may also trigger changes in organizational forms along the lines suggested by MacKie-Mason and Gordon (1997) and Damodaran et al. (1997). This is documented by Hodder et al. (2003) in the case of banks (from C-corporation to S-corporation) and Goolsbee and Maydew (2002) in the case of REIT spin-offs (from high profile and profitable C-corporations).

9 It should be noted that the regulatory constraint on a REIT's dividend policy has been found to be non-binding by Wang et al. (1993) and Bradley et al. (1998). Furthermore, institutional ownership constraints such as the "look-through" provision of the five-or fewer rule have been relaxed to revive the depressed real estate market in the early 1990's by OBRA '93 (Downs, 1998).

studies examines capital structure from the perspective of the classical theorems in the financial economics literature. Notable studies in this group are described as follows. Howe and Shilling (1988) argue that since REITs cannot deduct interest expenses, they are at a relative disadvantage compared to tax paying firms. They, thus, deduce that the value of REITs is inversely related to leverage. However, their empirical examination of stock price reactions (to announcements of new security offerings by REITs) suggests signaling of private information as an explanation for debt issuance. Maris and Elayan (1990) empirically examine REITs based on the theoretical considerations of agency costs and financial leverage clientele. Their results illustrate that REITs establish their capital structure to attract different investor clienteles, resulting in a binomial distribution. Jaffe (1991) models real estate entities such as REITs, RELPs and related entities in the classical Modigliani and Miller, MM (1958, 1963) framework. He refutes Howe and Shilling's (1988) argument derived from the tax hypothesis and demonstrates that the value of a real estate entity is invariant to leverage. Hamill (1993) extends the Jaffe (1991) analysis by incorporating recourse and non-recourse debt of RELPs to demonstrate the robustness of the invariance results. He argues that S-corporations portray a similar relationship (between value and leverage) that is observed in REITs with one exception. That is, when debt at the corporate level is available at a lower cost than at the individual level.<sup>10</sup> Shilling (1996) contradicts both Jaffe (1991) and Hamill (1993) by employing the Miller (1977) model to demonstrate that the REIT value is respectively maximized at the extreme 100% or 0% equity financing depending on whether there is a disadvantage or advantage of debt.<sup>11</sup> Ghosh et al. (1997) empirically corroborate the first result of Shilling (1996).

The second group of studies, however, investigates capital structure using other approaches. Notable studies in this group are described as follows. Gentry and Mayer (2002) examine the non-linear interaction between a REIT's investment and capital structure policies

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10 The following limitations of MM (1958, 1963) drive the basic Jaffe (1991) and the Hamill (1993) results: (i) The MM model *aggregates* the two adversarial claimants' (debt and equity) objective functions, thereby depriving the analysis of supply and demand functions and hence the optimal pricing parameters of debt; (ii) It is construed under risk neutrality (similar to a linear programming model) yielding a multitude of solutions (i.e., the well-known invariant result) in the absence of market imperfections (such as taxes) and a corner solution (i.e., 100% debt financing) under corporate tax deductibility of interest. A crucial assumption of the above invariant result is that individuals resorting to the MM (1958) arbitrage have the same negotiating prowess with financiers as available to institutions. Cornell (1997) highlights this limitation by stating that institutions (such as real estate entities) are able to get better terms on financing by using the underlying real assets as collateral. See Ebrahim and Mathur (2007) for a critique of the MM (1958, 1963) and Miller (1977) perspectives.

11 It should be noted that the Miller (1977) model driving Shilling's (1996) results is subject to the same limitation of the MM (1963) analysis as stated in Footnote 10.

by using a modified version of Tobin's  $q$  approach, where the underlying assets of the REIT are estimated using its appraised values. They deduce that REIT investment in properties is quite responsive to its modified Tobin's  $q$ , while its debt-to-value ratio responds sluggishly to it. Furthermore, REITs issue equity [announce repurchases] when their modified Tobin's  $q$  is high [low]. Finally, Giambona et al. (2008) verify the Shleifer-Vishny (1992) hypothesis that the leverage and debt maturity of REITs is influenced by the liquidation values of their underlying assets.<sup>12</sup>

Studying real estate investment from the perspectives of heterogeneous agents and alternative organizational forms raises the following interrelated intriguing issues (ranging from a macro to a micro-level): (i) How does an efficient organizational form evolve (given a particular set of claims) in a dynamic regulatory environment? (ii) How stable is this efficient organizational form? (iii) What are the sources of the welfare gains? (iv) How does competition between heterogeneous economic agents allocate these claims (given a real estate organization)? (v) Does capital structure matter for real estate entities? The aim of this study is to establish a basic framework to answer these questions.

In general, any analysis of optimal organizational form for real estate entities should cover five areas. First, it should link organizational form with its capital structure (Miller, 1977; Guenther, 1992). Second, it should incorporate the rivalry between taxable and institutional investors (Auerbach and King, 1983).<sup>13</sup> Third, it should embody non-tax factors such as administrative costs; limited liability (related to bankruptcy costs); and marketability (related to liquidity or trading of shares/ units in secondary markets) (Lentz and Stern, 1991; Barber, 1996; MacKie-Mason and Gordon, 1997; and Scholes et al., 2002). Fourth, it should integrate the entity's investment and financing policies in a non-linear framework instead of a linear framework (Gentry and Mayer, 2002). Fifth, it should segregate the demand and supply sides of financing to incorporate the agency perspective of equity and debt in a non-linear

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12 Shleifer and Vishny's (1992) prognosis linking debt capacity (and maturity) of a firm with its liquidation value is supported by the following well-known studies: (i) Benmelech et al. (2005), who find that properties with greater zoning flexibility are financed with higher loan-to-value ratios, larger maturity and lower interest rates; and (ii) Brown et al. (2006), who demonstrate that asset liquidation value is a significant factor in the lender's decision to foreclose or restructure a loan and thus influence the borrower's decision to default.

13 Modeling the rivalry between taxable and non-taxable investors is an intricate issue as one cannot use the standard mean-variance CAPM framework. This is because differential taxes imply heterogeneous expectations. This segregates the efficient frontier for both economic agents, breaching the well-known Two Fund Separation Theorem proposed by Tobin (1958).

framework, where value-additivity advocated in capital structure theorems does not hold (Varian, 1987).<sup>14, 15</sup>

This paper studies the optimal structuring of economically viable REITs, RELPs and UPREITs. We demarcate the underlying property cash flows into their component equity (real estate security) and debt (mortgage) stakeholder cash flows, and model the *agency perspective* of risk-averse investors [with *non-linear* objective functions] in the economy. This approach is consistent with that of Allen (2001), who recommends researchers in financial institutions to focus on the conflict of interest (agency issue) between equity and debt.<sup>16</sup> The present study, however, employs a rational expectations equilibrium (REE) to evaluate pareto-optimal debt contracts, where the deadweight costs of bankruptcy, related to limited liability, and tax parameters are assumed to be exogenous.<sup>17, 18</sup> We implicitly assume the existence of an *information architecture*, where property rights, foreclosure procedures, needed for real estate to serve as collateral, and accurate methods of valuing property are well established (see Levine et al., 2000). Finally, the welfare of both Pareto-efficient stakeholders in the REIT and RELP forms is contrasted to arrive at the Pareto-optimal hybrid UPREIT organizational form.

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14 Agency cost of debt refers to distortions in managerial decision making that are caused by conflicts of interest between stockholders and bondholders. The finance literature generally attributes agency issues to the presence of asymmetric information (see Allen, 2001). Financing real estate investment, however, constitutes a special case, where lenders (principals) can decipher any proprietary (ex-ante) information held by borrowers (agents) by trading financial claims over a multi-period horizon. This is substantiated in the literature on multi-period insurance contracting (see Cooper and Hayes, 1987; and Hosios and Peters, 1989). In the real world, lenders also have access to information on ex-post risk and return on various classes of properties to help them underwrite their facilities appropriately. Adverse selection (stemming from ex-ante information asymmetry) is reduced further by releasing funds in the escrow process when the title of the specific property is exchanged for cash. Lenders also reduce moral hazard (stemming from ex-post change in borrower behavior) by mandating the following in the mortgage covenants: (i) minimum maintenance of the property; (ii) payment of taxes; and (iii) adequate insurance coverage.

15 Segregating the demand and supply sides of financing incorporates the *agency perspective* of both net-borrower (agent) and net-lender (principal) to *endogenously* determine the equilibrium parameters of a loan contrary to the prognosis of MM (1958, 1963) and Miller (1977) (see Ebrahim and Mathur, 2007).

16 Our model employs a two-period version of the well-known Lucas (1978) model to study real estate organizational forms.

17 We opt for a setting involving symmetric information, as equilibrium asset prices aggregate and reveal private information (see Grossman and Stiglitz, 1976, and 1980). Thus, capital market participants can easily interpret private information held by counterparties by observing their trading patterns. This result is a consequence of the Efficient Market Hypothesis (EMH – see Fama, 1970, 1991; Bray, 1981; Sheffrin, 1996; Malkiel, 2003).

18 Rational Expectations is defined by Maddock and Carter (1982) as "the application of the principle of rational behaviour to the acquisition and processing of information and to the formation of expectations." Bray (1981) explains it further by classifying rational expectations equilibrium as "self-fulfilling," as economic agents form correct expectations given the pricing model and information.



Three key results are derived in this paper, as discussed from a micro to a macro-level. First, capital structure does matter for real estate entities, as trading financial claims, against a property's cash flows, help competing risk-averse agents in optimizing their social welfare. Our results reflect a synthesis of the well-known Pecking Order and Static Trade-off Theories (Myers, 1984; Myers and Majluf, 1984), but construed in a framework of *symmetric* information.<sup>19</sup> These results confirm the frustrations of researchers such as Fama and French (2002) who try to disentangle the predications of the two competing theories. Our results also support the empirical findings of Shyam-Sunder and Myers (1999) in spite of the disapproval of Frank and Goyal (2003), who feel that large firms (with a long history of trading) are not subject to any adverse effects of asymmetric information. Finally, our results are based on the intuition that leverage and clientele for the real estate entities is contingent on the quality of the underlying assets and the regulatory restrictions imposed by the U.S. Congress. The fundamental relationship between debt and quality of assets is consistent with Maris and Elayan (1990), Shleifer and Vishny (1992) and Giambona et al. (2008).

Second, REITs coalesce with RELPs to the hybrid form of UPREITs to acquire the desirable features of the underlying forms. This is designed to move to the most efficient equilibrium, which is restricted to either of the REIT or RELP forms. This action alleviates transaction costs stemming from tax as well as non-tax factors inherent in one, or both, forms. Thus, the overall gains in welfare emanate from: (i) meticulous structuring of the UPREIT form, which minimizes administrative costs, bankruptcy costs, illiquidity costs, and taxes; and (ii) optimal use of leverage, which minimizes not only taxes but also the *endogenous* agency

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19 Our results illustrate ranking in a *hierarchical* order of *decreasing* pareto-efficiency with *increasing* agency costs of debt. They rank debt equilibria higher than that of equity equilibria in conformity with the Pecking Order Theory (see Myers 1984; and Myers and Majluf, 1984). We also observe the result of the Static Tradeoff Hypothesis (Myers, 1984) but as an intermediate equilibrium, as it involves reduction in welfare. This is because risky debt equilibrium is impacted severely by the agency cost of debt which is provoked by the risk of default. These equilibria are rationalized as follows:

- (i) The relative efficiency of risk-free mortgage over risky mortgage is based on the elimination of any risk of default. This result is in agreement with Wald (1999) and Graham (2000), who find that conservative debt ratios are the norm for large, liquid and profitable companies (with negligible bankruptcy costs).
- (ii) The relative efficiency of the risk-free equilibrium (with the fiduciary as the dominant investor or net borrower) is based on tax efficiency and is subject to regulatory constraints.
- (iii) The relative efficiency of risky equilibrium (with the taxable investor as the dominant investor or net borrower) is based on the availability of personal tax write-offs (on the original purchase price of the real estate entity, in states of default) and on the ability of the fiduciary to extract any potential costs of default in the form of high interest rates. This result is in agreement with Myers (2001) and the Static Trade-off Hypothesis (Myers, 1984).
- (iv) Finally, if the costs of default are excessive, leverage is not feasible. The real estate entity will then opt for equity financing. This result is in agreement with Agrawal and Nagarajan (1990), Berens and Cuny (1995), Shilling (1996), and Ghosh et al. (1997).

costs of debt. This improvement in welfare is empirically corroborated from wealth effects on UPREITs documented by both Ling and Ryngaert (1997) and Downs (1998).

The above result is based on the intuition that welfare of agents in an unconstrained optimization model (i.e., UPREIT form) is higher than that in a constrained, or restricted, form of either a REIT or a RELP. The increase in pareto-efficiency stems from the fact that the restricted original forms reduce the welfare of at least one agent without increasing that of the other. The hybrid form basically serves to "arbitrage" the beneficial features of the underlying restrictive forms. This result of pareto-efficiency is consistent with the view of Gordon and MacKie-Mason (1994), MacKie-Mason and Gordon (1997), Scholes et al. (2002) and that of Coase, who viewed hybrid organizational forms as "strange" and commented that it "might represent the dominant form of doing business" (see Menard, 2004, Footnote 3). However, the UPREIT form has the potential of unraveling if the conflict of interest between the "sponsors," or OP unit holders, and "investors," or shareholders of the REIT, are not mitigated. This potential instability of the UPREIT form is consistent with the view of Fama and Jensen (1983a, b) and Menard (2004).

Finally, UPREITs have the potential to boost the global economy by mitigating three types of moral hazard endemic in collateralized debt obligations (CDOs), which have brought about the current subprime crisis. Investment in Mortgage (or Hybrid) UPREITs can, thus, help shore up the capital base of financial institutions to facilitate the free flow of credit.

This paper is organized as follows: Section II illustrates the theoretical underpinnings of the REIT model; Section III demonstrates the model solutions (relegating all proofs to the Appendix); Section IV extends the model to the case of the RELP, sheds light on the synthesis (between the two) ensuing in the UPREIT form and contrasts UPREITs with CDOs, which are at the heart of the subprime crisis; Finally, Section V concludes the paper.

## II. MODEL DEVELOPMENT FOR REITS

For simplicity and mathematical tractability, we assume a two-period economy where there are two types of agents, two types of assets and an exogenous entity called the government. The agents are: (i) an investor, subject to taxes from the government; and (ii) a fiduciary of an institution, not subject to taxes, in the form of a pension fund etc. Agents are endowed with distinct amounts of the numeraire good, in our economy, at times  $t = 0$  and  $t = 1$ . They maximize their respective welfare at time  $t = 0$ .<sup>20, 21</sup> The assets in our economy consist of

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<sup>20</sup> Our model optimizes the expected utility of wealth instead of consumption. This approach may seem to be a departure from the norm of optimization over consumption. However, both methodologies are equivalent as

a real asset and a financial asset. The real asset consists of a property, whose payoffs at time  $t = 1$  constitute of net operating income, NOI ( $\tilde{q}_1$ ), and terminal value ( $\tilde{P}_1$ ), where both  $\tilde{q}_1$  and  $\tilde{P}_1$  are non-negative random first-order Markov processes and their probability distributions are known to the agents in the economy. Investment in the real asset is organized through an entity called a REIT.<sup>22</sup> The financial asset includes a risk-free or a risky mortgage issued by the REIT by encumbering its underlying real property and trading off financial claims against its payoffs. The government imposes a flat tax  $\tau$  on the net income earned, and paid out as dividends, by the REIT, an effective capital gains tax of  $g\tau$  on the appreciation of the REIT's stock price and allows a depreciation deduction of  $D_{\text{REIT}}$ .<sup>23, 24</sup> In general, any profits made at the REIT level are passed through to the shareholders. Any losses of the REIT have to be written off at the corporate, or trust, level.

The analysis in this section is carried out by modeling the taxable investor [non-taxable fiduciary] as a net borrower [lender] investing in only the REIT [the REIT and the Mortgage]. This is classified as Model I in Figure 1. Here, the taxable agent has a controlling interest in the REIT. The scenario is reversed in Model II (Figure 1) as discussed in the following section with the taxable investor [non-taxable fiduciary] as the net lender [borrower] investing in only the REIT and the Mortgage [the REIT]. Here, the fiduciary has a controlling interest in the REIT. We then evaluate both model solutions after imposing necessary market clearing conditions. The rationale for segregating the analysis in two models is to avoid the debilitating effect of the breakdown of the Tobin Fund Separation Theorem and incorporate the

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consumption ensues from wealth of assets, whose payoffs are denominated in the numeraire good. Optimization of expected utility of wealth is preferred over consumption due to legal constraints imposed on the fiduciary such as the "Prudent Man Rule" under the Employee Retirement Income Security Act (ERISA) of 1974 in the USA.

- 21 A two-period model is used in lieu of an overlapping generation's model as it avoids the implicit assumption of the infinite tenure of a risk-free bond. Our approach is consistent with the literature as Gordon and MacKie-Mason (1994) and Ciochetti et al. (2002) have also resorted to a two-period analysis for its relevance.
- 22 Even though our model is especially applicable to Equity REITs, it can be extended to Mortgage REITs by redefining the NOI, terminal value, and tax parameters. An important issue in the ongoing subprime crisis is the structuring of Mortgage (or Hybrid) REITs with illiquid mortgages to alleviate various types of moral hazards endemic in CDOs.
- 23 Since the effective tax rate on capital gains is less than that on income/dividends, capital gains are preferentially taxed. Thus,  $g$  is equivalent to the ratio of the effective capital gains tax rate and the tax on income, i.e.,  $g = \frac{g\tau}{\tau} \leq 1$ . For sake of simplicity, we do not segregate the capital gains rates on the appreciation of property and the recapture of depreciation as instituted in the Taxpayer Relief Act of 1997.
- 24 Likewise, taxable agents get a write-off against personal income for any capital losses in their REIT investment.

competitive behavior between the heterogeneous agents in the shaping of optimal stakeholder claims. This also embodies the distinct impact of taxes when the institutional investor is the net lender (in Model I), as opposed to the scenario where she is the net borrower (in Model II). This is consistent from a microeconomic perspective, where for every net borrower there is a net lender.

[FIGURE 1 HERE]

## II.a. Modeling the Taxable Investor as Net Borrower (Agent)

The goal of the taxable investor (in Model I) is to purchase the fractional shares,  $s$ , of the equity of the REIT and to borrow  $Q$  through the REIT form to maximize his expected utility of wealth:

$$\begin{aligned} \text{Max. } E_0 \{U(w_0) + \beta U(\tilde{w}_1)\} \\ (\text{in } w_0, w_1, s, Q) \end{aligned}$$

subject to the temporal budget constraints

$$w_0 = e_0 - s [P_0 - Q]_{\text{REIT Shell}} \quad (1)^{25}$$

$$\begin{aligned} \tilde{w}_1 &= e_1 + s [(\tilde{q}_1 + \tilde{P}_1) - Q(1 + \tilde{r})]_{\text{REIT Shell (APT)}} \\ &= e_1 + s [(\tilde{q}_1(1 - \tau) + \tilde{P}_1(1 - g\tau) + g\tau P_0 + \tau D_{\text{REIT}}(1 - g)) - Q(1 + \tilde{r})]_{\text{REIT Shell}} \end{aligned} \quad (2)^{26}$$

where:  $E_0 \{\cdot\}$  is the expectation operator at time 0,

$U(\cdot)$  is a strictly concave and twice continuously differentiable (Von Neumann-Morgenstern) utility function of the taxable investor,

$w_0$  is the wealth at time 0,

$\tilde{w}_1$  is the stochastic wealth at time 1,

$\beta$  is the discount factor,

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25 All borrowing is undertaken by the REIT at its Trust level, which is termed the REIT shell for expository purposes.

26 The net payoffs of a REIT consist of the following components:

- (i) The inflow component stemming from the  $s$  fractional ownership of the REIT times the dividend income added to its terminal value after deducting all the relevant taxes. First, the dividend income (after-tax) is evaluated by deducting the depreciation write-offs from the NOI as  $(\tilde{q}_1 - D_{\text{REIT}})(1 - \tau)$ . Second, the tax-basis of the REIT is evaluated as  $(P_0 - D_{\text{REIT}})$ . Third, the terminal value of the REIT (after taxes) is evaluated by deducting the capital gains tax of  $g\tau[\tilde{P}_1 - (P_0 - D_{\text{REIT}})]$  from the stochastic future value of the REIT ( $\tilde{P}_1$ ) as  $[\tilde{P}_1(1 - g\tau_1) + g\tau P_0 + \tau D_{\text{REIT}}(1 - g)]$ . Note that the depreciation write-offs on the income side are recaptured as capital gains on the liquidation side, yielding a net-effect equal to  $D_{\text{REIT}}\tau(1 - g)$ .
- (ii) The outflow component stemming from the payoff of the loan is equal to  $[s Q (1 + \tilde{r})]$ .

$s$  is the fractional investment in the shares of the REIT,

$Q$  is the total amount of capital resources borrowed at the Trust level,<sup>27</sup>

$P_0$  is the price of the assets, i.e., property, enclosed by the organizational form of REIT at time 0 ( $P_0 = \text{Debt } (Q) + \text{Equity } (P_0 - Q)$ ),

$e_0$  and  $e_1$  are the respective endowments at times 0 and 1,

$\tilde{r}$  is the real interest rate,<sup>28</sup>

$\tilde{q}_1$  is the NOI of the REIT received at time 1,

$\tilde{P}_1$  is the terminal value of the underlying property of REIT at time 1,

$\tau$  is the tax imposed by the government on net income,

$g\tau$  is the tax on capital appreciation,

$D_{\text{REIT}}$  is the depreciation allowed on the underlying property owned by the REIT,

$(1 - k_{\text{REIT}})\%$  is the sum of direct and indirect bankruptcy costs,<sup>29</sup> and

The suffix "APT" denotes the residual payoffs after all personal taxes.

The budget constraint at  $t = 0$  (Equation 1) illustrates residual wealth emanating from the initial endowment  $e_0$  after deducting the cost of a fraction  $s$  of the leveraged REIT at a unit price of  $(P_0 - Q)$ . The budget constraint at  $t = 1$  (Equation 2) illustrates the wealth emanating from the future endowment  $e_1$  in addition to the net payoffs of the fractional unit  $s$  of the REIT shares, after repayment of mortgage and taxes.

The Lagrangian  $L$  can be written as

$$L = E_0 \{ [U(w_0) + \beta U(\tilde{w}_1)] + \lambda_0 [e_0 - s(P_0 - Q) - w_0] \\ + \lambda_1 \beta [e_1 + s[(\tilde{q}_1(1 - \tau) + \tilde{P}_1(1 - g\tau) + g\tau P_0 + \tau D_{\text{REIT}}(1 - g)) - Q(1 + \tilde{r})] - \tilde{w}_1] \}$$

The First Order Necessary Conditions (FONCs) can be stated as follows:

- (i) At the optimum, the taxable investor will bid for the fractional shares ( $s$ ) of the REIT, which yields net benefits equal to zero. Similarly, the investor will avoid investing in a REIT if the net benefit is less than zero. This simplifies to the demand function for a REIT described as follows. The price bid for a share of REIT ( $P_0 - Q$ ) is equal to the expected value of the intertemporal marginal rate of substitution of the taxable investor

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27 In the current framework,  $Q$  is assumed to be positive as it denotes the amount borrowed (see Model I, Figure 1). The following Section III.a.(iva) discusses the case when  $Q$  is the amount lent (see Model II, Figure 1).

28 It is constant for a risk-free loan and variable (state dependent) for a risky loan.

29 These two costs of bankruptcy are incorporated in the model for the institutional investor as described in Section II.B.

( $\text{IMRS}_T = \beta E_0[\frac{U'(\tilde{w}_1)}{U'(w_0)}]$ ) times the net proceeds of underlying property, after repayment of mortgage and appropriate taxes.

$$\beta E_0 \left\{ \left[ \frac{U'(\tilde{w}_1)}{U'(w_0)} \right] [(\tilde{q}_1(1-\tau) + \tilde{P}_1(1-g\tau) + g\tau P_0 + \tau D_{\text{REIT}}(1-g)) - Q(1+\tilde{r})] \right\} = (P_0 - Q) \quad (3)$$

For a risk-free mortgage, Equation (3) simplifies to Equation (3a) given below.

$$(P_0 - Q_{\text{RF}}) = \beta E_0 \left\{ \left[ \frac{U'(\tilde{w}_1)}{U'(w_0)} \right] [(\tilde{q}_1(1-\tau) + \tilde{P}_1(1-g\tau) + g\tau P_0 + \tau D_{\text{REIT}}(1-g)) - Q_{\text{RF}}(1+r_{\text{RF}})] \right\} \quad (3a)$$

For a risky mortgage, Equation (3) decomposes into two integral components as expressed in Equation (3b). The first integral illustrates states of default, in the economy below the critical state  $c$ , where the taxable agent is allowed to write off his loss in the original purchase price of the REIT ( $P_0 - Q_{\text{Risky}}$ ) against his personal taxes. In contrast, the second integral illustrates the normal states, in the economy above the critical state  $c$ , where the taxable agent receives the full proceeds of his REIT investment, net of mortgage repayment and taxes.

$$(P_0 - Q_{\text{Risky}}) = \beta \int_0^c \frac{U'(\tilde{w}_{1j}) [g\tau(P_0 - Q_{\text{Risky}})]}{U'(w_0)} dx + \beta \int_c^\infty \frac{U'(\tilde{w}_{1j}) [(\tilde{q}_{1j}(1-\tau) + \tilde{P}_{1j}(1-g\tau) + g\tau P_0 + \tau D_{\text{REIT}}(1-g)) - Q_{\text{Risky}}(1+r_{\text{Risky}})]}{U'(w_0)} dx \quad (3b)^{30}$$

- (ii) At the optimum, the benefit of borrowing a unit amount of numeraire good is *equal* to its associated cost. This simplifies to the demand function for a mortgage described as follows. The  $\text{IMRS}_T$  of investor times the grossed up factor (consisting of one plus the real rate of interest) is equal to the unit amount of the numeraire good:

$$\beta E_0 \left\{ \left[ \frac{U'(\tilde{w}_1)}{U'(w_0)} \right] (1+\tilde{r}) \right\} = 1, \forall s \neq 0 \quad (4)$$

---

30 Two variables introduced in Equation (3b) are explained as follows:

- (i) The critical state  $c$  is defined as the state of the economy up to which the REIT is technically in default on its mortgage obligations. That is,  $Q^*_{\text{Risky}}(1+i^*_{\text{Risky}}) > (q_{1j} + P_{1j}) \forall j \leq c$ .
- (ii) The variable of integration  $x$  is defined in terms of the probability density function of future stochastic payoffs ( $f(\cdot)$ ) as follows:  $dx = f(q_{1j} + P_{1j})d(q_{1j} + P_{1j})$ .

For a risk-free mortgage Equation (4) simplifies to Equation (4a):

$$1 = \beta E_0 \left\{ \left[ \frac{U'(\tilde{w}_1)}{U'(w_0)} \right] (1+r_{RF}) \right\}, \forall s \neq 0 \quad (4a)$$

For a risky mortgage, Equation (4) again decomposes into two integral components as expressed in Equation (4b). The first integral illustrates states of default, below the critical state  $c$ , where the taxable agent loses both the terminal value of the REIT and the residual NOI. In contrast, the second integral illustrates normal states (above the critical state 'c'), where the REIT is liable for the full contractual payment on the underlying mortgage contract.

$$1 = \beta \int_0^c \frac{U'(\tilde{w}_{1j})[\tilde{q}_{1j} + \tilde{P}_{1j}]}{U'(w_0)Q_{Risky}} dx + \beta \int_c^\infty \frac{U'(\tilde{w}_{1j})[1+r_{Risky}]}{U'(w_0)} dx, \forall s \neq 0. \quad (4b)$$

The above analysis separates the investment decision from the financing one as shown in Equations (3) and (4), respectively. Nonetheless, the two decisions impact each other through the optimal wealth parameters  $w_0$  and  $\tilde{w}_1$  demonstrating the violation of the well-known Fisher Separation Theorem.<sup>31</sup>

Thus, a unique and constrained maximum of the taxable investor's objective function requires that the following conditions are met: First, the deterministic budget constraint (at  $t = 0$ ) as depicted by Equation (1), and the stochastic budget constraint (for each state of the economy at  $t = 1$ ), as depicted by Equation (2), are satisfied; Second, the simplified FONCs, i.e., Equations (3) and/ or (4), are satisfied. We note that the second order conditions are automatically satisfied as Chiang (1984) demonstrates that maximization of a strictly concave and twice continuously differentiable utility function with quasi-convex constraints gives a negative definite bordered Hessian matrix.

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31 The Fisher separation theorem states that under perfect and complete capital markets the production decision of a firm is determined solely by objective market criteria (such as maximization of wealth) without any consideration of its owner's subjective preferences. Market imperfections, such as taxes, lead to a breakdown of the separation (see Fisher, 1930; and Hirshleifer, 1958).

## II.b. Modeling the Fiduciary of an Institution as Net Lender (Principal)

Similar to the previous case, the goal of the fiduciary of an institution in Model I is to optimally select the fractional  $s'$  shares of equity of the REIT to purchase along with the amount of capital resources to lend  $Q'$  to the REIT to maximize her expected utility of wealth.<sup>32</sup>

$$\begin{aligned} \text{Max. } E_0 \{ V(w'_0) + \beta' V(\tilde{w}'_1) \} \\ (\text{in } w'_0, w'_1, s', Q') \end{aligned}$$

subject to the temporal budget constraints

$$w'_0 = e'_0 - s'[P_0 - Q']_{\text{REIT Shell}} - Q' \quad (5)$$

$$\tilde{w}'_1 = e'_1 + s'[(\tilde{q}_1 + \tilde{P}_1) - Q'(1+\tilde{r})]_{\text{REIT Shell}} + Q'(1+\tilde{r})_{\text{ABC}} \quad (6)^{33}$$

where:  $V(\cdot)$  represents the strictly concave and twice continuously differentiable (Von Neumann-Morgenstern) utility function of the fiduciary,

The notations with primes have the same meaning as that in the case of the taxable investor, and

The suffix "ABC" denotes the residual payoffs after all bankruptcy costs.

The budget constraint at time  $t = 0$  (Equation 5) illustrates the residual wealth emanating from the initial endowment  $e'_0$  after deducting the cost of the portfolio comprising of a fraction  $s'$  of the REIT at a unit price of  $(P_0 - Q')$  and a mortgage of  $Q'$  made to the underlying Trust. The budget constraint at  $t = 1$  (Equation 6) illustrates wealth emanating from future endowment  $e'_1$  along with net payoffs of the same portfolio of the REIT and the mortgage.

The Lagrangian  $L'$  can be written as

$$L' = E_0 \{ [V(w'_0) + \beta' V(\tilde{w}'_1)] + \lambda_0 [e'_0 - s'(P_0 - Q') - w'_0] + \lambda_1 \beta' [e'_1 + s'[(\tilde{q}_1 + \tilde{P}_1) - Q'(1+\tilde{r})] + Q'(1+\tilde{r})_{\text{ABC}} - \tilde{w}'_1] \}$$

The FONCs can be stated as follows:

- (i) At the optimum, the fiduciary will bid for a fraction  $s'$  of the REIT shares, which yields net benefits equal to zero. Similarly, the fiduciary will avoid investing in the REIT if the net benefit is less than zero. This too, simplifies to the demand function of the REIT

32 Maximization of the expected utility of wealth by a fiduciary is in compliance with ERISA particularly with respect to the Prudent Man's Rule. Furthermore, the beneficiaries of a pension plan may endorse a more conservative, i.e., risk averse, strategy with respect to their pension assets as opposed to their individual ones. This is consistent with empirical literature on trading activity of 401(K) plans versus an individual brokerage account (see Agnew et al., 2003; and Barber and Odean, 2004).

33 The dividend income emanating from institutional investment in REITs is not subject to the Unrelated Business Income Tax (UBIT) as long as it does not severely infringe upon the ownership concentration constraint. The ownership restrictions are binding despite the relaxation of the "look-through" provision of the five-or-fewer rule in OBRA '93 (see Downs, 1998).



yielding an optimal price ( $P_0-Q'$ ) as equal to the expected value of the intertemporal marginal rate of substitution of the fiduciary ( $IMRS_F = \beta' E_0[\frac{V'(\tilde{w}'_1)}{V'(\tilde{w}'_0)}]$ ) times the net proceeds of property after repayment of mortgage.

$$\beta' E_0 \left\{ \left[ \frac{V'(\tilde{w}'_1)}{V'(\tilde{w}'_0)} \right] [(\tilde{q}_1 + \tilde{P}_1) - Q'(1+\tilde{r})] \right\} = (P_0 - Q') \quad (7)$$

For a risk-free mortgage Equation (7) simplifies to Equation (7a).

$$(P_0 - Q'_{RF}) = \beta' E_0 \left\{ \left[ \frac{V'(\tilde{w}'_1)}{V'(\tilde{w}'_0)} \right] [(\tilde{q}_1 + \tilde{P}_1) - Q'_{RF}(1 + r_{RF})] \right\} \quad (7a)$$

For a risky mortgage, Equation (7) again decomposes into two integral components as expressed in Equation (7b). The first integral component illustrates the states of default, below the critical state  $c$ , where the fiduciary loses her REIT investment. This has a value of zero as a fiduciary of a non-taxable institution is not allowed to write-off losses, unlike a taxable investor. In contrast, the second integral illustrates the normal states, above the critical state  $c$ , where the fiduciary receives the full proceeds of her REIT investment, net of the mortgage repayment. This has a positive value. Thus, the asymmetrical payoffs of a REIT, in the default states versus normal states, under risky mortgages, are construed as value reducing by the fiduciary.

$$(P_0 - Q'_{Risky}) = \beta' \int_c^{\infty} \frac{V'(\tilde{w}'_{1j}) [(\tilde{q}_{1j} + \tilde{P}_{1j}) - Q'_{Risky}(1 + r_{Risky})]}{V'(\tilde{w}'_0)} dx \quad (7b)$$

- (ii) At the optimum, the benefit of lending is *equal* to its associated cost. This simplifies to the supply function for a mortgage described as follows. The  $IMRS_F$  times the grossed up factor (consisting of one plus the real rate of interest) is equal to the unit amount of the numeraire good:

$$\beta' E_0 \left\{ \left[ \frac{V'(\tilde{w}'_1)}{V'(\tilde{w}'_0)} \right] (1+\tilde{r}) \right\} = 1, \forall (1-s') \neq 0 \quad (8)$$

For a risk-free mortgage Equation (8) simplifies to Equation (8a).

$$1 = \beta' E_0 \left\{ \left[ \frac{V'(\tilde{w}'_1)}{V'(\tilde{w}'_0)} \right] (1+r_{RF}) \right\}, \forall (1-s') \neq 0 \quad (8a)$$

For a risky mortgage, Equation (8) again decomposes into two integral components as expressed in Equation (8b). The first integral illustrates states of default (in the economy below the critical state  $c$ ) where the fiduciary repossess the underlying property of the REIT along with its residual NOI, net of all direct and indirect costs of bankruptcy denoted by the fraction  $(1 - k_{\text{REIT}})$ . In contrast, the second integral incorporates normal states, above the critical state  $c$ , where the fiduciary receives full contractual payments of the mortgage.<sup>34</sup>

$$1 = \beta' k_{\text{REIT}} \int_0^c \frac{V'(\tilde{w}'_{1j})[\tilde{q}_{1j} + \tilde{P}_{1j}]}{V'(\tilde{w}'_0)Q_{\text{Risky}}} dx + \beta' \int_c^\infty \frac{V'(\tilde{w}'_{1j})[1+r_{\text{Risky}}]}{V'(\tilde{w}'_0)} dx, \quad \forall (1-s') \neq 0. \quad (8b)$$

Here too, the above analysis separates the investment decision from the financing one as shown in Equations (7) and (8), respectively. Nonetheless, the two decisions impact on each other through the optimal wealth parameters  $w'_0$  and  $\tilde{w}'_1$ .

Thus, a unique constrained maximum of the fiduciary's objective function requires that the following conditions are met: First, the deterministic budget constraint (at  $t = 0$ ) as depicted by Equation (5), and the stochastic budget constraint (for each state of the economy at  $t = 1$ ), as depicted by Equation (6), are satisfied; Second, the simplified FONCs, i.e., Equations (7) and/or (8), are satisfied. The second order conditions for a maximum are automatically satisfied due to the properties of a strictly concave and twice continuously differentiable utility function with quasi-convex constraints (see Chiang, 1984).

### II.c. The Market Clearing Conditions

(i) For the asset (REIT) market to be in equilibrium:

The fractional shares bought must sum up to one, i.e.,  $s + s' = 1$ . Also, the fiduciary may not be allowed to short REIT's shares, i.e.,  $s' \geq 0$ . Furthermore, in the long run, taxable investor may not permanently go short in the asset market, i.e.,  $s \geq 0$ . (9)

(ii) For the debt (mortgage) market to be in equilibrium:

$$\text{Funds Borrowed (Q)} = \text{Funds Lent (Q')} \quad (10)$$

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34 In the context of our model,  $k_{\text{REIT}} = 1$  signifies a risky mortgage with negligible bankruptcy costs. That is, it yields a hybrid facility akin to preferred stock in corporate finance. This is elaborated further in the Appendix.

### III. MODEL SOLUTION FOR REITS

A Rational Expectations Equilibrium (REE) is defined as one where all agents in the economy are knowledgeable of the property's payoffs  $(\tilde{q}_1, \tilde{P}_1)$  and their probability distributions. Assuming competitive markets and no initial capital constraints, at most five distinct solutions, i.e., equilibria ranked in a decreasing hierarchical order of pareto-efficiency, are plausible for *risk-averse* investors on satisfaction of their necessary conditions (discussed below). The optimal capital structure of a REIT is contingent on the quality of the underlying property owned by it and entails searching for the pareto-optimal financing package that minimizes the endogenous agency costs of debt and market imperfections such as taxes. The agents in the economy, thus, opt for pareto-optimal choices that involve the different clientele of the REIT. If the taxable investor outbids his institutional counterpart and owns the REIT in its entirety, as depicted with  $s = 1$  and  $s' = 0$  in Model I in Figure 1, it is classified as the first-corner solution. If both entities own fractions of the REIT, as depicted with  $s > 0$  and  $s' > 0$  in Models I and II in Figure 1, it is classified as an interior solution. Finally, if the fiduciary or institutional investor outbids her taxable counterpart and owns the REIT in its entirety, as depicted with  $s = 0$  and  $s' = 1$  in Model II in Figure 1, it is classified as the second-corner solution. Our results are different from the solutions discussed in the literature stemming from linear models. It should be noted that our solutions involve the respective agents trading off either risk-free or risky or no financial claims against the underlying real asset. Bankruptcy in our model is endogenously determined as the financial contracts prices default-free mortgages separately from those involving default.

#### III.a. The Necessary Conditions For Model Solutions

##### Lemma 1.

A rational expectations equilibrium for a risk-free mortgage involves at most two distinct equilibria, depending on the identity of the net borrower. The first [second] equilibrium requires satisfaction of the necessary conditions (i), (ii) and (iii) [(i), (iv) and (v)] as described below:

- (i) Basic Condition: The future stochastic payoffs of the underlying property owned by the REIT, composed of the sum of NOI plus the terminal value, are strictly positive even in the worst state of the economy. That is,  $\text{Min. } (q_{1j} + P_{1j}) >> 0 \forall j$ . (11)

The above condition necessitates that the underlying property of the REIT be of high quality to retain its value in the subsequent period.

- (ii) Asset (REIT) Pricing Condition for the Interior Solution (when the taxable investor is the net borrower as illustrated in Model I in Figure 1) requires that the agents do not outbid each other for the ownership of the REIT. In other words, the expected value of the IMRS of each investor times the net proceeds of the real estate project after repayment of the risk-free mortgage and appropriate taxes is equal to the price of the REIT:

$$\begin{aligned} & \beta E_0 \left\{ \left[ \frac{U'(\tilde{w}_1)}{U'(\tilde{w}_0)} \right] [(\tilde{q}_1(1-\tau) + \tilde{P}_1(1-g\tau) + g\tau P_0 + \tau D_{REIT}(1-g)) - Q_{RF}(1+r_{RF})] \right\} \\ & = \beta' E_0 \left\{ \left[ \frac{V'(\tilde{w}'_1)}{V'(\tilde{w}'_0)} \right] [(\tilde{q}_1 + \tilde{P}_1) - Q_{RF}(1+r_{RF})] \right\} = (P_0 - Q_{RF}), \forall s \in (0,1) \end{aligned} \quad (12a)$$

- (iib) Asset (REIT) Pricing Condition for the First Corner Solution (when the taxable investor is the net borrower) requires the outbidding of the institutional investor:

$$\beta E_0 \left\{ \left[ \frac{U'(\tilde{w}_1)}{U'(\tilde{w}_0)} \right] [(\tilde{q}_1(1-\tau) + \tilde{P}_1(1-g\tau) + g\tau P_0 + \tau D_{REIT}(1-g)) - Q_{RF}(1+r_{RF})] \right\} = (P_0 - Q_{RF}), \forall s=1 \quad (12b)$$

- (iii) Debt (Mortgage) Pricing Condition for the Interior/ First Corner Solution (when the taxable investor is the net borrower) requires equality between the demand and supply functions for risk-free mortgage financing:

$$\beta E_0 \left\{ \left[ \frac{U'(\tilde{w}_1)}{U'(\tilde{w}_0)} \right] (1+r_{RF}) \right\} = \beta' E_0 \left\{ \left[ \frac{V'(\tilde{w}'_1)}{V'(\tilde{w}'_0)} \right] (1+r_{RF}) \right\} = 1, \forall s \in (0,1) \quad (13)$$

- (iva) Asset (REIT) Pricing Condition for the Interior Solution (when the fiduciary is the net borrower as illustrated in Model II in Figure 1) requires satisfaction of the condition similar to Equation (12a). However, the wealth parameters for the case where the fiduciary is the net borrower are respectively evaluated, differently from those in Sections II.a and II.b, as follows:

$$w_0 = e_0 - s [P_0 - Q]_{REIT\ Shell} - Q \quad (1a)$$

$$\begin{aligned} \tilde{w}_1 & = e_1 + s [(\tilde{q}_1 + \tilde{P}_1) - Q(1 + \tilde{r})]_{REIT\ Shell\ (APT)} + Q(1 + \tilde{r})_{APT} \\ & = e_1 + s [(\tilde{q}_1(1-\tau) + \tilde{P}_1(1-g\tau) + g\tau P_0 + \tau D_{REIT}(1-g)) - Q(1 + \tilde{r})]_{REIT\ Shell} + Q(1 + \tilde{r}(1-\tau)) \end{aligned} \quad (2a)$$

$$w'_0 = e'_0 - s' [P_0 - Q]_{REIT\ Shell} \quad (5a)$$

$$\tilde{w}'_1 = e'_1 + s' [(\tilde{q}_1 + \tilde{P}_1) - Q(1 + \tilde{r})]_{REIT\ Shell} \quad (6a)$$

Note that when the taxable agent is the net borrower (as depicted in Model I, Section II.a.), he cannot write off the interest expense against the REIT's operating income (see Howe and Shilling, 1988; Maris and Elayan, 1990; and Shilling, 1996). However, when he is the net lender (as depicted in Model II), he is taxed on the interest income as shown in Equation (2a). This asymmetric imposition of taxes leads to different mortgage pricing conditions as shown in Equations (13) and (15) leading to the feasibility of only corner solutions in the case of REITs. That is, the equilibria comprise of solutions where either the taxable investor owns the REIT in its entirety (first corner solution) or the fiduciary owns the REIT in its entirety (second corner solution).

- (ivb) Asset (REIT) Pricing Condition for Second Corner Solution (when the fiduciary is the net borrower) requires the outbidding of the taxable investor:

$$\beta' E_0 \left\{ \left[ \frac{V'(\tilde{w}'_1)}{V'(\tilde{w}'_0)} \right] [(\tilde{q}_1 + \tilde{P}_1) - Q_{RF}(1 + r_{RF})] \right\} = (P_0 - Q_{RF}), \forall s = 0 \quad (14)$$

Here too, the wealth parameters are given by Equations (5a) and (6a).

- (v) Debt (Mortgage) Pricing Condition for Interior/ Second Corner Solution (when the fiduciary is the net borrower) requires equality between the supply and the demand functions for risk-free mortgage financing (after substituting for the wealth parameters as given in Equations (1a), (2a), (5a) and (6a)):

$$\beta E_0 \left\{ \left[ \frac{U'(\tilde{w}'_1)}{U'(\tilde{w}'_0)} \right] (1 + r_{RF} \left( \frac{1-s-\tau}{1-s} \right)) \right\} = \beta' E_0 \left\{ \left[ \frac{V'(\tilde{w}'_1)}{V'(\tilde{w}'_0)} \right] (1 + r_{RF}) \right\} = 1, \forall s \in [0,1) \quad (15)$$

**Proof:** See Appendix.

**Lemma 2.**

A rational expectations equilibrium for a risky (non-recourse) mortgage involves at most two distinct equilibria, again depending on the identity of the net borrower. The first [second] equilibrium requires satisfaction of the necessary conditions (i), (ii) and (iii) [(i), (iv) and (v)] as described below.

- (i) Basic Conditions: (a) The mortgage is structured in such a way that it involves default in some state of the economy in the following period; (b) The interest rate contracted for risky mortgage is greater than that of the corresponding risk-free mortgage solution

determined above; (c) Finally, the debt ratio for risky mortgage is greater than that of the corresponding risk-free mortgage solution determined above.

- (ii) Asset (REIT) Pricing Condition for Interior Solution (when the taxable investor is the net borrower as illustrated in Model I in Figure 1) requires that the agents do not outbid each other for the ownership of the REIT. In other words, the expected value of IMRS of each investor times the net proceeds of the real estate project after repayment of risky mortgage and appropriate taxes is equal to the price of the REIT:

$$\begin{aligned}
& \beta \int_0^c \frac{U'(\tilde{w}_{1j})[g\tau(P_0 - Q_{\text{Risky}})]}{U'(w_0)} dx \\
& + \beta \int_c^\infty \frac{U'(\tilde{w}_{1j})[(\tilde{q}_{1j}(1-\tau) + \tilde{P}_{1j}(1-g\tau) + g\tau P_0 + \tau D_{\text{REIT}}(1-g)) - Q_{\text{Risky}}(1+r_{\text{Risky}})]}{U'(w_0)} dx \\
& = \beta' \int_c^\infty \frac{V'(\tilde{w}'_{1j})[(\tilde{q}_{1j} + \tilde{P}_{1j}) - Q_{\text{Risky}}(1+r_{\text{Risky}})]}{V'(w'_0)} dx = (P_0 - Q_{\text{Risky}}), \forall s \in (0, 1) \quad (16a)
\end{aligned}$$

In general, the above condition is not satisfied. This is because the fiduciary perceives owning REIT shares, where the underlying property is encumbered with a risky mortgage, as value reducing (see Equation (7b)).<sup>35</sup> One can also argue that an interior solution is not feasible in the case of risky mortgages as they are quasi-equity claims. Thus, a fiduciary in her role as lender would not own an equity claim (REIT shares) along with a quasi-equity claim of a risky mortgage.

- (iib) Asset (REIT) Pricing Condition for First Corner Solution (when the taxable investor is the net borrower) requires the outbidding of the institutional investor:

35 Institutional investors generally forgo risky investment strategies as it would constitute a breach of trust as a fiduciary and subject them to litigation. They are, therefore, compelled to adopt conservative investment policies (see Agnew et al., 2003; and Barber and Odean, 2004).

$$\begin{aligned}
& \beta \int_0^c \frac{U'(\tilde{w}_{1j})[g\tau(P_0 - Q_{\text{Risky}})]}{U'(w_0)} dx \\
& + \beta \int_c^\infty \frac{U'(\tilde{w}_{1j})[(\tilde{q}_{1j}(1-\tau) + \tilde{P}_{1j}(1-g\tau) + g\tau P_0 + \tau D_{\text{REIT}}(1-g)) - Q_{\text{Risky}}(1+r_{\text{Risky}})]}{U'(w_0)} dx \\
& = (P_0 - Q_{\text{Risky}}), \forall s = 1
\end{aligned} \tag{16b}$$

- (iii) Debt (Mortgage) Pricing Condition for Interior/ First Corner Solution (when the taxable investor is the net borrower) requires equality between the demand and supply functions for risky mortgage financing:

$$\begin{aligned}
& \beta \int_0^c \frac{U'(\tilde{w}_{1j})[\tilde{q}_{1j} + \tilde{P}_{1j}]}{U'(w_0)Q_{\text{Risky}}} dx + \beta \int_c^\infty \frac{U'(\tilde{w}_{1j})[1+r_{\text{Risky}}]}{U'(w_0)} dx = \\
& \beta' k_{\text{REIT}} \int_0^c \frac{V'(\tilde{w}'_{1j})[\tilde{q}_{1j} + \tilde{P}_{1j}]}{V'(w'_0)Q_{\text{Risky}}} dx + \beta' \int_c^\infty \frac{V'(\tilde{w}'_{1j})[1+r_{\text{Risky}}]}{V'(w'_0)} dx = 1, \forall s \in (0, 1]
\end{aligned} \tag{17}$$

- (iva) Asset (REIT) Pricing Condition for Interior Solution (when the fiduciary is the net borrower as illustrated in Model II in Figure 1) requires satisfaction of the condition similar to Equation (16a). However, the wealth parameters are described by Equations (1a), (2a), (5a) and (6a), respectively.

Here too, the above pricing condition is also not satisfied generally as the fiduciary perceives owning REIT shares, encumbered with a risky mortgage, as value reducing.

- (ivb) Asset (REIT) Pricing Condition for Second Corner Solution (when the fiduciary is the net borrower) requires the outbidding of the taxable investor:

$$\beta' \int_c^\infty \frac{V'(\tilde{w}'_{1j})[(\tilde{q}_{1j} + \tilde{P}_{1j}) - Q_{\text{Risky}}(1+r_{\text{Risky}})]}{V'(w'_0)} dx = (P_0 - Q_{\text{Risky}}), \forall s = 0 \tag{18}$$

Here too, the wealth parameters are given by Equations (5a) and (6a). However, the above pricing condition too is also generally not satisfied as the fiduciary perceives owning REIT shares, encumbered with a risky mortgage, as value reducing.

- (v) Debt (Mortgage) Pricing Condition for Interior/ Second Corner Solution (when the fiduciary is the net borrower) requires equality between the supply and demand functions for risky mortgage financing after substituting for the wealth parameters as given in Equations (1a), (2a), (5a) and (6a):

$$\beta \int_0^c \frac{U'(\tilde{w}_{1j}) [k_{REIT}(1-s-\tau)[\tilde{q}_{1j} + \tilde{P}_{1j}] + \tau Q_{Risky}]}{U'(w_0)(1-s)Q_{Risky}} dx + \beta \int_c^\infty \frac{U'(\tilde{w}_{1j}) [1+r_{Risky}(1-s-\tau)]}{U'(w_0)(1-s)} dx =$$

$$\beta' \int_0^c \frac{V'(\tilde{w}'_{1j}) [\tilde{q}_{1j} + \tilde{P}_{1j}]}{V'(w'_0)Q_{Risky}} dx + \beta' \int_c^\infty \frac{V'(\tilde{w}'_{1j}) [1+r_{Risky}]}{V'(w'_0)} dx = 1, \forall s \in [0, 1) \quad (19)$$

Here again, the above condition, in general, is not satisfied as the fiduciary perceives owning REIT shares, encumbered with a risky mortgage, as value reducing.

**Proof:** See Appendix.

### Lemma 3.

An unleveraged rational expectations equilibrium is the last resort, when the *endogenous* agency costs of debt deter the leveraged equilibrium (described in Lemmas 1 and 2). It involves a distinct solution, which requires satisfaction of the asset (REIT) pricing condition as described below.

- (i) Asset (REIT) Pricing Condition (Interior Solution) requires the expected value of the IMRS of each investor times the net payoffs of the underlying real property, after payment of appropriate taxes, to equal the price of the REIT:

$$\beta E_0 \left\{ \left[ \frac{U'(\tilde{w}_1)}{U'(w_0)} \right] [(\tilde{q}_1(1-\tau) + \tilde{P}_1(1-g\tau) + g\tau(P_0) + \tau D_{REIT}(1-g))] \right\}$$

$$= \beta' E_0 \left\{ \left[ \frac{V'(\tilde{w}'_1)}{V'(w'_0)} \right] [\tilde{q}_1 + \tilde{P}_1] \right\} = P_0, \forall s \in (0,1) \quad (20)$$

**Proof:** See Appendix.



### III.b. Key Result<sup>36</sup>

#### Theorem

Investment in real estate (through the organizational form of the REIT under competing heterogeneous agents) is feasible in rational expectations equilibria ranked in a *hierarchical* order of *decreasing* pareto-efficiency with *increasing* agency costs of debt. These equilibria are contingent on: (i) the quality of the underlying properties; and (ii) regulatory constraints on institutional ownership (such as the Five or Fewer rule, Unrelated Business Income Tax, etc.). The following general results are inferred from the model: First, for high quality properties (with very stable payoffs where the risk of default is not provoked), the risk-free mortgage equilibria are pareto-optimal over risky ones. Second, regulatory constraints on institutional ownership inhibit the risk-free mortgage equilibrium (where the fiduciary is the net borrower), even though it is pareto-optimal over its counterpart (where the taxable investor is the net borrower). Third, for intermediate quality properties (with less stable payoffs where the risk of default leads to a moderate reduction in social welfare) the risky mortgage equilibrium (with the taxable investor as the net borrower) is the only feasible solution. Finally, for low quality properties (with unstable payoffs where the risk of default leads to excessive reduction in welfare), the unleveraged equilibrium is the only viable alternative.

**Proof:** See Appendix.

The above results are basically construed in the framework of *symmetric* information, augmented by the agency cost of debt (provoked by the risk of default as discussed in Myers 1984; 2001), corporate and personal taxation (Miller, 1977), and regulatory constraints (Downs, 1998). Yet, they resemble an amalgamation of the Pecking Order Theory (under *asymmetric* information) and Static Trade-off Theory (under *symmetric* information and supplemented by the agency cost of debt and corporate taxation) (see, Myers, 1984; and Myers and Majluf, 1984). This is because in our hierarchical order, debt financing is ranked higher than equity financing. This is in conformity with the Pecking Order Theory. We also observe the Static Tradeoff result as an intermediate solution due to decrease in welfare. Thus, our results highlight the frustrations of researchers such as Fama and French (2002) who try their utmost to segregate the impact of the two competing theories. Furthermore, our results give credence to the empirical observations of Shyam-Sunder and Myers (1999) despite the

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36 The discussion of the key results in this section as well as in the next alludes to a numerical simulation available on request from the authors.

reservations of Frank and Goyal (2003) that large firms (with continuous trading records) are not considered to suffer from asymmetric information. Finally, our results are based on the intuition that leverage and clientele for the real estate entities is contingent on the quality of assets owned by the REIT and the regulatory restrictions imposed by U.S. Congress. The relationship between debt and quality of assets is consistent with Maris and Elayan (1990), Shleifer and Vishny (1992) and Giambona et al. (2008). These results are ranked in the hierarchical order of decreasing efficiency and rationalized as follows:

- (i) The relative efficiency of risk-free mortgage over risky mortgage is based on the elimination of agency cost of debt and is consistent with the following assertion of Myers (2001, p. 96): "Conflicts between debt and equity investors only arise when there is a risk of default. If debt is totally free of default risk, debt holders have no interest in the income, value or risk of the firm. But if there is a chance of default, then shareholders gain at the expense of debt investors." This result is also in agreement with the empirical findings of Wald (1999) and Graham (2000), who find that conservative debt ratios are the norm for large, liquid and profitable companies, with low bankruptcy costs.
- (ii) The relative efficiency of the risk-free equilibrium (with the fiduciary as the dominant investor or the net borrower in Model II) is based on tax efficiency and is deterred by regulatory constraints.
- (iii) The relative efficiency of risky equilibrium (with the taxable investor as the dominant investor or net borrower) is based on: (i) the availability of personal tax write offs (on the original purchase price of the REIT in states of default); and (ii) the ability of the fiduciary (as net lender) to extract the cost of default in the form of high interest rate. This is consistent with the above citation of Myers (2001) and the Static Trade-off Hypothesis (Myers, 1984).
- (iv) Finally, the relative efficiency of unleveraged equilibrium is based on the instability of payoffs, which cannot support fixed debt obligations. If these unstable payoffs stem from growth options, then our result is consistent with Berens and Cuny (1995). However, if the unstable payoffs constitute large undiversifiable investment of personal/family wealth and human capital, then our result is consistent with Agrawal and Nagarajan (1990). Nonetheless, the REIT in this case will opt for equity financing. This result is in conformity with the empirical observations of Shilling (1996) and Ghosh et al. (1997).

Thus, investing in real estate through the organizational form of a REIT is feasible in equilibria ranked in the following decreasing order of pareto-efficiency:

- (i) First Corner Equilibrium (with risk-free mortgage), where the taxable investor is the dominant investor (net borrower) owning all the REIT shares in the economy.
- (ii) First Corner Equilibrium (with risky mortgage), where the taxable investor is dominant investor (net borrower) owning all the REIT shares in the economy.
- (iii) Unleveraged Interior Equilibrium, where both agents own a fraction of the REIT in the economy without trading off financial claims against the payoffs of the underlying property.

It should be noted that the highest ranking equilibrium, i.e., the Second Corner solution, with the risk-free mortgage, where the fiduciary is the dominant investor owning all the REIT shares in the economy, is restricted by regulatory constraints. This is because it leads to absolute tax avoidance. Downs (1998) is of the view that although OBRA '93 relaxed the "look-through" provision of the "five or fewer" rule, it does not change the possibility of a pension fund being construed as a single investor, for purposes of the 100 investors requirement. Other aspects of OBRA '93 still impose binding constraints on the ownership concentration of REITs and expose their dividends to UBIT.

#### **IV. EXTENSION OF ANALYSIS TO RELPs AND UPREITs**

The Economic Recovery Tax Act of 1981 endowed partnerships with numerous tax benefits leading to their dominance in real estate organizational forms. This resulted in a huge tax shelter industry culminating in the passage of the Tax Reform Act of 1986 (TRA '86) to curtail their prominence (see Lentz and Fisher, 1989; Denning and Shastri, 1993; and Gordon and MacKie-Mason, 1994). The income from RELPs in the post TRA '86 era is classified as passive, as opposed to the portfolio for REITs, the depreciation schedule is lengthened and the passive losses in excess of allowed deductions are carried forward to offset any future gain, or used at the termination of the investment. Nonetheless, excess tax losses, in our RELP model explained below, have no value. A value maximizing investor would, therefore, endogenously select the property and loan characteristics in a manner that would avoid any negative effects of excess tax losses. The investor, in our model, would avoid the situation where the value of a partnership is inversely related to entity leverage.

Contrasting RELPs with REITs, we realize the following:

- (i) In the context of tax factors such as interest expense write-offs, RELPs have an advantage over REITs. This stems from the feature of partnerships that income deductions, credits, and passive losses (subject to limitations of the IRC Code) flow through to both the general and limited partners and are taxed only once at the partner level (see Lentz and Fisher, 1989; and Denning and Shastri, 1993). Thus, the interest expense of RELPs is taxed deductible, while interest income is taxable.<sup>37</sup> This symmetrical aspect of RELP taxation makes an interior solution feasible, increases its cost of debt and impacts on its capital structure.<sup>38</sup>
- (ii) In the context of tax factors such as depreciation, there is no difference between owning real estate through either the RELP or the REIT organizational form, because real estate acquired after 1993 and held for the production of income in a trade or business is depreciated straight line over either 27.5 or 39 years depending on its classification (for both RELPs and REITs, see IRS Publication 946).
- (iii) In the context of non-tax factors such as limited liability, there is not much difference between owning real estate through the organizational form of a RELP as a limited partner or a REIT. This is due to the fact that the sum of the direct and indirect costs of bankruptcy are attributed to the dominant clientele, the taxable investor or the fiduciary, of these forms and thus are similar in accordance with the observation of Gordon and MacKie-Mason (1994). That is,  $(1-k_{RELP}) \approx (1-k_{REIT})$ .
- (iv) In the context of other non-tax factors such as administrative costs and liquidity, RELPs clearly have a disadvantage in contrast to REITs (see Lentz and Stern, 1991; and Barber, 1996).

Investing in real estate, through the organizational form of a RELP under competing heterogeneous agents, can be analyzed by incorporating the following in the REIT models discussed in Sections II and III:

- (i) Changing the cost of debt for the taxable investor (in Equation (2)) from  $Q[1+\tilde{r}]$  to  $Q[1+\tilde{r}(1-\tau)]$ .

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37 In general, institutional investors are not subject to UBIT on rents from real property and gains from its disposition [IRC 512(b)(3), 512(b)(5), 512(c)]. This is true even if the property held by partnership is leveraged as long as the requirements of IRC 512 (c) (9) are satisfied.

38 The increases in the cost of debt of RELPs is attributed to part of interest expense deduction being expropriated away by institutional investor as illustrated in Equations (13) and (15) with  $\tilde{r}$  for the taxable investor being replaced with  $[\tilde{r}(1-\tau)]$ . The rationale behind this assertion is based on Miller (1977).

- (ii) Accounting for leakages in the NOI as  $\tilde{q}_1(1-z_1)$  and terminal value as  $\tilde{P}_1(1-z_2)$ , where  $z_1$  and  $z_2$  denote administrative expenses and liquidity costs, respectively.

Thus, solving the RELP model, with the above modifications (in a manner similar to that of the REIT models of Sections II and III), yields the following equilibria (ranked in *decreasing* hierarchical order of pareto-optimality with *increasing* agency costs of debt):

- (i) Interior/ Second Corner Equilibrium (with risk-free debt), where the fiduciary is the dominant investor (or net borrower) owning a fraction of the RELP units with the taxable investor.
- (ii) Interior/ First Corner Equilibrium (with risk-free debt), where the taxable investor is the dominant investor (or net borrower) owning a fraction of the RELP units with the fiduciary.
- (iii) First Corner Equilibrium (with risky debt), where the taxable investor owns all the RELP units in the economy.
- (iv) Unleveraged Interior Equilibrium, where both agents own a fraction of the RELP, in the economy, without trading off financial claims against the payoffs of the underlying property.

It should be noted that in case of RELPs, we find an improvement in *pareto-efficiency* as it is feasible to realize the highest ranking equilibrium, i.e., the Second Corner/ Interior Equilibrium. This is because RELPs are not subject to the onerous regulatory restrictions (such as the "five or fewer" rule) as REITs.

Contrasting RELPs with REITs in the new economic environment (post OBRA '93), RELPs still enjoy marginally higher tax benefits in the form of deductibility of interest expense, part of which is expropriated away, impacting on its capital structure as hypothesized by Miller (1977). This, however, comes with a disadvantage of administrative costs and liquidity (see Lentz and Stern, 1991; and Barber, 1996). The disadvantage of liquidity can be overcome by coalescing with other RELPs under the umbrella of a PTP. However, this still does not improve the efficiency of RELPs as documented by Wang and Erickson (1997). A better alternative is to meticulously synthesize RELPs with REITs to yield the UPREIT form as explained below, which not only alleviates the liquidity problem but also reduces the administrative costs.

[FIGURE 2 HERE]

Figure 2 illustrates that the UPREIT structure synthesizes a publicly-traded REIT with an operating partnership (OP). The UPREIT is initiated when: (i) a group of real estate owners or sponsors form an OP to contribute their properties in return for limited partnership (LP) interests; and (ii) a group of capital contributors or investors form a REIT through a public offering, which serves as a general partner (GP) for the operating partnership. The proceeds of investors' capital are used to provide working capital, repay debt, acquire additional property or for any other UPREIT purposes. The ensuing partnership is termed an "umbrella partnership" as the LP units are perceived to be spines while the GP units are perceived to be the staff and handle (see Cornell, 1997). In the amalgamated entity, the GP satisfies the REIT requirements of the IRC Section 856. That is, it is subject to the organizational, income, asset and distributive requirements of a REIT. The investors of the UPREIT contribute their capital for income and potential appreciation, while the sponsors of the UPREIT contribute their real estate for income and for the right to "put" their partnership interests in exchange for REIT shares. Thus, to liquidate their interest, sponsors are given the flexibility of converting their LP units to REIT shares, which can be redeemed in the stock market. This enables the REIT's equity portion to capitalize the LP units into more shares over time.

#### **IV.a. Key Results**

##### **Corollary 1**

In general, an UPREIT is a thorough combination of the REIT and RELP organizational forms. It is designed to mitigate transaction costs stemming from taxes and non-tax factors, such as administrative costs, bankruptcy costs and illiquidity costs, inherent in either one or both forms. Subsequent optimal segregation of equity versus debt claims, to minimize the *endogenous* agency costs of debt, enhances the welfare of heterogeneous stakeholders to yield a pareto-efficient organizational form.

**Proof:** See Appendix.

The above result is based on the intuition that welfare of agents in an unconstrained optimization model is higher than that in a constrained or restricted one. That is, welfare of agents in a hybrid organizational form or unconstrained model is higher than that in a form that is restricted to either of the two original forms of REITs and RELPs. The increase in pareto-efficiency stems from the fact that the restrictive original forms reduce the welfare of at least one agent without increasing that of the other. The hybrid form basically serves to "arbitrage" the beneficial features on the underlying restrictive forms. The above result is consistent with

the view of Gordon and MacKie-Mason (1994), MacKie-Mason and Gordon (1997), Scholes et al. (2002) and that of Coase.

An UPREIT enhances the welfare of its competitive stakeholders by facilitating the move towards an interior equilibrium ranked in the highest hierarchical order. This improvement in welfare is empirically corroborated from the wealth effects on UPREITs documented by Ling and Ryngaert (1997) and Downs (1998).

Our results on the interior solution are confirmed by empirical evidence in (i) Ciochetti et al. (2002) who find that institutional investors owned 53% of outstanding UPREIT shares in 1998 and (ii) Goolsbee and Maydew (2002), who find institutional ownership of the three largest UPREITs ranging from 47% to 80%. It should be noted that the above interior solution is derived without infringing on any aspect of the tax code such as the "five or fewer" rule, which does not apply to umbrella partnerships (see Cornell, 1997).

In reality, the industry has creatively taken advantage of the following provisions of the tax code in its move towards the UPREIT structure: (i) Non-recognition of gain on contribution of property by the sponsors; and/ or (ii) Non-recognition of gains upon the assumption of liabilities in the excess of the sponsor's basis in the property (see Sinai and Gyourko, 2004; and Campbell et al., 2005). These two potential tax liabilities on the sponsors pits their interest against the investors, who contributed cash to purchase the shares of the appended REIT. This conflict of interest flares up in: (i) Ordinary business activities, such as during the sale of contributed property or during the reduction of property debt; or (ii) Merger and acquisition activities (see Sagalyn, 1996; and Cornell, 1997).

The above conflict of interest between sponsors and investors is too complicated to model in the current framework of our study. However, it impacts on the value of the UPREIT as reported in Han (2006). The crucial issue here is to mitigate this conflict of interest by: (i) making the REIT as the sole GP and having its shareholders own at least 50% of the umbrella partnership; and (ii) appointing a majority of independent directors to the UPREITs board (see Kleiman, 1993).

## **Corollary 2**

The UPREIT structure has the capacity to stimulate the global economy by alleviating three forms of moral hazard (endemic in Collateral Debt Obligations – CDOs), which have contributed to the ongoing subprime crisis.<sup>39</sup> These different types of moral hazards prevalent

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<sup>39</sup> CDOs are a type of structured credit product constructed from a portfolio of fixed income securities such as a Mortgage-Backed Security (MBS) or an Asset-Backed Security (ABS). They are segregated into different "tranches": Senior (rated AAA), Mezzanine (AA to BB) and Equity (not rated). Senior tranches receive a

in CDOs ensue from: (i) negatively amortizing teaser rate Adjustable Rate Mortgages (ARMs) where the equity "cushion" provided by the home-owner is negligible (see Wachter, 2008); (ii) originating Mortgage-Backed Securities (MBS) by pooling the above portfolios of mortgages with *no* tangible institutional capital at risk (see Keys et al. 2008; and Wachter, 2008); and (iii) structuring CDOs in an *ad hoc* manner to endogenize leverage amongst the various "tranches" (which are akin to a multi-purpose closed-end fund) and continuously trading the underlying portfolio of mortgage collateral (described in (i) where the ultimate borrower has "no skin in the game") to make the vehicle opaque, difficult to value and thus illiquid.

**Proof:** See Appendix.

The above result emanates from UPREITs: (i) pricing their underlying collateral (i.e., mortgages) meticulously so that the borrowers (home-owners) have some of their capital at risk (by minimizing the agency costs of debt as discussed in Sections II and III); (ii) subjecting the various originator's (i.e. sponsor's and investor's) capital at risk; and (iii) employing leverage within various classes of stakeholders methodically (again by minimizing the agency costs of debt) and refraining from continuously trading illiquid mortgage instruments, thus making the portfolio more transparent, easier to price and more marketable. This result is, however, subject to keeping in control the conflict of interest between its sponsors and investors. Thus, investing in the UPREIT form would enable financial intermediaries to strengthen their capital base and allow them to make loans to revitalize the global economy.

To sum up, the assertions of Coase (1937) and Alchian (1950) can be reinterpreted for the case of real estate entities as follows: Organizations evolve to the form that alleviates the transaction costs stemming from tax as well as non-tax factors. This is empirically corroborated by Campbell et al. (2005), who find that UPREITs comprise more than 80% of new REITs formed since 1992. This efficient structure, however, has the potential of unraveling if the conflict of interest between the sponsors and investors of UPREIT is not mitigated. This is because it may invite a judicial review if the sponsors are found to be in breach of their fiduciary obligations of fairness in their business judgment. Furthermore, taking undue advantage of the tax code may invoke the ire of Congress (see Sagalyn, 1996; and Cornell, 1997). The potential instability of the UPREIT form is consistent with the view of Fama and Jensen (1983a, b) and that of Menard (2004). Finally, UPREITs have the capacity of

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preferential status over the junior ones such that losses are applied in the reverse order of seniority. Junior tranches thus offer higher coupons to compensate for bearing higher default risk.



redeeming the global economy from the current crisis by mitigating various types of moral hazards prevailing in CDOs and thus enhancing the asset base of financial institutions.

## V. CONCLUSION AND POLICY IMPLICATIONS

This paper studies how the competitive behavior of taxable and institutional investors shapes organizational form. We verify the assertion of Coase (1937) and Alchian (1950) that organizations *evolve* to the optimal form that mitigates transaction costs emanating from tax as well as non-tax factors. In the real estate sector this takes special meaning, as it demonstrates the ingenuity of industry in (i) meticulously acquiring a hybrid structure (containing the desirable features of its underlying forms); and (ii) efficiently trading off debt claims between its rival stakeholders. The subsequent gains in welfare emanate from minimizing administrative costs, agency costs, bankruptcy costs, illiquidity costs and taxes. This result verifies the prognosis of Miller (1977) and Guenther (1992) that optimal organizational form is interrelated with the optimal capital structure of real estate entities.

Truly, REITs, and especially UPREITs, have served as a notable example inspiring a global "revolution" in real estate securitization (see Capozza and Seguin, 2003; and Campbell et al. 2005). We feel that UPREITs will continue to adapt and strive to reach the most efficient equilibrium in a dynamic regulatory environment. In other words, UPREITs will continue to dominate as long as they (i) alleviate the potential conflict of interest between the sponsors and the investors (see Sagalyn, 1996; and Cornell, 1997), and (ii) refrain from taking undue advantage of the tax laws. This conclusion is consistent with that of Gordon and MacKie-Mason (1994), MacKie-Mason and Gordon (1997), Scholes et al. (2002) and of Coase (as expressed in Menard, 2004). However, the potential vulnerability of the UPREIT form to conflict of interest, between the sponsors and investors, is consistent with the view of Fama and Jensen (1983a, b) and that of Menard (2004), who terms hybrid organizational forms in competitive markets as "unstable."

Thus, policy makers need to be aware of the influence of institutional investors in the shaping of organizational forms especially in the ongoing subprime crisis. They need to be proactive in framing their policies to harness the resources of these key investors to develop the critical sectors of the economy. This is vital for reviving the global economy, as asset price improvements (in the real estate sector) enhance the capital base of firms in the financial services industry thereby easing the flow of credit.

## APPENDIX

### **Proof of Lemma 1:**

- (i) The condition (given by Equation (11)) is satisfied if the REIT owns high quality property, free of encumbrances other than a mortgage, such that it is able to pay back its

debt with interest in future even in the worst state of the economy. This is due to the fact that a high quality property allows the REIT to retain some value even in the worst state of the economy, in period 1, thus defining the *maximum* level of risk-free debt available to it.

That is,  $\text{Min.}[(q_{1j} + P_{1j}) - Q_{RF} (1+r_{RF})] > 0 \Rightarrow \text{Min.}(q_{1j} + P_{1j}) > Q_{RF} (1+r_{RF}) \forall j$ .

Since  $Q_{RF} (1+r_{RF}) > 0$ , we have the result  $\text{Min.}(q_{1j} + P_{1j}) > 0$ .

- (iia) Equation (12a) is derived using Equations (3a), (7a), (9) and (10).
- (iib) Equation (12b) is derived using Equations (3a), (9) and (10).
- (iii) Equation (13) is derived using Equations (4a), (8a), (9) and (10).
- (iva) The REIT pricing condition is the counterpart of Equation (12a) when the net borrower is the fiduciary. It is derived by optimizing the two-period expected utility of wealth of both taxable investor and fiduciary using Equations (1a), (2a), (5a) and (6a).
- (ivb) Equation (14) is a subset of the above REIT pricing equation in (iva).
- (v) Equation (15) is the counterpart of Equations (4a) and (8a) when the net borrower is the fiduciary. Its derivation is described in (iva) above. Q.E.D.

**Proof of Lemma 2:**

- (i) (a) For a mortgage to be risky, the borrower fails to honor his contractual obligations in some state of the economy in the future; (b and c) The reason why the debt ratio and the contract rate of interest for risky mortgage are higher than that of the risk-free mortgage are due to the fact that the supply curve is upward sloping. The borrower prefers a high debt ratio, while the lender or financier seeks extra compensation for it and for the states of default.
- (iib) Equation (16a) is derived using Equations (3b), (7b), (9) and (10).
- (iib) Equation (16b) is derived using Equations (3b), (9) and (10).
- (iii) Equation (17) is derived using Equations (4b), (8b), (9) and (10).
- (iva) The REIT pricing condition is the counterpart of Equation (16a) when the net borrower is the fiduciary. It is derived by optimizing the two-period expected utility of both taxable investor and fiduciary using Equations (1a), (2a), (5a) and (6a).

- (ivb) Equation (18) is a subset of the above REIT Pricing equation in (iva).
- (v) Equation (19) is derived using the counterparts of Equations (4b) and (8b) when the net borrower is the fiduciary. Its derivation is described in (iva) above. Q.E.D.

**Proof of Lemma 3:**

- (i) Equation (20) is derived using Equations (3), (7) and (9). Q.E.D.

**Proof of Theorem:**

The five equilibria described in Lemmas 1-3 are impacted distinctly by *increasing* agency costs of debt under market imperfections such as taxes, and regulatory constraints. A sequential search process is utilized to determine the pareto-efficient packages as explained below.

- (i) *The Pareto-optimality of the risk-free mortgage facility over its risky counterpart when the underlying property constitutes a high quality one (with stable payoffs capable of supporting a moderate amount of debt, i.e., in the absence of the risk of default).*

The risky mortgage pricing conditions (Equations (17) and (19)) consist of two parts, one in the default states of the economy, at or below the critical  $c$  state, and the other in the normal states. In the default states, the net lender repossesses the underlying property, along with its residual NOI. But due to the direct and indirect costs of bankruptcy, the lender receives a fraction  $k_{REIT}$  of the proceeds, as indicated by the line AB in Figure 3, in contrast to the normal state of the economy, as indicated by the line ED in Figure 3, where she receives the full contractual proceeds of the loan. The triangle ABE represents the leakages of resources in the form of deadweight costs of bankruptcy. Thus, in equilibrium, Equations (17) and (19) illustrate that these bankruptcy costs are incorporated by lenders in their pricing mechanism in such a way that they do not face them. It is the REIT owners who ultimately bear these costs in the form of higher interest rates.<sup>40</sup>

[FIGURE 3 HERE]

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<sup>40</sup> It should be noted that as  $k_{REIT} \rightarrow 1$ , the area of triangle ABE  $\rightarrow 0$  implying that the deadweight costs of bankruptcy  $\rightarrow 0$ .

The absence of default implies the satisfaction of Equation (11) for properties of high quality, which retain their value in the future. That is,  $\text{Min.}(q_{lj}+P_{lj}) > 0 \forall j$ . Here, risky mortgage is subject to bankruptcy costs in addition to taxes, while the risk-free mortgage is only subject to market imperfections such as taxes. Since bankruptcy costs are transmitted by the lender to the REIT owners, their welfare is lower with risky mortgage than with risk-free mortgage. Furthermore, equilibrium with risky mortgage is feasible only when the agency costs, ensuing from bankruptcy costs as indicated by the triangle ABE in Figure 3, are contained. In contrast, equilibrium with the risk-free mortgage is feasible even when that with risky mortgage is unfeasible due to excessive bankruptcy costs. In this context, risky mortgages, if they exist, are at best pareto-neutral to their risk-free counterparts. This result is consistent with the finance literature as Myers (1977) attributes the agency cost of debt restraining firms from investing in positive NPV projects leading to the under-investment issue. One way to alleviate this agency cost of debt is to collateralize debt with the tangible assets of a firm as discussed in Stulz and Johnson (1985). This is precisely what our model entails in our design of the risk-free debt facility by ensuring that borrowers pledge adequate security to lenders as implied by the Basic Condition in Lemma 1. That is,  $Q_{RF} < \frac{\text{Min.}(q_{lj}+P_{lj})}{(1+r_{RF})}$ . This result is also in agreement with that of Wald (1999) and Graham (2000), who find that conservative debt ratios are the norm for large, liquid and profitable firms, with low bankruptcy costs.

The asymmetric tax regulations imposed on the financing of REITs (Equations (2) and (2a)) yield two corner solutions, as discussed in Section III.a. Both models are completely solved as the number of *primary endogenous* variables after the imposition of market clearing constraints ( $s = 1$  or  $0$ ,  $Q_{RF} = Q'_{RF}$ ,  $r_{RF}$  and  $P_0$ ) are exactly equal to the number of *independent* debt and asset pricing conditions.

- (ii) *The infeasibility of the pareto-optimal risk-free equilibrium with the fiduciary as net borrower due to imposition of regulatory restraint.*

The risk-free mortgage equilibrium with the fiduciary as the net borrower is pareto-optimal over the one with taxable investor as the net borrower, which is due to the fact that gains in welfare ensue from efficient tax management, i.e., at the expense of the U.S. Treasury. This is precisely the reason why regulatory constraints were originally enforced on the institutional ownership of property in the form of UBIT, five or fewer

rule, etc. Although one aspect of these restrictions (i.e., the "look-through" provision of the five or fewer rule) has been relaxed to revive the depressed real estate sector of the economy by the passage of OBRA '93. Nonetheless, the risk-free mortgage equilibrium with a dominant (100%) institutional investor can attract the ire of the U.S. Congress (see Downs, 1998). REITs are, therefore, confined to the lower hierarchical order of equilibrium where the taxable investor is the dominant investor. REITs can move to the higher level of equilibrium by combining with a RELP as an UPREIT as described in the next section.

(iii) *The pareto optimality of the risky mortgage facility over its risk-free counterpart when the underlying property constitutes an intermediate quality one with less stable payoffs.*

Here the risk of default implies the condition  $(q_{ij} + P_{ij}) = 0$  for some state  $j$  in the economy, leading to the infeasibility of the risk-free loan facility due to the violation of Equation (11). Risky debt is the only possible solution as long the potential cost of default is adequately compensated by the equity holders (see Myers, 1977).<sup>41</sup> Since risky debt is *quasi-equity* it entails a corner solution. The fiduciary, as the net borrower in Model II, avoids this equilibrium as she perceives owning REIT shares, encumbered with a risky mortgage, as value reducing (see Equation (7b)). In this case, the risky mortgage equilibrium, with the taxable investor owning all REIT shares in the economy, termed as the first corner solution, is the only alternative. This is attributed to the presence of personal tax write-offs in the states of bankruptcy and the ability of the fiduciary to extract the cost of default in the form of high interest rate, thereby confirming the Static Trade-off Hypothesis (see Myers, 1984). This model solution is completely determined as the number of *primary endogenous* variables is exactly equal to the *independent* debt and asset pricing conditions. Thus, bankruptcy in our model is *endogenous* as risky debt is priced differently from risk-free debt.

(iv) *The infeasibility of leverage when the underlying property constitutes a low quality one with highly unstable payoffs.*

When the cost of potential default is not adequately compensated by equity holders (i.e., in the presence of excessive costs of default), this trivial solution is the only viable alternative as illustrated in Lemma 3. Since this equilibrium is a constrained

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41 This result is empirically corroborated from the bankruptcy of mortgage REITs in the mid 1970s (see Corgel et al., 1995).

optimization (with zero debt) it is at the lowest rung of the pareto-efficiency. Thus, it is obvious that REITs use leverage to enhance the welfare of their stakeholders. This result is in agreement with Agrawal and Nagarajan (1990), Berens and Cuny (1995), Shilling (1996) and Ghosh et al. (1997).

Thus, we realize that our basic result resembles a combination of the Pecking Order and the Static Trade-off Theories (Myers, 1984; and Myers and Majluf, 1984), but derived in a framework of *symmetric* information. Furthermore, we realize the difficulty faced by Fama and French (2002) in isolating the impact of these two competing theories. Thus, in the context of REE, we give credence to the empirical findings of Shyam-Sunder and Myers (1999) despite the misgivings of Frank and Goyal (2003). Finally, we confirm that the relationship between debt and quality of the underlying real asset, owned by the REIT, is consistent with the findings of Maris and Elayan (1990), Shleifer and Vishny (1992) and Giambona et al. (2008). Q.E.D.

#### **Proof of Corollary 1:**

An UPREIT is a hybrid form consisting of the desirable features of one or both of the REITs and RELPs forms. As such, it is less restrictive or constrained than its underlying organizational forms. It is thus able to reduce transaction costs emanating from tax as well as non-tax factors, such as administrative costs, bankruptcy costs and illiquidity costs. Subsequent segregation of equity versus debt claims is performed optimally, by minimizing the *endogenous* agency costs of debt, to reach the most efficient equilibrium restricted to the REIT form. These enhance the welfare of the competing stakeholders. We can thus conclude that an UPREIT is a pareto-efficient organizational form. This result is consistent with that of Gordon and Mackie-Mason (1994), Mackie-Mason and Gordon (1997), Scholes et al. (2002) and that of Coase (see Menard, 2004, Footnote 3). Q.E.D.

#### **Proof of Corollary 2:**

Three types of moral hazards (prevalent in CDOs) have contributed to the current subprime crisis. The UPREIT form alleviates these as elaborated below.

First, intense competition among financial intermediaries in a deregulated environment lowered underwriting standards especially for subprime (risky) borrowers, who are funded by negatively amortizing Adjustable Rate Mortgages (ARM), which is a recipe for disaster (see Wachter, 2008). In contrast, UPREITs are able to meticulously price mortgages to reduce agency costs of debt by ensuring that borrowers have adequate equity cushion. In this paper,

we have illustrated mortgages reducing only one form of agency cost of debt, i.e., originating from the underinvestment issue highlighted in Myers (1977). There are, however, more intricate mortgages (not discussed in this paper) such as Participating Mortgages (PMs), which reduce the asset (or risk) substitution issue (in the agency cost of debt) as well (see Shackleton and Wojakowski, 2008). Thus, subprime borrowers (in the case of Mortgage/ Hybrid UPREITs) can be funded by Shared-Appreciation Mortgages (SAMs – belonging to the broad family of PMs), which makes them eligible for home-ownership with a below market rate of interest in return for a share in the appreciation of the property (at the tenure of mortgage, or on sale of property, or at the time of re-financing – see Shackleton and Wojakowski, 2008).

Second, originators of Mortgage-Backed Securities (MBS) have *no* tangible capital at risk (except for their reputational capital) while securitizing the pool of mortgages underwritten by them (see Wachter, 2008; Keys et al. 2008). In contrast, the originators of UPREITs (i.e., sponsors and investors), who contribute illiquid mortgages and/ or capital to the securitization of UPREITs are at risk. The investment bank here is a pure intermediary, who brings the originators together for a fee.

Finally, the ad hoc way in which the MBS is segregated into different "tranches" (or classes of securities akin to a multi-purpose closed-end fund) called CDOs to provide preferential return to senior classes. That is, these senior tranches enhance the risk and return of junior tranches. In other words, leverage is used endogenously amongst the tranches. However, the continuous trading of the underlying collateral (MBS or other Asset-Backed Security – ABS) makes the CDO facility an opaque one. This makes it difficult to price and thus makes it illiquid (see Mason and Rosner, 2007). In contrast, Mortgage (or Hybrid) UPREITs can price their leverage claims optimally either through Model I or Model II as illustrated in our Theorem. UPREITs do not continuously trade their illiquid mortgages making them more transparent, easier to price and thus more marketable (liquid).



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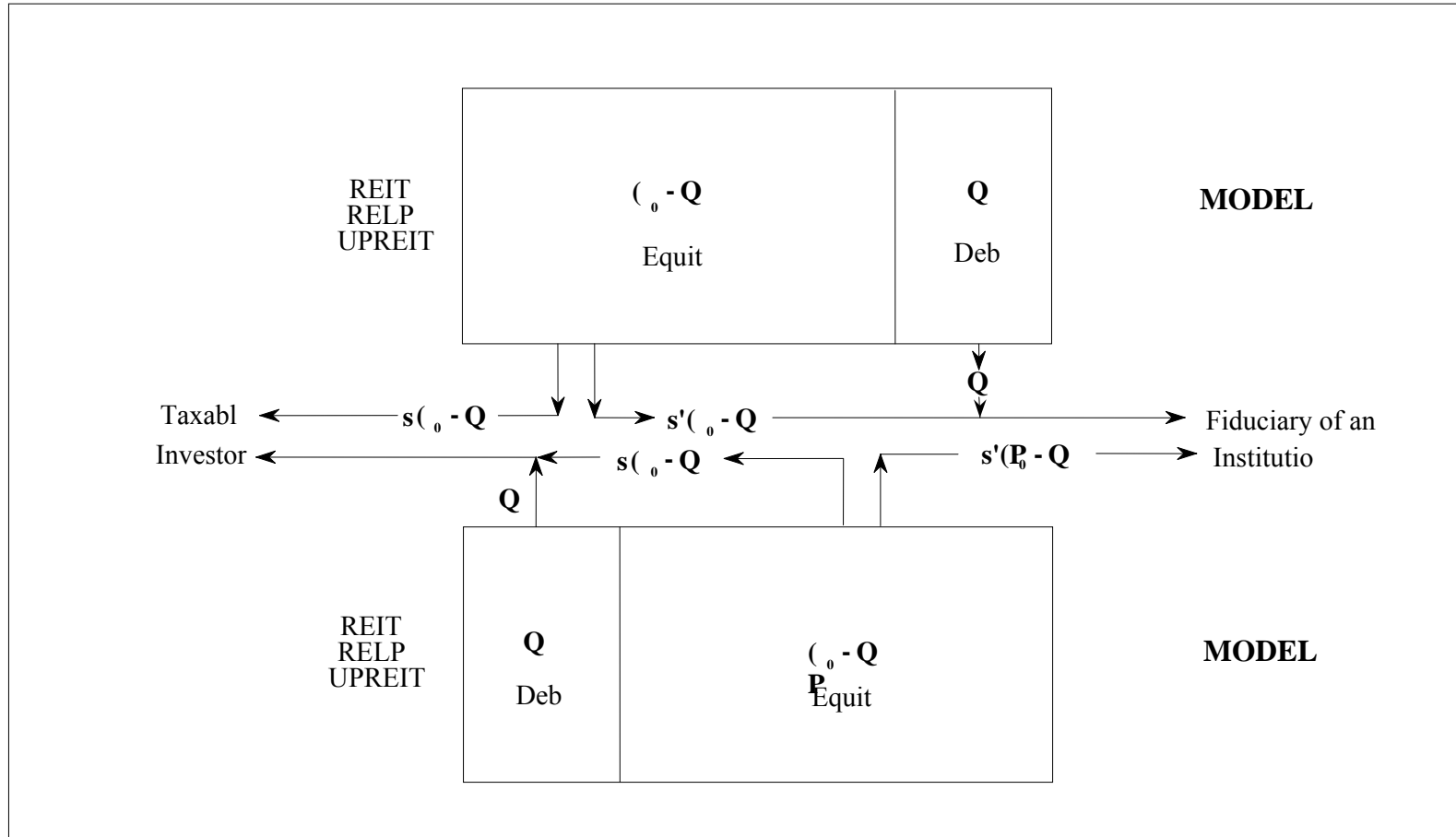
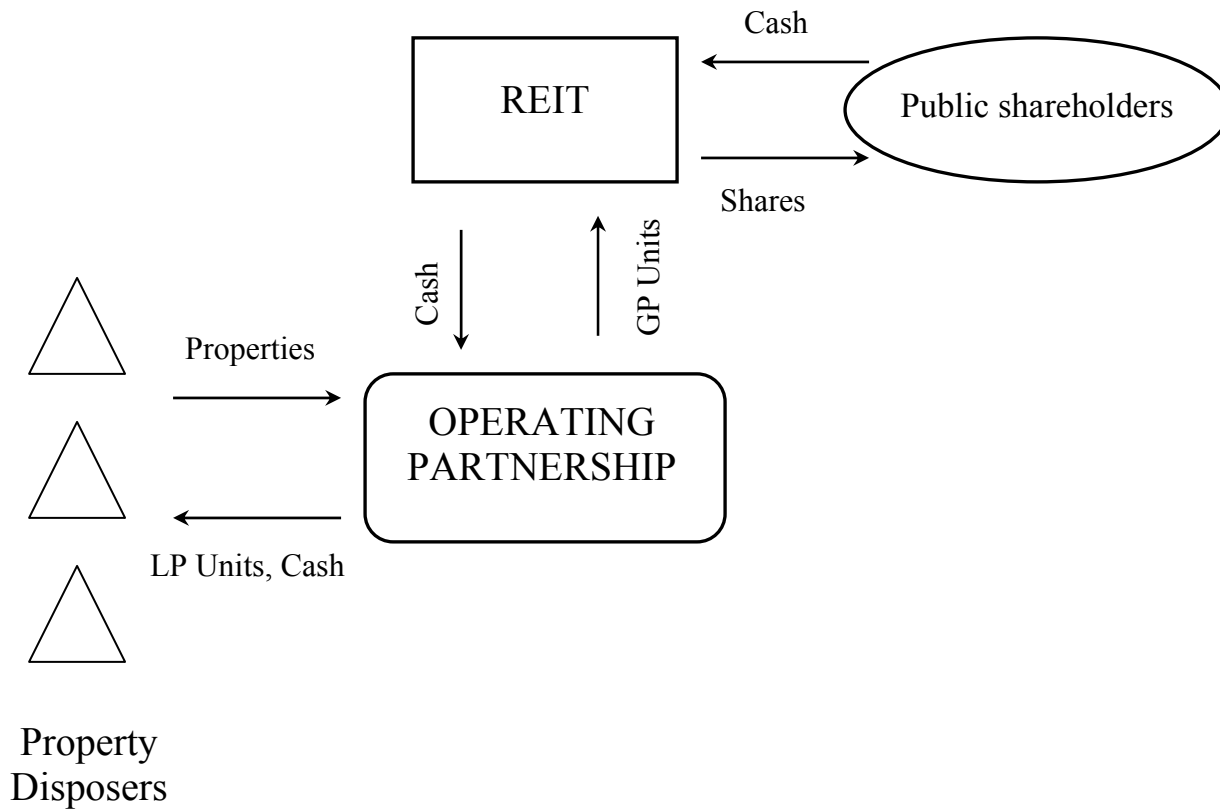


Figure 1: Two Modes of Capitalizing a REIT/RELP/UPREIT



**Figure 2: The UPREIT Structure**

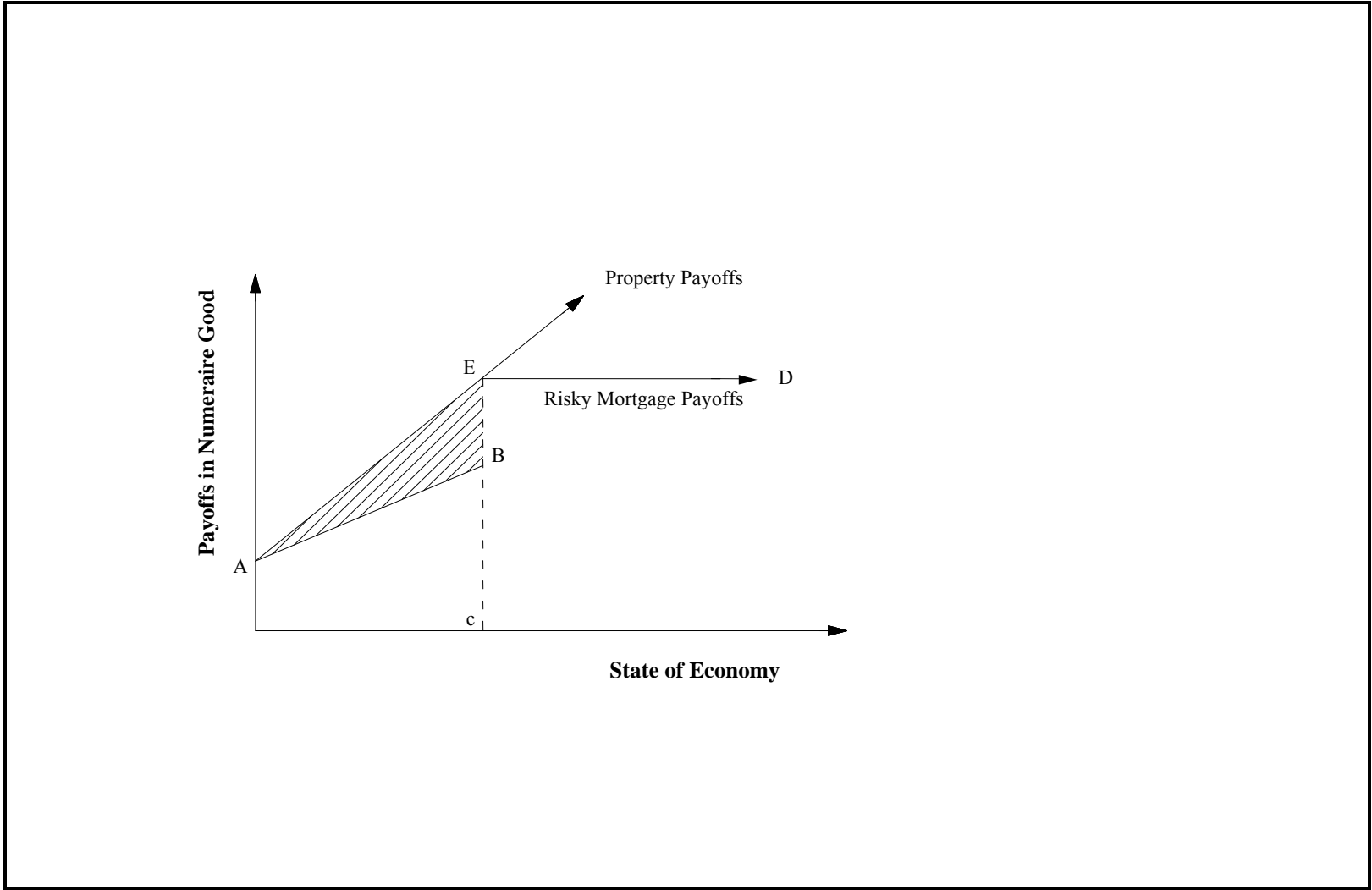


Figure 3: Dead Weight Costs of Bankruptcy