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Journal of Forest Economics

journal homepage: www.elsevier.com/locate/jfe



Illiquidity and risk of commercial timberland assets in the United States



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ARTICLE INFO

Article history:

Received 13 June 2013

Accepted 29 January 2015

JEL classification:

C22

G17

R32

Keywords:

Forest Investment

Real estate

Valuation

Volatility

ABSTRACT

Using the BDS independent test and the bootstrapping method, this paper examines the relationship between return and risk of various timberland investment vehicles and the holding period. Results from the BDS test reject the null hypothesis of independent and identically distributed (i.i.d.) returns and results from the simulation indicate that the average quarterly return remains almost constant and thus independent of the holding period but the average quarterly risk (standard deviation) varies among different timberland investment vehicles. For private-equity timberland assets, the average periodic risk increases with the holding period, whereas for public-equity timberland assets, it stays relatively constant. Overall, there is some evidence that private-equity timberland returns as measured by various NCREIF timberland indices tend not to be independent and identically distributed, a violation of the key assumption for the modern portfolio theory.

Published by Elsevier GmbH, on behalf of Department of Forest Economics, Swedish University of Agricultural Sciences, Umeå.

Introduction

The United States has abundant forestland resources. About one third of the country's land area, or 751 million acres, are forestlands. Among them, 514 million acres with an estimated market value of \$460 billion are considered as commercial timberlands that are mainly used to produce timber (Newell and Eves, 2009; Smith et al., 2009). Timberland has been recognized as an alternative asset class ever

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since the economic recession in the US in the mid-1970s, when investors, especially institutional investors began to seek investment opportunities other than stocks and bonds for the diversification purpose. With increasing capital inflows into the timberland market, timberland has come of age and is well known for its “biological beta” (Conroy and Miles, 1989), a unique feature embedded in timberland asset that differentiates itself from other types of assets. That is, the biological growth dominates the other two return drivers (timber price change and land value appreciation) of timberland investments and is independent of the financial market (Caulfield, 1998; Mei et al., 2013).

Generally speaking, there are two ways to engage in the timberland business. One is investing through private, closed-end funds, usually managed by timberland investment management organizations (TIMOs).¹ The other is investing in publicly traded timber firms or real estate investment trusts (REITs). Combined, TIMOs and REITs control about 50 million acres of timberland in the US (Harris et al., 2010). Regarding their returns, private-equity timberland investment is typically gauged by the national council of real estate investment fiduciaries (NCREIF) timberland index (NTI) or timberland fund and separate account index (NTFSAI), and public-equity timberland investment is measured by stock returns of publicly traded timber firms.

Under the framework of the modern portfolio theory (Markowitz, 1952), numerous studies have examined and compared the financial performance of private- vs. public-equity timberland investments. Zinkhan and Cabbage (2003), and Healey et al. (2005), among others, show that the NTI has comparable returns to common stocks but much lower volatility. Newell and Eves (2009), Waggle and Johnson (2009), and Wan et al. (2012) prove that private-equity timberland has a diversification role in a mixed-asset portfolio. Sun and Zhang (2001) and Mei and Clutter (2010) conclude that private-equity timberland asset has low systematic risk but substantial abnormal returns, whereas public-equity timberland asset has similar risk as the financial market but no abnormal returns. However, these classical financial analyses ignore some key facts of the private-equity timberland asset – illiquidity, large transaction cost and long holding period, as opposed to high liquidity, high efficiency and low friction of the public security market, on which the modern portfolio theory is founded. In other words, these analyses disregard the distinction between single- vs. multi-period investment decisions as demonstrated by Thomson (1991). Therefore, their methods may be problematic and their findings may be debatable.

Another concern of private-equity timberland investment is an appropriate return index. It is well known that the NIT is based on both actual transactions and appraisals (NCREIF, 2013). Because appraisers tend to use both current and past market information in forming appraisal values, a phenomenon known as “appraisal smoothing”, this essentially leads to the seemingly superior performance of real estates (Geltner, 1989). To correct for the appraisal smoothing bias, Scholtens and Spierdijk (2010) apply the unsmoothing method proposed by Fisher et al. (1994) and find less evidence that private-equity timberland investment improves the mean-variance efficiency. However, there are mixed evidence and arguments to the appraisal smoothing theory in the real estate literature.² Cheng et al. (2011a) illustrate that appraisal-based returns may not suffer any smoothing bias because of the heterogeneity of appraiser behaviors and abilities to access and interpret information.

This study intends to examine, analytically and empirically, the statistical properties of various proxies of timberland investment returns and the validity of the modern portfolio theory to timberland assets. The results reveal that the assumption of independent and identically distributed (i.i.d.) returns, a critical link of the efficient market hypothesis and the modern portfolio theory (Fama, 1970; Merton, 1969; Samuelson, 1969), is violated by private-equity timberland assets, and that the risk of

¹ A closed-end fund is a collective investment scheme that has a fixed number of shares. A closed-end fund is usually sponsored by a fund management company which will control how the fund is invested. It begins by soliciting money from investors in an initial offering, being it public or limited. Investors are given shares corresponding to their initial investment. Fund managers pool the money and purchase securities or other assets. What exactly a fund manager can invest in depends on the fund's charter, prospectus and the applicable government regulations. A closed-end timberland fund is specialized in timberland investment. A separately managed account is used by TIMOs to manage timberland properties for one investor in a single portfolio. A commingled (pooled) fund is used to collect capital from a number of investors and then invest in a portfolio of timberland properties.

² A comprehensive review of the appraisal smoothing theory is beyond the scope of this study but can be found in Geltner et al. (2003) and Cheng et al. (2011a, 2011b).

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