

Risk Reduction in Large Portfolios: Why Imposing the Wrong Constraints Helps

Ravi Jagannathan, Tongshu Ma

First published: 15 July 2003

<https://doi.org/10.1111/1540-6261.00580>

Citations: 1,012

ABSTRACT

Green and Hollifield (1992) argue that the presence of a dominant factor would result in extreme negative weights in mean-variance efficient portfolios even in the absence of estimation errors. In that case, imposing no-short-sale constraints should hurt, whereas empirical evidence is often to the contrary. We reconcile this apparent contradiction. We explain why constraining portfolio weights to be nonnegative can reduce the risk in estimated optimal portfolios even when the constraints are wrong. Surprisingly, with no-short-sale constraints in place, the sample covariance matrix performs as well as covariance matrix estimates based on factor models, shrinkage estimators, and daily data.

REFERENCES



Best, Michael J., and Robert R. Grauer, 1991, On the sensitivity of mean-variance-efficient portfolios to changes in asset means: Some analytical and computational results, *Review of Financial Studies* 4, 315–342.

[Web of Science®](#) | [Google Scholar](#)

Black, Fisher, and Robert Litterman, 1992, Global portfolio optimization, *Financial Analysts Journal* 48, 28–43.

[Google Scholar](#)

Bloomfield, Ted, Richard Leftwich, and John Long, 1977, Portfolio strategies and performance, *Journal of Financial Economics* 5, 201–218.

[Web of Science®](#) | [Google Scholar](#)

Chan, Louis K. C., Jason Karceski, and Josef Lakonishok, 1999, On portfolio optimization: Forecasting covariances and choosing the risk model, *Review of Financial Studies* 12, 937–974.

[Web of Science®](#) | [Google Scholar](#)

Cohen, Kalman, Gabriel Hawawini, Steven Maier, Robert Schwartz, and David Whitcome, 1983, Friction in the trading process and the estimation of systematic risk, *Journal of Financial Economics* 12, 263–278.

[Web of Science®](#) | [Google Scholar](#)

Connor, Gregory, and Robert A. Korajczyk, 1986, Performance measurement with the arbitrage pricing theory, *Journal of Financial Economics* 15, 373–394.

[Web of Science®](#) | [Google Scholar](#)

Connor, Gregory, and Robert A. Korajczyk, 1988, Risk and return in an equilibrium APT: Applications of a new test methodology, *Journal of Financial Economics* 21, 255–289.

[Web of Science®](#) | [Google Scholar](#)

Dimson, Elroy, 1979, Risk measurement when shares are subject to infrequent trading, *Journal of Financial Economics* 7, 197–226.

[Web of Science®](#) | [Google Scholar](#)

Elton, Edwin J, and Martin J. Gruber, 1993, Estimating the dependence structure of share prices: Implications for portfolio selection, *Journal of Finance* 28, 1203–1232.

[Google Scholar](#)

Fama, Eugene, and Kenneth French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3–56.

[Web of Science®](#) | [Google Scholar](#)

Frost, Peter A., and James E. Savarino, 1986, An empirical Bayes approach to efficient portfolio selection, *Journal of Financial and Quantitative Analysis* 21, 293–305.

[Web of Science®](#) | [Google Scholar](#)

Frost, Peter A., and James E. Savarino, 1988, For better performance: Constrain portfolio weights, *Journal of Portfolio Management* 15, 29–34.

[Web of Science®](#) | [Google Scholar](#)

Green, Richard C., and Burton Hollifield, 1992, When will mean-variance efficient portfolios be well diversified? *Journal of Finance* 47, 1785–1809.

[Web of Science®](#) | [Google Scholar](#)

Jagannathan, Ravi, and Tongshu Ma, 2002, Risk reduction in large portfolios: Why imposing the wrong constraints helps, NBER working paper 8922.

[Google Scholar](#)

Jobson, J. D., and Bob Korkie, 1980, Estimation for Markowitz efficient portfolios, *Journal of the American Statistical Association* 75, 544–554.

[Web of Science®](#) | [Google Scholar](#)

Jobson, J. D., and Bob Korkie, 1981, Putting Markowitz theory to work, *Journal of Portfolio Management* 7, 70–74.

[Google Scholar](#)

Jorion, Philippe, 1985, International portfolio diversification with estimation risk, *Journal of Business* 58, 259–278.

[Web of Science®](#) | [Google Scholar](#)

Jorion, Philippe, 1986, Bayes–Stein estimation for portfolio analysis, *Journal of Financial and Quantitative Analysis* 21, 279–292.

[Web of Science®](#) | [Google Scholar](#)

Jorion, Philippe, 1991, Bayesian and CAPM estimators of the means: Implications for portfolio selection, *Journal of Banking and Finance* 15, 717–727.

[Web of Science®](#) | [Google Scholar](#)

Ledoit, Olivier, 1996, *A well-conditioned estimator for large dimensional covariance matrices*, Working paper, UCLA.

[Google Scholar](#)

Ledoit, Olivier, 1999, *Improved estimation of the covariance matrix of stock returns with an application to portfolio selection*, Working paper, UCLA.

[Google Scholar](#)

Liu, Ludan, 2001, *Portfolio constraints and shrinkage estimation*, Working paper, Carroll School of Management, Boston College.

[Google Scholar](#)

Markowitz, H. M., 1952, Portfolio selection, *Journal of Finance* 7, 77–91.

[Web of Science®](#) | [Google Scholar](#)

Markowitz, H. M., 1959, *Portfolio Selection: Efficient Diversification of Investments* (Yale University Press, New Haven, CT).

[Google Scholar](#)

Michaud, Richard O., 1989, The Markowitz optimization enigma: Is "optimized" optimal? *Financial Analysts Journal*, 45, 31-42.

[Google Scholar](#)

Morrison, Donald F., 1990, *Multivariate Statistical Methods* (McGraw-Hill, New York).

[Google Scholar](#)

Newy, Whitney K., and Kenneth D. West, 1987, A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix, *Econometrica* 55, 703-708.

[Web of Science®](#) | [Google Scholar](#)

Pastor, Lubos, and Robert Stambaugh, 2000, Comparing asset pricing models: An investments perspective, *Journal of Financial Economics* 56, 335-381.

[Web of Science®](#) | [Google Scholar](#)

Scholes, Myron, and Joseph Williams, 1977, Estimating betas from nonsynchronous data, *Journal of Financial Economics* 5, 309-328.

[Web of Science®](#) | [Google Scholar](#)

Schwert, G. Williams, and Paul L. Seguin, 1990, Heteroskedasticity in stock returns, *Journal of Finance* 45, 1129-1155.

[Web of Science®](#) | [Google Scholar](#)

Shanken, Jay, 1987, Nonsynchronous data and the covariance-factor structure of returns, *Journal of Finance* 42, 221-231.

[Web of Science®](#) | [Google Scholar](#)

Sharpe, William, 1963, A simplified model for portfolio analysis, *Management Science* 9, 277-293.

[Web of Science®](#) | [Google Scholar](#)

Wang, Zhenyu, 2002, *A shrinkage approach to model uncertainty and asset allocation*, Working paper, Columbia University.

[Google Scholar](#)

ABOUT WILEY ONLINE LIBRARY

Privacy Policy
Terms of Use
About Cookies
Manage Cookies
Accessibility

Wiley Research DE&I Statement and Publishing Policies
Developing World Access

HELP & SUPPORT

Contact Us
Training and Support
DMCA & Reporting Piracy

OPPORTUNITIES

Subscription Agents
Advertisers & Corporate Partners

CONNECT WITH WILEY

The Wiley Network
Wiley Press Room