

The Equity Risk Premium for Securitized Real Estate: The Case for U.S. Real Estate Investment Trusts

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Abstract

This paper examines an important topic about the performance of securitized real estate by estimating the expected equity risk premium for U.S. real estate investment trusts (REITs). By employing a novel methodology, explicitly incorporating REIT shareholders taxation for capital gains and ordinary income, the analysis demonstrates that the expected after-tax risk premiums for REITs generate and are consistent with a reasonable coefficient of relative risk aversion. This finding is contrary to much of the literature about the risk premium. We demonstrate that for a range of plausible stochastic tax burdens, the coefficient of relative risk aversion for REIT shareholders is likely to fall within the interval of 4.3–6.3, values significantly lower than those previously reported for real estate and other asset markets.

This paper examines an important topic about the performance of securitized real estate by estimating the expected equity risk premium for U.S. real estate investment trusts (REITs). The estimation of the expected risk premium has been a thorny and puzzling issue. The analysis spans the disciplinary boundaries of real estate finance, corporate finance, and taxation economics. The understanding of decision-making under uncertainty is fundamental to real estate, finance, and economics.

The equity premium puzzle was first identified by Mehra and Prescott (1985), using historical data for the stock market portfolio, $\beta = 1$. Utilizing the traditional capital consumption asset pricing model (CCAPM), with an expected equity risk premium of 6% for the S&P 500, a commonly-used value and estimated by Mehra (2003) based upon average historical stock returns, yields a coefficient of relative risk aversion of roughly 50. This unbelievably high value for the coefficient of relative risk aversion constitutes the so called “equity premium puzzle.” Put somewhat differently, the “risk-adjusted” stock market rate of return is too high for the perceived measured risks associated with stock market investments.

There have been numerous attempts to resolve the stock market equity risk premium puzzle. Fama and French (2002) have delineated one of the most

promising ways to resolve the stock equity risk premium puzzle. They observe that historical stock market trends will overestimate the expected equity risk premium for stocks because there were significantly large unexpected capital gains during 1951–2000. They indicate that the application of the dividend growth model engenders an estimate that is superior to the traditional methods of simply using historical averages. The Fama and French estimate of the expected stock returns generates a standard error that is less than one-third the standard error derived from average stock returns. Using the average return estimation, the Sharpe ratio for the 1872–1950 period was only half that for 1951–2000, while the Sharpe ratio estimated from the dividend growth model is similar for both periods.

The Fama and French (2002) estimate of the expected stock returns, by itself, unfortunately, does not appear to resolve the equity premium risk puzzle. Magin (2009) demonstrates that the coefficient of relative risk aversion implied by the expected equity premium of 2.55% [obtained by Fama and French (2002) using the dividend growth model] is still unreasonably large: 20.40. Magin, by employing a modified model with a stochastic tax variable τ_t imposed on stockholders' wealth, finds that for an average investor, who realizes short-term and long-term gains in accordance with historical patterns, the coefficient of relative risk aversion is 3.76. Since earlier studies imply that a coefficient of relative risk aversion, a , between 2 and 4 would seem reasonable (Mehra, 2003), the Magin estimate for $a = 3.76$ is consistent with perceived equity risk premium.

Surprisingly, research relating to the risk premium for asset classes other than stocks has been largely neglected. For real estate, an exception is Shilling (2003), who examines the equity risk premium puzzle for real estate assets. In his study, he utilizes two different real estate value data sets: NCREIF¹ and the Korpaz Real Estate Survey data.² The NCREIF data are derived from real estate appraisals, which are ex post data provided by institutional investors. The Korpaz data set uses expectational survey data collected from the broader real estate industry. Shilling's analysis may be hampered by these data sets. First, appraisals used to construct the NCREIF data set are known to have significant smoothing biases (Quan and Quigley, 1991; Edelstein and Quan, (2005)).³ Second, survey data are believed to have potential intrinsic problems (Dokko and Edelstein, 1989). The risk premiums generated using these data sets differ significantly, with the historical NCREIF data set producing a real estate risk premium significantly lower than that produced by the Korpaz Survey data. This gap, at least in part, may be explained by the unexpected capital losses that occurred in the real estate markets during 1988–2002.

We develop an alternative database and methodology for estimating the real estate risk premium. Our approach is to utilize transactions data based on securitized traded real estate markets, REITs. We utilize the Fama and French (2002) estimate for the expected before-tax risk premium for the S&P 500 to estimate the expected before-tax risk premium for REITs. REIT stockholders, like non-REIT

stockholders, are subject to stochastic taxes. This tax obligation emanates from the taxation of short-term and long-term capital gains, and dividends. It is, therefore, appropriate to examine and analyze the after-tax, not the before-tax, risk premiums. Taxes are an important consideration for real estate investors. Methodologically, our model, because our analysis is dealing with pass-through tax entities, REITs, does not need to model taxation at the entity level (e.g., corporate level), but does focus on taxation at the ultimate investor level. Since REITs are special C-Corporations, because of tax treatment and other regulations, it is not trivial to determine the actual tax burden on REIT shareholders vis-à-vis non-REIT stock shareholders. REITs do not pay federal taxes on the corporate level if they distribute at least 90% of taxable income to shareholders in the form of dividends. Since REIT dividends typically are a substantial part of the overall before-tax return from REITs, and are taxed ostensibly as ordinary income,⁴ one might expect that investors attracted to REITs may be subject to below average ordinary income tax rates. To address this issue, we modify the traditional way of determining the actual tax burden on stocks developed by Sialm (2008). While employing NAREIT data to calculate REIT investor tax burdens, we also test our results by letting ordinary income tax rates for REIT stockholders vary from 25% to 100% of those for the general stock market shareholders. In this way, we create a range for the expected after-tax real estate risk premium and use it to determine a range for the “true” coefficient of relative risk aversion for investors in REITs.

We find that for plausible levels of tax burdens, the coefficient of relative risk aversion for REITs investors will be in the interval between 4.3 and 6.3, a very reasonable range for risk aversion. Indeed, REITs are high dividend yield stocks. High dividend yield stocks have always been perceived to be closely akin to bonds and, therefore, (rightly or wrongly) less risky than growth stocks. This fact alone should attract risk-averse investors to REITs. It is not surprising that a substantial portion of REIT investments are unit trusts and institutions that are both cash flow oriented and risk averse.⁵

Our analysis and findings provide suggestive insights about the behavior of many other types of real estate investments. This paper focuses on publicly traded REITs, which are ostensibly pass-through entities (i.e., taxes are not paid at the entity level, but are paid by the investor-owner); the preponderance of real estate is owned through similar taxation-ownership vehicles (LLCs, GPs, MLPs, and LPs). However, these latter real estate ownership vehicles are not publicly traded. In this context, our results are, at the very least, suggestive of the behavior of owners in the larger, broader general real estate investment market.

The remainder of the paper is organized as follows. In the next section, we define and review the CCAPM, the coefficient of relative risk aversion, and the equity risk premium puzzle. In the sections that follow we develop estimates for the effective tax rates for REITs shareholders, and derive the expected after-tax risk premium for REITs and the implied coefficient of relative risk aversion for REITs shareholders. We close with concluding remarks.

The CCAPM and the Equity Premium Puzzle

The capital consumption asset pricing model (CCAPM) is one of the central concepts in financial economics and is a significant generalization of the capital asset pricing model (CAPM). Unlike the CAPM, where economic agents optimize by simply distributing resources between different financial assets, the CCAPM focuses on multi-period consumption-saving decisions under uncertainty. Following Rubinstein (1976) and Lucas (1978), we define the CCAPM. Consider an infinite horizon model with $n - 1$ risky assets and the n^{th} risk-free asset. Let p_{kt} be the price per share of asset k at period t , d_{kt} be the dividend paid per share of asset k at period t , z_{kt} be the number of shares of asset k held by an agent at period t , and c_t be the agent's consumption at period t . Let the investor's one-period utility function be $u(c_t)$. Consider the investor's optimization problem:

$$\max_{\{c_{t+T}\}_{T=0}^{\infty}} \sum_{T=0}^{\infty} b^T E[u(c_{t+T})], \quad (1)$$

where $0 < b < 1$ and $u(\cdot)$ is such that $u'(\cdot) > 0$ and $u''(\cdot) < 0$, subject to:

$$c_{t+T} = \sum_{k=1}^n (p_{kt+T} + d_{kt+T}) z_{kt+T} - \sum_{k=1}^n p_{kt+T} z_{kt+T+1}. \quad (2)$$

Taking the first-order condition we obtain:

$$-u'(c_t) p_{kt} + bE[u'(c_{t+1})(p_{kt+1} + d_{kt+1})] = 0 \quad \text{for } k = 1, \dots, n. \quad (3)$$

Hence,

$$E \left[\frac{bu'(c_{t+1})}{u'(c_t)} R_{kt+1} \right] = 1 \quad \text{for } k = 1, \dots, n-1, \quad (4)$$

and

$$E \left[\frac{bu'(c_{t+1})}{u'(c_t)} \right] R_f = 1, \quad (5)$$

where $R_{kt+1} = (p_{kt+1} + d_{kt+1})/p_{kt}$ is the total rate of return for asset k and R_f is the total risk-free rate.

Equations (4) and (5) are known as Euler equations.

Rubinstein (1976) demonstrated that if c_{t+1} and R_{kt+1} are bivariate log-normally distributed and $u(c) = c^{1-a}/(1-a)$, then:

$$\ln(E[R_{kt+1}]) - \ln(R_f) = a \times COV \left[\ln(R_{kt+1}), \ln \left(\frac{C_{t+1}}{C_t} \right) \right], \quad (6)$$

where a is the coefficient of relative risk aversion. The coefficient of relative risk aversion measures an agent's propensity to take risk. The higher is the coefficient of agent's relative risk aversion, the lower is agent's propensity to take risk. Generally, for an agent with utility function $u(\cdot)$, we define the coefficient of agent's relative risk aversion as:

$$rr(c) = \left[-\frac{u''(c)c}{u'(c)} \right].$$

If $u(c) = c^{1-a}/(1-a)$, then $u'(c) = c^{-a}$ and $u''(c) = -a \times c^{-a-1}$. So clearly:

$$rr(c) = \left[-\frac{-a \times c^{-a-1} \times c}{c^{-a}} \right] = a.$$

Therefore, the major conclusion of the CCAPM is that the expected risk premium for a risky asset is equal to the covariance of the logarithms of the asset's return and consumption in the period of the return multiplied by the agent's coefficient of relative risk aversion.

The traditional CCAPM without insecure property rights and with the current expected equity premium of 6% for the S&P 500 ($\beta = 1$) portfolio, calculated by Mehra (2003), using simply the average stock return, yields a coefficient of risk aversion of roughly 50:

$$a = \frac{\ln(E[R_{kt+1}]) - \ln(R_f)}{COV \left[\ln(R_{kt+1}), \ln \left(\frac{C_{t+1}}{C_t} \right) \right]} = \frac{0.07 - 0.01}{0.00125} = 47.6. \quad (7)$$

This unbelievably high value for the coefficient of relative risk aversion constitutes the so-called “equity premium puzzle.” It was first identified by Mehra and Prescott (1985) using historical data for the stock market portfolio.

Calculating the Tax Yield for REITs

Sialm (2008) estimates the tax yield for the S&P 500 stocks to be:

$$\begin{aligned}
 TY_{kt+1} &= \frac{\tau_{t+1}^d d_{mt+1} + \tau_{t+1}^{SCG} SCG_{mt+1} + \tau_{t+1}^{LCG} LCG_{mt+1}}{p_{mt}} \\
 &= \tau_{t+1}^d \times 0.045 + \tau_{t+1}^{SCG} \times 0.001 + \tau_{t+1}^{LCG} \times 0.018, \quad (8)
 \end{aligned}$$

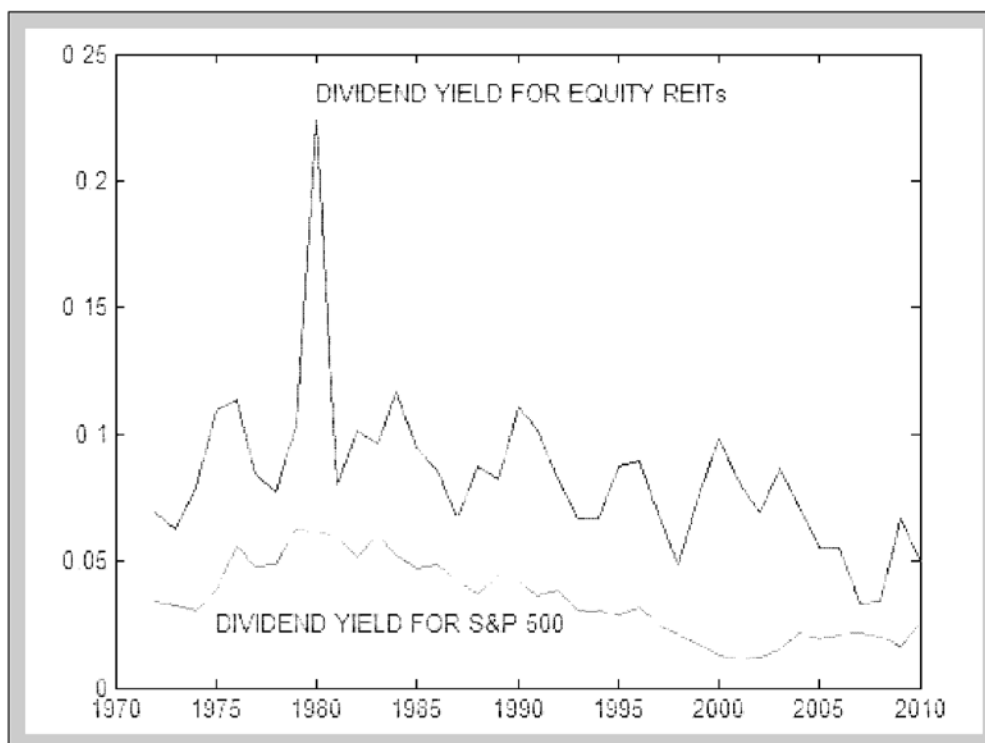
where p_{mt} is the price per share of the S&P 500 (market) portfolio, d_{mt+1} is the dividend per share of the S&P 500 (market) portfolio, τ_{t+1}^d is the effective dividend tax for the S&P 500 (market) portfolio, τ_{t+1}^{SCG} is the tax on short-term capital gains, τ_{t+1}^{LCG} is the tax on long-term capital gains, SCG_{mt+1} are realized short-term capital gains, and LCG_{mt+1} are realized long-term capital gains.

So, $d_{mt+1}/p_{mt} = 0.045$, $SCG_{mt+1}/p_{mt} = 0.001$ and $LCG_{mt+1}/p_{mt} = 0.018$.

Since REITs are publicly traded on the same exchanges and in exactly the same fashion as publicly traded stocks (some REITs are included in the S&P 500), one might wish to assume that τ_{t+1}^{SCG} , τ_{t+1}^{LCG} , SCG_{t+1}/p_t and LCG_{t+1}/p_t are likely to be similar for S&P 500 stocks and REITs. However, this is unlikely to be true about the dividend yields, since unlike the rest of the publicly traded companies, REITs are obligated to distribute at least 90% of taxable income to their shareholders in the form of dividends. Indeed, using the FTSE NAREIT U.S. Equity REITs Index for 1972–2010 as a benchmark for U.S. REIT performance, the average dividend yield for REITs is almost twice that of the average dividend yield for S&P 500 stocks: 0.08 vs. 0.05 (Exhibit 1).

Since REITs distribute at least 90% of taxable income to shareholders in the form of dividends, the dividend distributions of REITs constitute a significant portion of the overall before-tax return from them. Therefore, since REIT dividends are ostensibly taxed as ordinary income,⁶ it is natural to expect that the typical investor in REITs may be subject to below average ordinary income tax rates.

Many institutional investors, such as insurance companies or pension funds, are, in fact, tax exempt, and may be attracted to REITs. Hence, the average tax rate that has been suggested for the S&P, in general, may not be appropriate for REIT investors. To address this issue, we note that only about 20% of equity REIT shares are held in taxable accounts.⁷ Moreover, when stock dividends are taxed, they are on average taxed at the ordinary income tax rate of about 20% (Samwick, 2000). Therefore, if investors in REITs were subject to average ordinary income

Exhibit 1 | Dividend Yield for Equity REITs and S&P 500 for 1972–2010

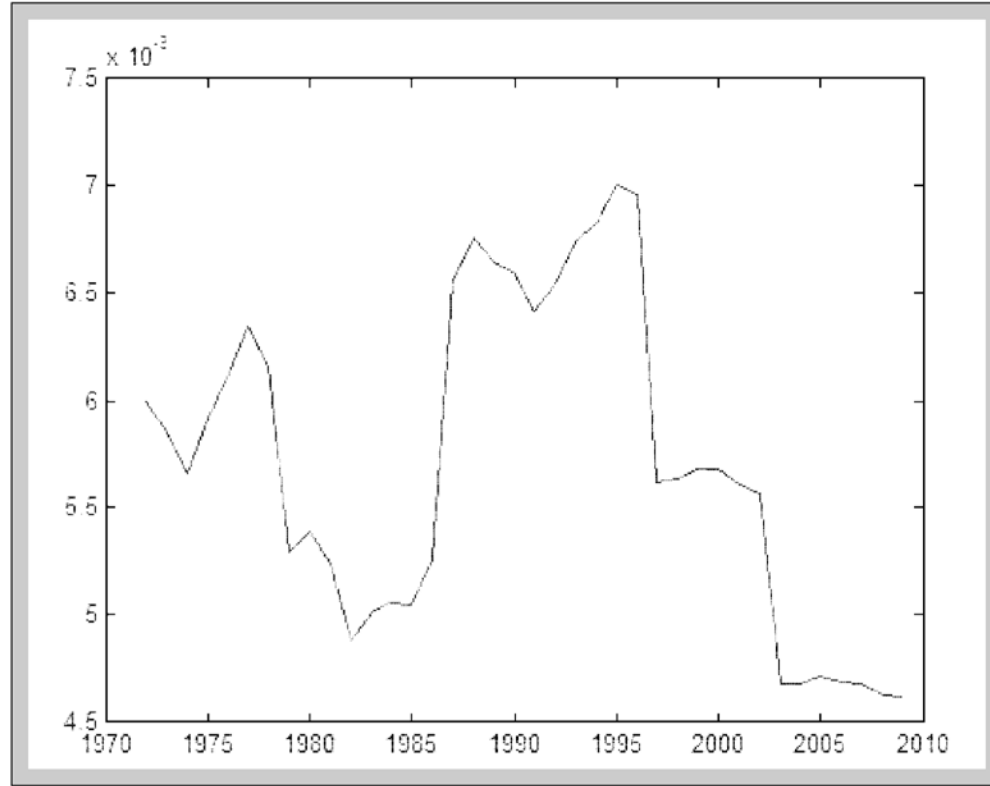
tax rates, the effective overall dividend tax rate $\tau_{re\ t+1}^d$ would be about 4%. However, it is reasonable to expect that the typical investor in REITs, who has below average ordinary income tax rates, pays, for example, an overall effective dividend tax rate of half of that of an investor in general stocks. We therefore estimate the tax yield for equity REITs for 1971–2009 as:

$$TY_{re\ t+1} = 0.02 \times 0.08 + \tau_{t+1}^{SCG} \times 0.001 + \tau_{t+1}^{LCG} \times 0.018. \quad (9)$$

We obtain the mean tax yield for shareholders of equity REITs, $E[TY_{re\ t+1}] = 0.0059$ (Exhibit 2).

Estimating Expected After-tax Risk Premiums and the Coefficient of Relative Risk Aversion for REIT Investors

The traditional CCAPM without insecure property rights, assuming a current expected rate of return for REITs of 13.75%, estimated using average historical

Exhibit 2 | Tax Yield for Equity REITs for 1972–2009

before-tax returns for FTSE NAREIT U.S. Equity REITs Index for 1972–2010 as a benchmark for U.S. REIT performance, produces a coefficient of risk aversion for REIT stockholders of:

$$a = \frac{\ln(E[R_{re\ t+1}]) - \ln(R_f)}{COV[\ln(R_{re\ t+1}), \ln\left(\frac{C_{t+1}}{C_t}\right)]} = \frac{0.137464 - 0.04}{0.00125} = 77.97. \quad (10)$$

Let us first estimate a using the dividend growth model and no taxes. The Fama and French (2002) dividend growth model estimate for the expected before-tax risk premium for the S&P 500 is 2.55%. Since $\beta_{REITs} = 0.5^8$, we can conclude that:

$$\overbrace{E[R_{re\ t+1}] - R_f}^{0.5 \times 0.0255} = \overbrace{\beta_{REITS}}^{0.5} \left(\overbrace{E[R_{mt+1}] - R_f}^{0.0255} \right) = 0.0127. \quad (11)$$

We obtain that for an average investor, the coefficient of risk aversion is:

$$a = \frac{\overbrace{\ln(E[R_{re\ t+1}]) - \ln(R_f)}^{0.5 \times 0.0255}}{\underbrace{COV \left[\ln(R_{re\ t+1}), \ln \left(\frac{C_{t+1}}{C_t} \right) \right]}_{0.00125}} = \frac{0.0127}{0.00125} = 10.16. \quad (12)$$

Following Magin (2009), we introduce stochastic taxes. The use of the stochastic tax $\tau_{re\ t+1}$ ⁹ imposed on the wealth from equity REIT holdings creates a new term $E[\tau_{re\ t+1}] \approx -\ln(E[1 - \tau_{re\ t+1}])$, reducing a further to:

$$\begin{aligned} a &= \frac{\ln(E[R_{re\ t+1}]) - \ln(R_f) + \ln(E[1 - \tau_{re\ t+1}])}{COV \left[\ln(R_{re\ t+1}), \ln \left(\frac{C_{t+1}}{C_t} \right) \right]} \\ &\quad + COV \left[\ln(1 - \tau_{re\ t+1}), \ln \left(\frac{C_{t+1}}{C_t} \right) \right] \\ &= \frac{0.5 \times 0.0255 - 0.0059 + 0.0002}{0.00125 + 0.0000} = 5.6055. \end{aligned} \quad (13)$$

Let us conduct an additional analysis. As we previously established, if REIT investors were subject to average ordinary income tax rates, the effective dividend tax rate for REIT stockholders would be about 0.04. However, since the investors in REITs are likely to have lower than average ordinary income tax rates, we allow the actual ordinary income tax rates for REITs shareholders to vary from 25% to 100% of regular stock holders (Exhibit 3).

These computations suggest that the investors in REITs, who may have lower than average ordinary income tax rates and have a taste for current cash flow, appear to be, not surprisingly, more risk averse than investors in S&P 500 (market) portfolios.

Exhibit 3 | Numerical Simulations

Effective Dividend Tax	Expected Tax Yield	After-tax Risk Premium	After-tax Volatility	Coeff. of Relative Risk Aversion
0.04	0.0076	0.0051	0.2518	4.3157
0.03	0.0067	0.0060	0.2963	4.9206
0.02	0.0059	0.0068	0.3358	5.6055
0.01	0.0050	0.0077	0.3826	6.2904

We believe there may be three intertwined explanations and issues associated with our statistical findings. Our earlier discussion identifies specifically the first two issues.

First, our methodology takes into account the stochastic nature of taxation. As seen in our empirical analysis, the application of stochastic taxation appears to lower the estimated value for the coefficient of risk aversion. Moreover, since REITs effectively are not taxed at the corporate level and are largely pass-through entities, the use of stochastic taxation for the investor-stakeholder is appropriate. However, when there is both corporate taxation and shareholder taxation (as is the case for regular C-Corporations), the analysis is more complex than the structure of our model; the implications for the coefficient for risk aversion in the presence of double taxation (i.e., corporate and shareholder taxes) are unclear.

A second issue, one alluded to above in the text, is that the cash flow nature of REITs may attract risk-averse investors. If this, on average, is true, one would expect that the coefficient of risk aversion for REIT shareholders to be higher than that for the general stock market.

Third, the structure, organization, and economics of REITs may also play a role in explaining why our findings for the coefficient of risk aversion for REITs are different than those found for the general stock market. For example, Striwe, Rottke, and Zietz (2013) suggest that the REIT advisor structure and leverage may interplay with corporate governance in a way that differentiates REITs from other C-Corporations. As suggested by Tidwell, Ziobrowski, Gallimore, and Ro (2014), credit rating changes for REITs have differential impacts on their performance vis-à-vis the general U.S. equity markets. This notion that the cost of capital and credit rating are interrelated is reinforced by Danielsen, Harrison, Van Ness, and Warr (2014). Another strand that differentiates REITs from the general stock market is proposed by Chatrath, Christie-David, and Ramchander (2012). They suggest that REIT-specific information may have a large, in many instances, opposite effect to macro-economic news in a way that is different for REITs vis-à-vis other corporations. Ben-Shahar, Sulganik, and Tsang (2011) indicate that

funds from operations (FFO), a non-traditional corporate measure for performance, is a better measure for REIT analysis than the C-Corporate standard of net income or EBITDA. Anglin, Edelstein, Gao and Tsang (2011) discuss how REIT corporate governance may have unique features affecting REIT performance. Finally, DeLisle, Price, and Sirmans (2013) indicate that REIT volatility acts “paradoxically”; that is, the idiosyncratic volatility dominates the aggregate volatility in REIT pricing. In contrast to the negative and significant price volatility risk for non-REIT equities, they find that systematic volatility is not priced in REIT returns. All of these recent articles and the first two possible suggested explanations and issues indicate that REITs may be different in many ways from non-REIT equities. We leave it to the next generation of researchers to untangle the impacts of these three potential interrelated issues about, and explanations for, the equity risk premium for REITs.

Conclusion

The “equity risk premium puzzle” was first identified by Mehra and Prescott (1985) in the context of the overall stock market portfolio. Surprisingly, the issue of the puzzle with respect to other asset classes went largely unexplored. This paper estimates the expected real estate equity risk premium (for REITs) by introducing a novel empirical methodology, incorporating stochastic taxes. We then estimate the expected after-tax real estate risk premium to obtain an improved estimate for the coefficient of relative risk aversion for investors in REITs. REITs are special C-Corporations that, among other things, do not typically pay federal taxes at the corporate level if they distribute dividends representing at least 90% of taxable income (as well as follow other specified REIT regulations). Our major findings indicate that REIT investors (who are likely to have lower than average ordinary income tax rates and a taste for current cash flow) appear to be more risk averse than investors in the S&P 500 (market) portfolios. We find that for assumed reasonable levels of tax burden on REITs shareholders, the coefficient of relative risk aversion for REIT investors is likely to vary between 4.3 and 6.3. Since a substantial portion of commercial real estate is owned in the form of pass-through tax vehicles, our findings about REITs are suggestive for real estate investors in general. However, the evaluation of the precise risk behavior for non-REIT real estate investor-owners is an issue for future research.

Endnotes

- ¹ The National Council for Real Estate Investment Fiduciaries (NCREIF) collects real estate value and return data for institutional investment grade commercial real estate.
- ² A survey of large commercial real estate investors in the United States.
- ³ While in our paper appraisal accuracy and appraisal smoothing are moot because our analysis employs market data from publicly traded REITs, the issues surrounding appraisal smoothing are not as obvious as some claim. In particular, usually the models

of appraisal smoothing assume relatively homogeneous appraiser behavior and the use of similar information sets. Lai and Wang (1998), as well as Cheng, Lin, and Lin (2011) demonstrate that if appraisers either use heterogeneous information sets and/or exhibit behavioral-methodological differences, it is conceivable that appraisal data could be more (or less) volatile than the underlying true valuation market volatility. That is, appraisal smoothing bias depends crucially upon modeling assumptions. A slightly different argument is provided by Edelstein and Quan (2005). They suggest that large errors for individual appraisals (i.e., volatile appraisals) may wash out in the aggregate, generating price indices that are reasonably smooth and appropriate measures of market valuation changes.

- ⁴ Depending upon REIT activity, dividends may be taxed as capital gains and/or return on capital; but the majority of dividends are subject to ordinary income taxation rates.
- ⁵ The model we have developed, because there is no taxation at the corporate level, does not necessarily generalize in its current form to public utility companies, which resemble REITs in that they have large depreciable assets and generally have high cash flowing capabilities, but differ from REITs in that utilities are subject to corporate taxes and do not have legal dividend distribution requirements.
- ⁶ Dividends may be taxable, at least in part, as long-term capital gains, or non-taxable as return of capital; however, the bulk of REIT dividends are treated as ordinary income by the recipient (Boudry, 2011).
- ⁷ Clayton and MacKinnon (2009) demonstrated that starting in 1994, institutional ownership of REITs is nearly identical to the institutional ownership of non-REIT shares listed on the NYSE. It is not surprising since REITs are publicly traded on the same exchanges and in exactly the same fashion as other publicly traded stocks. Consistent with these findings, Gyourko and Sinai (1999) hypothesized that the percentage of REITs shares held in tax-exempt accounts is similar to the percentage of S&P 500 stock shares held in tax-exempt accounts. They implied that the institutional ownership of REITs appears to be a good approximation to tax-exempt ownership. Since current institutional ownership of stocks is roughly 80%, we conclude that about 20% of equity REIT shares are held in taxable accounts. See also Chan, Leung, and Wang (1998) and Lin, Rahman and Yung (2009) for important discussion of institutional ownership of REITs.
- ⁸ See Ambrose and Linneman (2001) for numerical values for β_{REITs} .
- ⁹ The stochastic tax $\tau_{re\ t+1}$ imposed on the wealth from equity REITs holdings is defined as

$$\begin{aligned}
 \tau_{re\ t+1} &= \frac{\tau_{re\ t+1}^d d_{re\ t+1} + \tau_{t+1}^{SCG} SCG_{t+1} + \tau_{t+1}^{LCG} LCG_{t+1}}{p_{re\ t+1} + d_{re\ t+1}} \\
 &= \frac{\tau_{re\ t+1}^d d_{re\ t+1} + \tau_{t+1}^{SCG} SCG_{t+1} + \tau_{t+1}^{LCG} LCG_{t+1}}{\underbrace{p_{re\ t}}_{\text{Tax Yield, } TY_{re\ t+1}}} \\
 &\times \underbrace{\frac{p_{re\ t}}{p_{re\ t+1} + d_{re\ t+1}}}_{1/R_{re\ t+1}} = \frac{TY_{re\ t+1}}{R_{re\ t+1}}.
 \end{aligned}$$

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