Portfolio Investment with the Exact Tax Basis via Nonlinear Programming

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Published Online: 1 Feb 2005 | https://doi.org/10.1287/mnsc.1040.0315

Abstract

Computing the optimal portfolio policy of an investor facing capital gains tax is a challenging problem: because the tax to be paid depends on the price at which the security was purchased (the tax basis), the optimal policy is path dependent and the size of the problem grows exponentially with the number of time periods. Dammon et al. (2001, 2002, 2004), Garlappi et al. (2001), and Gallmeyer et al. (2001) address this problem by *approximating* the exact tax basis by the weighted average purchase price. Our contribution is threefold. First, we show that the structure of the problem has several attractive features that can be exploited to determine the optimal portfolio policy using the *exact* tax basis via nonlinear programming. Second, we characterize the optimal portfolio policy in the presence of capital gains tax when using the *exact* tax basis. Third, we show that the certainty equivalent loss from using the average tax basis instead of the exact basis is very small: it is typically less than 1% for problems with up to 10 periods, and this result is robust to the choice of parameter values and to the presence of transaction costs, dividends, intermediate consumption, labor income, tax reset provision at death, and wash-sale constraints.

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Volume 51, Issue 2

February 2005
Pages 151-313

Article Information

Metrics

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Information

Received: February 10, 2002
Published Online: February 01, 2005

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Cite as

Victor DeMiguel, Raman Uppal, (2005) Portfolio Investment with the Exact Tax Basis via Nonlinear Programming. Management Science 51(2):277-290.

https://doi.org/10.1287/mnsc.1040.0315

Keywords

portfolio choice | capital gains tax | optimization | nonlinear programming

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