共變異數矩陣估計與最適投資組合績效

學生：楊以如　　指導教授：羅志賢 博士

國立高雄應用科技大學金融資訊碩士班

摘要

由於先前 Markowitz (1952)所提出的「平均數-變異數投資組合模型」(Mean-variance model)，會產生樣本誤差問題。因此，本文採用全域最小變異數模型、最小追蹤誤差方法(Minimum Tracking Error Variance)及共整合法來測試台灣股票市場的績效表現是否優於以台灣五十指數做為標竿指數之績效。並進一步比較三種方法績效之優劣。本研究的樣本期間為 1998 年 7 月開始，以 60 個月的資料當作移動視窗並進行月頻率替換至 2009 年 12 月為止。實證結果顯示，在考量風險的情況下，以全域最小變異模型所建構之投資組合風險為最低。而在績效表現的部份，則是以共整合方法所建構之投資組合最好，尤其是以 50 支股票所組成的投資組合績效表現最優，甚至超越了以台灣加權股價指數為標竿指數之績效。另外，最小追蹤誤差法在績效方面優於全域最小變異模型，而在風險部份又遠低於共整合法，因此就整體而言，以最小追蹤誤差法所建構之投資組合是優於其他兩種方法的。

關鍵詞：投資組合績效、全域最小變異模型、最小追蹤誤差方法、共整合方法

The Estimation of Covariance Matrix and the Performance of Optimal Portfolio

Student：Yi-Ru Yang　　Advisors：Dr. Chih-Hsien Lo

Institute of Department of Finance
National Kaohsiung University of Applied Sciences

ABSTRACT

The mean-variance model that Markowitz (1952) proposed has a sample error problem. This paper employs global minimum variance model、minimum tracking error method, and co-integration approach to investigate whether the performance is superior to the performance of Taiwan 50 index and further compare three methods' performance. The sample period will start in July 1998 to December 2009, and use rolling windows to replace the frequency. This research shows that the global minimum variance model has the lowest risk, and the co-integration method has the highest performance. However, the performance of minimum tracking error method is better than the global minimum variance model and lower volatility than the co-integration method. Therefore, the minimum tracking error method is the best method to construct the portfolio.

Keywords: portfolio performance, global minimum variance, minimum tracking error variance, co-integration approach

目錄

參考文獻

鄭義與張菁惠 (2004)，「投資組合追蹤誤差之探討」，*貨幣觀測與信用評等*，50 期，頁 12-18。

李建興、彭琪祿與施仁貴 (2005)，「以限制追蹤誤差方式建構增長型指數基金：以台灣五十指數為例」，*金融風險管理季刊*，第一卷第三期，頁 1-26

吳思萱 (2002)，「指數投資組合建構之實證研究」，實踐大學，碩士論文。

梁益民 (2003)，「Black-Litterman 模型在國際資產配置之應用」，國立中央大學，碩士論文。

李豐吉 (2009)，「限制追蹤誤差法股票交易策略之研究」，義守大學，碩士論文。

Alexander, C. (1999) "Optimal Hedging Using Cointegration," *Philosophical Transactions of the Royal Society London Series A*, Vol.357, 2039-2058.

Alexander, C. and Dimitriu, A. (2002) "The Cointegration Alpha: Enhanced Index Tracking and Long-Short Equity Market Neutral Strategies," *ISMA Discussion Papers in Finance, UK*.

Alexander, C. and Dimitriu, A. (2005) "Indexing and Statistical Arbitrage," *The Journal of Portfolio Management*, Vol.31, 50-63.

Ammann, M. and Zimmermann, H. (2001) "Tracking Error and Tactical Asset Allocation," *Journal of Financial Analysis*, Vol.57, 32-43.

Bertrand, P. (2008) "Another Look at Portfolio Optimization under Tracking-Error Constraints," Working paper.

Best, M. J. and Grauer, R. R. (1991) "On the Sensitivity of Mean-Variance-Efficient Portfolios to Changes in Asset Means: Some Analytical and Computational Results,"*Review of Financial Studies*, Vol.4, 315-342.

Bodnar, T. and Schmid, W. (2008) "A Test for the Weights of the Global Minimum Variance Portfolio in an Elliptical Model," *Metrika* , Vol.67,127-143.

Britten, J. M. (1999) "The Sampling Error in Estimates of Mean-Variance Efficient Portfolio Weights," *The Journal of Finance*, Vol.54, 655-671.

Chan, L. K. C., Karceski, J. and Lakonishok, J. (1999) "On Portfolio Optimization: Forecasting Covariances and Choosing the Risk Model," *Review of Financial Studies*, Vol.12, 937-974.

David, M. W., Kathleen, D. W. and John, P.E. (1998) “Assessing Estimation Error in a Tracking Error Variance Minimisation Framework,” *Pacific-Basin Finance Journal*, Vol.6, 175–192.

Dickey, D.A. and Fuller, W.A. (1979) “Distribution of Estimators for Time Series Regressions with a Unit Root,” *Journal of the American Statistical Association*, Vol.74, 427-431.

Elton, E. J. and Gruber, M. J. (1973) “Estimating the Dependence Structure of Share Prices-Implications for Portfolio Selection,” *Journal of Finance*, Vol.28, 1203-1232.

Engle, R. F. and Granger, W.J. (1987) “Co-integration and Error Correction: Representation, Estimation, and Testing,” *Econometrica*, Vol.55, 251-276.

Engle, R. F. and Yoo, B. S. (1987) “Forecasting and Testing in Cointegrated Systems,” *J. Econometrics*, Vol. 35, 143-159.

Fletcher, J. (2009) “Risk Reduction and Mean-Variance Analysis: An Empirical Investigation,” *Journal of Business Finance & Accounting*, Vol.36, 951–971.

Frahm, G. (2008) “Linear Statistical Inference for Global and Local Minimum Variance Portfolios,” Working paper.

Frahm, G. and Memmel, C. (2009) “Dominating Estimators for the Global Minimum Variance Portfolio,” Working paper.

Granger, C.W.J. (1981) “Some Properties of Time Series Data and Their Use in Econometric Model Specification,” *Journal of Econometric*, Vol.16, 121-130.

Granger, C.W.J. (1986) “Developments in the Study of Cointegrated Economic Variables,” *Oxford Bulletin of Economics and Statistics*, Vol.48, 213-228.

Grinold, R. C. and Kahn, R. N. (1995) “Active Portfolio Management,” Chicago: Probus Publishing Company.

Israelsen, L.C. (2005) “A Refinement to the Sharpe Ratio and Information Ratio,” *Journal of Asset Management*, Vol.5, 423-427.

Jagannathan, R. and Ma, T. (2003) “Risk Reduction in Large Portfolios: Why Imposing the Wrong Constraints Helps,” *Journal of Finance*, Vol. 58, 1651-1684.

Johansen, S. (1988) “Statistical Analysis of Cointegration Vectors,” *Journal of Economic Dynamics and Control*, Vol.12, 231- 254.

Johansen, S. and Juselius, K. (1990) “Maximum Likelihood Estimation and Inference

on Cointegration-with Applications to the Demand for Money," *Oxford Bulletin of Economics and Statistics*, Vol.52, 169-210.

Jorion, P. (1985) "International Portfolio Diversifaction with Estimation Risk," *Journal of Business*, Vol.58, 259-278.

Jorion, P. (1992) "Portfolio Optimization in Practice," *Financial analysis journal*, Vol.48, 68-74.

Jorion, P. (2003) "Portfolio Optimization with Tracking-Error Constraints," *Financial Analysts Journal*, Vol.59, 70-82.

Kempf, A. and Memmel, C. (2006) "Estimating the Global Minimum Variance Portfolio," *Schmalenbach Business Review*, Vol.58, 332-348.

Kwaitkowski, D., Phillips, P.C.B., Schmidt, P. and Shin, Y. (1992) "Testing the Null Hypothesis of Stationarity Against the Alternative of a Unit Root: How Sure are We that Economic Time Series Have a Unit Root?," *Journal of Econometrics*, Vol.54, 159-178.

Ledoit, O. and Wolf, M. (2003) "Improved Estimation of the Covariance Matrix of Stock Returns with an Application to Portfolio Selection," *Journal of Empirical Finance*, Vol.10, 603-621.

Markowitz, H. M. (1952) "Portfolio Selection," *Journal of Finance*, Vol.7, 77-91.

Merton, R. C. (1980) "On Estimating the Expected Return on the Market: An Exploratory Investigation," *Journal of Financial Economics*, Vol.8, 323-361.

Michaud, R. O. (1989) "The Markowitz Optimization Enigma: Is Optimized Optimal?" *Financial Analysts Journal*, Vol.45, 31-42.

Roll, R. (1992) "A Mean-Variance Analysis of Tracking Error," *The Journal of Portfolio Management*, Vol.18, 13-22.

Rudolf, M., Wolter, H. J. and Zimmermann, H. (1999) "A Linear Model for Tracking Error Minimization," *Journal of Banking and Finance*, Vol. 23, 85–103.

Sharpe, W. F. (1963) "A Simplified Model for Portfolio Analysis," *Management Science*, Vol.9, 277–93.

Sharpe, W. F. (1966) "Mutual Fund Performance," *Journal of Business*, Vol.39, 119-138.

Treynor, J. L. and Black, F. (1973) "How to Use Security Analysis to Improve Portfolio Selection," *Journal of Business*, Vol.46, 66-86.