Stochastic Taxation and Pricing of CMBS REITs[1]

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Abstract

This paper examines an important topic about the performance of CMBSs by estimating the expected equity risk premium for U.S. CMBS REITs. The estimation of the expected risk premium has been a thorny issue that spans the intersection of real estate finance, corporate finance, taxation economics, and investor decision-making. By employing a novel methodology, explicitly incorporating CMBS REIT shareholders' taxation for capital gains and ordinary income, the analysis demonstrates that the expected after-tax risk premiums for CMBS REITs generate and are consistent with a reasonable coefficient of relative risk aversion. This finding is contrary to much of the existing literature about the risk premium (the so called equity risk premium puzzle). In this study, employing a Capital Consumption Asset Pricing Model (CCAPM) with stochastic taxation, we are able to demonstrate that for a range of plausible stochastic tax burdens, the coefficient of relative risk aversion for CMBS REIT shareholders is likely to fall within the interval of $7.43 - 10.59$, values significantly lower than those reported in most prior studies for real estate and other asset markets.

Keywords: CMBS, Equity Premium, REITs, Risk Aversion, Stochastic Tax

I. Introduction

As is readily recognized by practitioners, academics, and regulators, taxation plays a significant role in real estate investment decisions and ultimate real estate financial performance, and, therefore, should have a substantial role in the performance of commercial real estate, commercial real estate mortgages, and, ultimately CMBS. Surprisingly, this taxation "effect" and its impact upon CMBSs have been neglected in the existing literature.[2] This paper examines an important topic about the performance of CMBSs by estimating the expected equity risk premium for U.S. CMBS 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.[3] 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 period of 1872-1950 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 estimate of the expected stock returns, by itself, unfortunately, does not appear to resolve the equity premium risk puzzle. Magin (2014) 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 (2014), by employing a modified model with a stochastic tax variable τ_t imposed on stock

[2] See Reference section for the literature on CMBS pricing.
[3] See DeLong and Magin (2009) for a review, for example.

holders' 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[4], the Magin estimate for $a = 3.76$ is consistent with perceived equity risk premium.

Surprisingly, research relating to the risk premium puzzle for an asset class other than stocks has been largely neglected. For real estate, the known exceptions are Shilling (2003) and Edelstein and Magin (2013), who have examined the equity risk premium puzzle for real estate assets.

In his study, Shilling utilizes two different real estate value data sets: NCREIF[5] and the Korpaz Real Estate Survey data[6]. The NCREIF data is 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.[7][8] Second, survey data is believed to have potential intrinsic problems.[9] 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.

On the other hand, in their study, using their novel approach by employing the CCAPM with stochastic taxation and NAREIT data, Edelstein and Magin were able to demonstrate that for a range of reasonable stochastic tax burdens, the coefficient of relative risk aversion for US Equity REITs shareholders is likely to fall within the interval of 4.32 to 6.29, values significantly lower than those reported in most prior studies for real estate and other asset markets.

We use here a database and methodology similar to ones developed in Edelstein and Magin (2013) for estimating the expected risk premium for US Equity REITs to estimate the expected risk premium for US CMBS REITs. Our tack

[4] Mehra (2003)

[5] The National Council for Real Estate Investment Fiduciaries (NCREIF) collects real estate value and return data for institutional investment grade commercial real estate.

[6] A Survey of large commercial real estate investors in the United States.

[7] See Edelstein and Quan (2005), Quan and Quigley (1991).

[8] While in our paper appraisal accuracy and appraisal smoothing are moot because our analysis employs market data from publicly traded Real Estate Investment Trusts, 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 modelling 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.

[9] See Dokko and Edelstein (1989)

is to utilize transactions data based upon CMBS REITs.[10] We utilize the Fama and French estimate for the expected before-tax risk premium for the S&P 500 to estimate the expected before-tax risk premium for CMBS REITs. REITs stock holders, like non-REIT stock holders, 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 REITs 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 REITs dividends typically are a substantial part of the overall before-tax return from REITs, and are taxed ostensibly as ordinary income[11], 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 REITs holders 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 CMBS REITs investors will be in the interval between 7.43 and 10.59, a very reasonable range for risk aversion. Indeed, CMBS REITs are very high dividend yield stocks, with even higher dividend yield than Equity REITs. 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 very risk-averse investors to CMBS 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.[12]

The remainder of the paper is organized as follows. Section II defines and reviews the CCAPM, the coefficient of relative risk aversion and the Equity Risk Premium Puzzle. Section III develops estimates for the effective tax rates for CMBS REITs shareholders. Section IV derives the expected after-tax risk premium for CMBS REITs, and the implied coefficient of relative risk aversion

[10] Unfortunately, NAREIT data for CMBS REITs is only available for the period 2000-2014.

[11] 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.

[12] The model we have developed, because there is no taxation at the corporate level, does not necessarily generalize in its current form to public utilities 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.

for CMBS REITs shareholders. Section V concludes.

II. 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 multiperiod 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, 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:

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

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

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

Taking the first-order condition we obtain

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

Hence,

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

and

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

where $R_{kt+1} = \frac{p_{kt+1} + d_{kt+1}}{p_{kt}}$ 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 lognormally distributed and $u(c) = \frac{c^{1-a}}{1-a}$, then

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

where a is the coefficient of relative risk aversion. The coefficient of relative risk aversion measures agents' 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 $u(c) = \frac{c^{1-a}}{1-a}$, then $u'(c) = c^{-a}$ and $u''(c) = -a \cdot c^{-a-1}$. So clearly

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

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 agents' 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:

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

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.

III. Calculating the Tax Yield for CMBS REITs

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

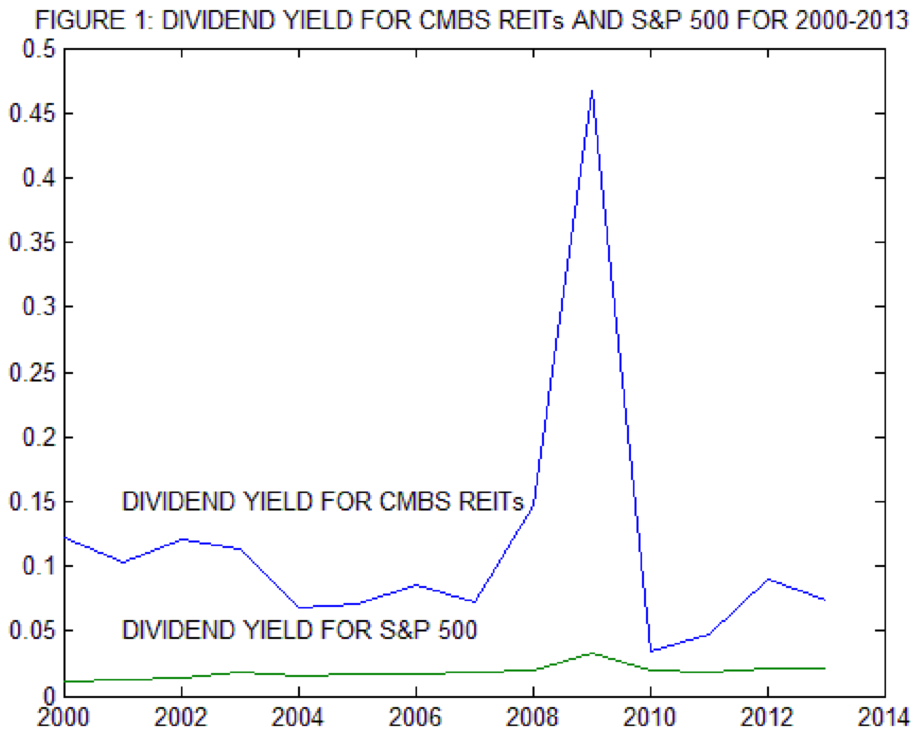
$$TY_{mt+1} = \frac{\tau^d_{t+1} d_{mt+1} + \tau^{SCG}_{t+1} SCG_{mt+1} + \tau^{LCG}_{t+1} LCG_{mt+1}}{p_{mt}} = $$
$$= \tau^d_{mt+1} \cdot 0.045 + \tau^{SCG}_{t+1} \cdot 0.001 + \tau^{LCG}_{t+1} \cdot 0.018, \tag{8}$$

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^{d}_{mt+1} is the effective dividend tax for the S&P 500 (market) portfolio,
τ^{SCG}_{t+1} is the tax on short-term capital gains,
τ^{LCG}_{t+1} is the tax on long-term capital gains,
SCG_{mt+1} are realized short-term capital gains,
LCG_{mt+1} are realized long-term capital gains.

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

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^{SCG}_{t+1}, τ^{LCG}_{t+1}, $\frac{SCG_{t+1}}{p_t}$ and $\frac{LCG_{t+1}}{p_t}$ 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 NAREIT US CMBS REITs Index for 2000-2014 as a benchmark for US CMBS REITs performance, the average dividend yield for CMBS REITs is more than twice that of the average dividend yield for S&P 500 stocks: 0.123 vs. 0.045.[13] See Figure 1 below.

[13] Unfortunately, NAREIT data for CMBS REITs is only available for the period 2000-2014.



Since REITs distribute at least 90% of taxable income to shareholders in the form of dividends, REITs dividend distributions constitute a significant portion of the overall before-tax return from REITs.

Therefore, since REIT dividends are ostensibly taxed as ordinary income[14], 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 REITs investors. To address this issue, we shall note that only about 20% of REITs shares are held in taxable accounts.[15] Moreover, when stock dividends

[14] 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. See Boudry (2011).

[15] 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 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,

are taxed, they are on average taxed at the ordinary income tax rate of about 20%.[16] Therefore, if investors in REITs were subject to average ordinary income tax rates, the effective overall dividend tax rate $\tau^{d}_{cmbs\ reits\ t+1}$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 will therefore estimate the tax yield for CMBS REITs for 2000-2014 as

$$TY_{cmbs\ reits\ t+1} = 0.02 \cdot 0.123 + \tau^{SCG}_{t+1} \cdot 0.001 + \tau^{LCG}_{t+1} \cdot 0.018. \tag{9}$$

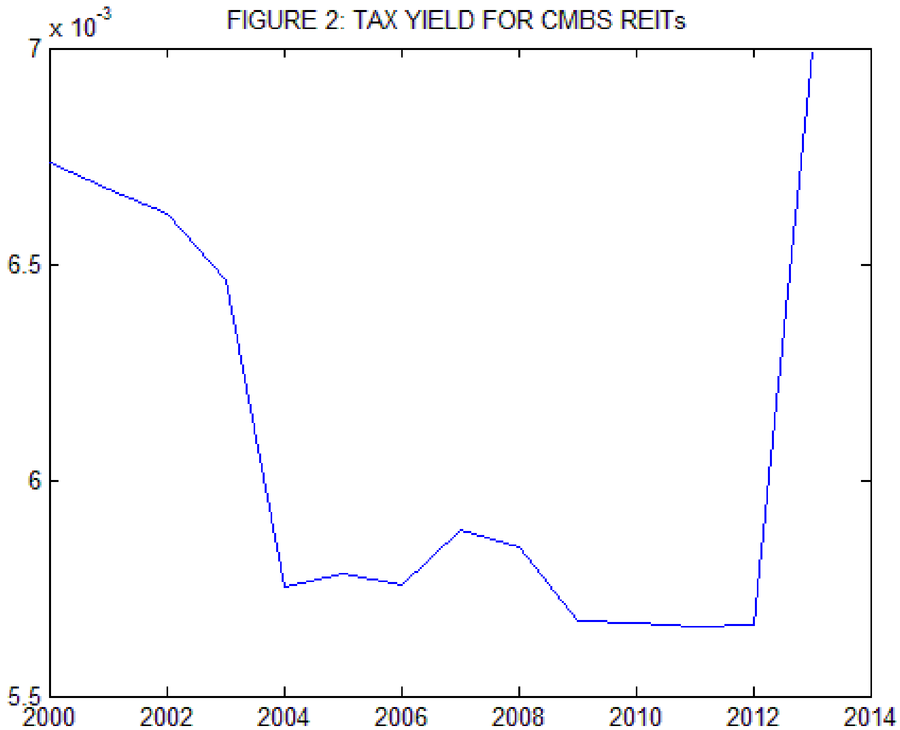
We obtain the mean tax yield for shareholders of CMBS REITs,

$$E\left[TY_{cmbs\ reits\ t+1}\right] = 0.0061.$$

See Figure 2 below.

Gyourko and Sinai (1999) hypothesized also 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 REITs institutional ownership appears to be a good approximation to tax-exempt ownership. Since current institutional ownership of stocks is roughly 80%, we can conclude that about 20% of equity REITs 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.

[16] See Samwick (2000)



IV. Estimating Expected After-tax Risk Premiums and the Coefficient of Relative Risk Aversion for CMBS REITs Investors

The traditional CCAPM without insecure property rights, and assuming a current expected equity premium for CMBS REITs of 4.20%, estimated using average historical before-tax returns for IShares CMBS ETF as a benchmark for US CMBS REITs performance, produces a coefficient of risk aversion for CMBS REITs stockholders

$$a = \frac{\ln\left(E\left[R_{cmbs\ reits\ t+1}\right]\right) - \ln(R_f)}{COV\left[\ln(R_{\ cmbs\ reits\ t+1}),\ \ln\left(\frac{C_{t+1}}{C_t}\right)\right]} = \frac{0.7 \cdot 0.06}{0.00125} = 33.6000. \qquad (10)$$

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 $\beta_{cmbs\ reits} = 0.7$[17] we can conclude that

[17] See IShares CMBS ETF data at http://investing.money.msn.com/investments/etf-list/?symbol=CMBS

$$\overbrace{E\left[R_{cmbs\ reits\ t+1}\right]-R_f}^{0.7\cdot 0.0255}=\overbrace{\beta_{cmbs\ reits}}^{0.7}\left(\overbrace{E\left[R_{mt+1}\right]-R_f}^{0.0255}\right)=0.0178. \qquad (11)$$

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

$$a=\frac{\overbrace{\ln\left(E\left[R_{cmbs\ reits\ t+1}\right]\right)-\ln(R_f)}^{0.7\cdot 0.0255}}{\underbrace{COV\left[\ln(R_{cmbs\ reits\ t+1}),\ \ln\left(\frac{C_{t+1}}{C_t}\right)\right]}_{0.00125}}=\frac{0.0178}{0.00125}=14.2400. \qquad (12)$$

Following Magin (2014), we introduce stochastic taxes. The use of the stochastic tax $\tau_{cmbs\ reits\ t+1}$[18] imposed on the wealth from CMBSs holdings creates a new term $E\left[\tau_{\ cmbs\ reits\ t+1}\right]\approx-\ln\left(E\left[1-\tau_{cmbs\ reits\ t+1}\right]\right)$, reducing a further:

$$a=\frac{\ln\left(E\left[R_{cmbs\ reits\ t+1}\right]\right)-\ln(R_f)+\ln\left(E\left[1-\tau_{cmbs\ reits\ t+1}\right]\right)+COV[\ln\left(R_{cmbs\ reits\ t+1}\right),\ \ln\left(1-\tau_{cmbs\ reits}\right.}{COV\left[\ln\left(R_{cmbs\ reits\ t+1}\right),\ \ln\left(\frac{C_{t+1}}{C_t}\right)\right]+COV\left[\ln\left(1-\tau_{cmbs\ reits\ t+1}\right),\ \ln\left(\frac{C_{t+1}}{C_t}\right)\right]}$$

$$=\frac{0.7\cdot 0.0255-0.0061+0.0002}{0.00125+0.0000}=9.5354. \qquad (13)$$

Let us conduct an additional analysis. As we previously established, if CMBS REITs' investors were subject to average ordinary income tax rates, the effective dividend tax rate for CMBS REITs' holders would be about 0.04. However, since the investors in CMBS REITs are likely to have lower than average ordinary income tax rates, we allow the actual ordinary income tax rates for CMBS REITs' shareholders to vary from 25% to 100% of regular stock holders. See Table 1 below.

[18] The stochastic tax $\tau_{cmbs\ reits\ t+1}$ imposed on the wealth from CMBSs holdings is defined as

$$\tau_{cmbs\ reits\ t+1}=\frac{\tau^d_{cmbs\ reits\ t+1}d_{cmbs\ reits\ t+1}+\tau^{SCG}_{t+1}SCG_{t+1}+\tau^{LCG}_{t+1}LCG_{t+1}}{p_{cmbs\ reits\ t+1}+d_{cmbs\ reits\ t+1}}=$$

$$=\underbrace{\frac{\tau^d_{cmbs\ reits\ t+1}d_{cmbs\ reits\ t+1}+\tau^{SCG}_{t+1}SCG_{t+1}+\tau^{LCG}_{t+1}LCG_{t+1}}{p_{cmbs\ reits\ t+1}}}_{Tax\ Yield,\ TY_{cmbs\ reits\ t+1}}\cdot\underbrace{\frac{p_{cmbs\ reits\ t}}{p_{cmbs\ reits\ t+1}+d_{cmbs\ reits\ t+1}}}_{1/R_{cmbs\ reits\ t+1}}=\frac{TY_{cmbs\ reits\ t+1}}{R_{cmbs\ reits\ t+1}},$$

Table 1
Numerical Simulations

Effective Dividend Tax	Expected Tax Yield	After-tax Risk Premium	Coefficient of Relative Risk Aversion
0.04	0.0087	0.0091	7.4273
0.03	0.0074	0.0104	8.4803
0.02	0.0061	0.0117	9.5334
0.01	0.0048	0.0130	10.5865

These computations suggest that the investors in CMBS REITs, who may have lower than average ordinary income tax rates and have a taste for current cash flow (high dividend yield), appear to be, not surprisingly, more risk averse than investor in Equity REITs and S&P 500 (market) portfolio. See Table 2 below.

Table 2
Coefficients of Relative Risk Aversion for Different Asset Classes

Asset Class	Dividend Yield, %	Coefficient of Relative Risk Aversion	Source
S&P 500 Index Portfolio	4.50	3.76	Magin (2014)
Equity REITs	8.00	4.32-6.29	Edelstein and Magin (2013)
CMBS REITs	12.29	7.43-10.59	This Paper

We believe there may be two intertwined explanations and issues associated with our statistical findings.

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 REIT's 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 REIT's may attract especially risk averse investors, in general. If this, on average, is true, one would expect that the coefficient of risk aversion for REIT's shareholders appear to be higher than that for the general stock market.

V. 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 CMBS 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 CMBS 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 CMBS REITs 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 investor in Equity REITs and in the S&P 500 (market) portfolio. We find that for assumed reasonable levels of tax burdens on CMBS REITs shareholders the coefficient of relative risk aversion for CMBS REITs investors is likely to vary in the interval between 7.43 and 10.59.

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