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**A Test of Historical and Shrinkage Estimates of Expected
Returns in International Portfolio Selection.**

**A THESIS PRESENTED IN PARTIAL FULFILMENT OF THE
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Abstract

A number of researchers have chosen internationally diversified portfolios using the Mean-Variance approach to portfolio selection. Typically, the estimates of expected returns, variances and covariances are taken from historical data. Recently this approach has come under criticism due to the poor performance of these portfolios out of the sample period. A suggested improvement is to use "shrinkage" estimators to improve the estimates, particularly for expected returns. This statistical adjustment leads to less emphasis being placed on increasing expected return and more on risk reduction.

The researchers to test shrinkage estimates internationally have had conflicting results, possibly due to the methodology used. Jorion (1985) found support for shrinkage estimators outperforming historical estimates, with short sales unconstrained. A single period model with a five year sample was used. Grauer and Hakansson use a multi-period model, with short sales restricted. The sample period is eight years in this instance, and the opposite result is obtained.

This study tests both types of mean estimate in a single period model, with short sales restricted. The difference in out of sample performance is insignificant with both four and eight year samples. Additionally, a naive strategy of weighting the portfolio equally between countries, thereby ignoring the historical data, outperforms the other methods. Thus, the use of four year sample periods appears to be of no use.

With the eight year sample the performance of all methods is remarkably similar, with a portfolio chosen to minimise variance having the best performance, although only slightly.

The use of historical data, whether or not shrinkage estimates are used, has proved to be of very little benefit in this study.

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CHAPTER 1

Introduction

It has been common to use the Mean-Variance approach for portfolio selection, as developed by Markowitz (1952)¹, to select internationally diversified portfolios. Wide diversification among securities of low correlation, as pointed to by the Mean-Variance approach, provides a logical impetus to consider international markets. Lower correlations typically occur between markets, when compared to correlations of the securities within the markets. International portfolios provide the widest possibilities for diversification, and this combined with lower correlations should lead to superior portfolios.

Early work in this area concentrated on using risk and return parameters estimated from historical data². These estimates were used to derive optimal portfolios, with little consideration of the effect of errors in the estimates. This approach has come under much criticism in recent times, for several reasons. The most significant criticism is the poor *ex-post* performance of these portfolios. Jorion (1986) finds that naive strategies, such as an equally weighted portfolio, often outperform the portfolio selected. It follows that errors in the estimates based on historical data have resulted in inferior performance.

Of greatest importance in improving the performance of portfolios selected by the Mean-Variance approach is the accurate estimation of expected returns. This is due to the large effect on portfolio composition of small variations in expected return, in comparison to the more moderate effects of variance and covariance³. Unfortunately, expected returns have been the more difficult parameter to estimate as well.

¹ Markowitz, Harry M., "Portfolio Selection." Journal of Finance, (March, 1952).

² Grubel, H. G., "Internationally Diversified Portfolios: Welfare Gains and Capital Flows.", American Economic Review, (December, 1968).

Levy, H. and Sarnat, M., "International Diversification of Investment Portfolios.", American Economic Review (September, 1970).

³ Chopra, Vijay K., and Ziemba, William T., "The Effect of Errors in Means, Variances and Covariances on Optimal Portfolio Choice", The Journal of Portfolio Management, (Winter, 1993).

The need to improve expected return estimates has inspired the use of shrinkage estimates⁴. Shrinkage estimates adjust the sample means, in this case expected returns, towards a common value. The effect of this, in a portfolio context, is to reduce the likelihood that an optimal portfolio will largely consist of securities with high sample expected returns estimated with considerable error. Additionally, a security that has performed poorly in the past is less likely to be rejected as a contender for the portfolio. Portfolios selected by this method are thus more diversified, with more emphasis put on reduction of portfolio risk than on increased portfolio return.

The purpose of this thesis is to compare historical and shrinkage estimates of expected returns when choosing optimal portfolios. The performance of these portfolios is compared with two alternative strategies, these being minimum variance portfolios, based on historical estimates of variance and covariance, and equally weighted portfolios.

This topic has been considered by other researchers with mixed success when international markets are considered. Reasons for the differing results may include the methodology and data used. This report considers an intermediate methodology to those giving the conflicting results, and a different database. This will provide further insight into the usefulness of the Mean-Variance approach and historical or shrinkage estimates of expected returns.

⁴ Jorion, P., "International Portfolio Diversification With Estimation Risk.", *Journal of Business*, (No. 3, 1985).