MCFS Academic Research Grants Program

Conditional Performance Evaluation incorporating Time-Changing Alpha and Beta in Australian Managed Funds: A Kalman Filter Approach

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1. Introduction

In Grant 16/2005: "Are Actively Managed Funds Really That Bad?" we contended that performance models that assume constant portfolio risk over time cannot properly address the question of whether active funds achieve abnormal performance. We therefore investigated variation in individual fund alphas through time by using (a) rolling regressions and (b) Kalman filters and identified considerable variation in individual fund alpha.

Follow-on funding is now requested to extend these models to incorporate conditioning information, comprising January and July dummies, the dividend yield, the short-term interest rate and the slope of the term structure.

2. Background and aims of project

This project maintains the focus on measuring the performance of individual active funds, taking into account the time changing nature of the performance measures that these funds generate.

As discussed in the initial grant, the question of whether mutual funds generate abnormal returns is of considerable significance. Active management has received limited support in the finance literature yet active managers form an important part of the mutual fund industry. There is a considerable literature that criticises active managers and a similarly considerable literature that supports them (particularly Gruber, 1996 and Pastor and Stambaugh, 2002) yet much of the prior research has been based on the creation of portfolios constructed to avoid survivorship bias. We argue that it is this portfolio creation process that reduces the chance of finding superior active managers and so we focus on individual fund performance rather than portfolio performance.

Standard performance evaluation measures assume that the fund managers maintain their stated portfolio risk over the evaluation period (Carhart 1997; Grinblatt & Titman 1989; Jensen 1968; Sharpe 1966; Treynor 1965). Additional measures allow for the possibility that managers actively time the market, changing the nature of the portfolio in line with their view of future market conditions (Treynor & Mazuy 1966; Henriksson & Merton 1981). Conditional forms of these measures have also been developed by Ferson and Schadt (1996) and Ferson, Warther (1996) and Christopherson, Ferson and Turner (1999).

3. Significance and innovation

The project is innovative in that we extend on the observations of Ferson and Schadt (1996) and Ferson and Warther (1996) who argued that it is critical to adjust for time changing fund beta in any test of firm performance. In this case we are interested in the time variation in excess performance that is exhibited by active funds, as well as time variation in the other parameters.

Unlike much of the current literature we are interested in how individual fund alphas vary through time rather than focusing on the alpha calculated for a portfolio of funds.

To date, there has been little discussion concerning the possibility that the selectivity performance measure, alpha, might change over time in some predictable manner. One exception is the model developed by Christopherson, Ferson and Turner (1999). This model allows estimation of conditional alpha as well as conditional beta and we adapt this model in this project.

4. Description of Approach

In our model we allow for time varying conditional and . The model is defined in state space form and is estimated using the Kalman filter and maximum likelihood estimation[1]. The model is an expanded form of the Ferson and Schadt (1996) and Ferson and Warther (1996) models.

The signal or observation equation is given by:

$$RF_t = \alpha_t + \beta_t RM_t + e_t \tag{1}$$

and the state equations by:

$$\alpha_t = a_0 + a_1\alpha_{t-1} + a_2 JAN_t + a_3 JUL_t + a_4 {}^{D}\!/_{P_{t-1}} + a_5 STI_{t-1} + a_6 YC_{t-1} + \varepsilon_t \tag{2}$$

$$\beta_t = b_0 + b_1\beta_{t-1} + b_2 JAN_t + b_3 JUL_t + b_4 {}^{D}\!/_{P_{t-1}} + b_5 STI_{t-1} + b_6 YC_{t-1} + \upsilon_t \,. \tag{3}$$

Where:

RF is the monthly return for the fund,
RM is the monthly stock market return measured by the returns on the ASX200 index,
JAN and *JUL* are dummy variables for January and July respectively,
D/P is the dividend yield,
STI is short term interest rate and
YC is the effect of the yield curve measured by taking the short term rate away from a long term one.

The error terms in equations (1) to (3) are assumed to be independent of each other.

We are therefore using a Kalman filter to model the time series variation in the Jensen model parameters (e.g. Black, Fraser & Power 1992; Mamaysky, Speigel & Zhang 2005) augmented to allow for predictable variation in risk such as that proposed by Ferson and Schadt (1996) and Ferson and Warther (1996). This approach therefore extends the simple Kalman filter models appearing in the literature to incorporate the more complex, data intensive conditional models.

We will also examine the feasibility of conditioning a quadratic version of the signal equation where we allow to be time varying and conditional as well:

$$RF_t = \alpha_t + \beta_t RM_t + \gamma RM_t^2 + e_t \tag{4}$$

For comparative purposes we will run conditional versions of the standard rolling regressions. The proposed model is essentially an expanded form of the Ferson and Schadt (1996) and Ferson and Warther (1996) model, taking the form:

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[1] Eviews version 5 is used to estimate the models using the Marquardt algorithm.

$$RP_t = \begin{cases} a_{1p} + a_{2p}JAN_t + a_{3p}JUL_t + a_{4p}D/P_{t-1} + a_{5p}STI_{t-1} + a_{6p}YC_{t-1} + \\ b_{1p}RM_t + \gamma_p RM_t^2 + b_{2p}RM_t \times JAN_t + b_{3p}RM_t \times JUL_t + \\ b_{4p}RM_t \times D/P_{t-1} + b_{5p}RM_t \times STI_{t-1} + b_{6p}RM_t \times YC_{t-1} + \varepsilon_{pt} \end{cases} \quad (5)$$

Where, similar to the conditional beta, the conditional alpha is now defined as a function of time.

$$\alpha_t = a_{1p} + a_{2p}JAN_t + a_{3p}JUL_t + a_{4p}D/P_{t-1} + a_{5p}STI_{t-1} + a_{6p}YC_{t-1} \quad (6)$$

Under the initial grant we were unable to run rolling Christopherson, Ferson and Turner (1999) based regressions and conditional Kalman filter models because of the very large number of parameters that must be estimated for these approaches.

In the initial project Morningstar fund return data on Australian international mutual funds was examined. In addition, a further sample of funds with a return history sufficiently long to enable application of the Kalman filter approach to be employed was constructed. This data set will now be used to estimate the time-varying conditional performance models.

This analysis also identifies the volatility of the performance measures over the available data set as the Kalman filter technique provides a measure of parameter stability. Thus we will also be able to get some sense of just how aggressive active funds are and whether periods of aggressive trading are time specific, fund specific or driven by some other variables such as the level of the equity market or the level of interest rates. These additional variables, such as the equity market index and interest rates, will be obtained from Datastream.

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