Risk and return properties of fund-of-funds

Single managed investment portfolios (fund-of-funds) have increased in popularity. **SIMONE BRANDS** and **DAVID R. GALLAGHER** take a look at how these funds are structured.

Fund-of-fund (FoF) investment products are defined as a single managed investment portfolio, where fund assets are allocated across a number of individual investment vehicles. FoFs provide investors with the opportunity of accessing a suite of investment products offered by competing investment management institutions by utilising a single investment vehicle.

The alleged benefits of investing in actively managed FoFs include enhancement in the execution of an investor's investment strategy as well as improved diversification. This is achieved through the delegation of responsibility to FoF providers in the selection and monitoring of investment products, while controlling for manager-specific investment style and process risk.

Research examining FoF structures can be motivated in terms of the significant growth and proliferation in the number of fund-of-fund investment vehicles in Australia, equivalent to a 119 percent growth rate over the last five years and accounting for $16.6 billion in assets as at March 2002.[1]

While FoF products represent a distinct form of investment vehicle available to investors, conceptually, a FoF approach can also be extrapolated to include any investment arrangement or product utilising the products of a number of investment providers.

Institutional superannuation funds, through their employment of external institutional fund managers, themselves exhibit features similar to FoFs. According to APRA's Superannuation Trends for the March Quarter 2003, more than $A173 billion in assets is delegated to investment managers by institutional investors.

An additional investment approach that closely resembles a FoF structure is known as implemented consulting or a manager-of-managers arrangement. Asset consulting organisations provide specialised investment advice to large institutional superannuation clients as a means of enhancing the efficiency and selection of investment managers comprising the overall pension fund portfolio. In this case, asset consultants assume responsibility for manager selection and the execution of day-to-day decisions normally faced by the fund's trustees.

The bundling of investment products and services can also be extended to include discretionary master trusts and WRAP accounts, which are administrative platforms that enable investors to select their desired investment portfolios from a suite of products offered at a single gateway.

The most important difference between FoFs, master trusts and WRAP accounts is that in the latter two cases it is the individual investor who assumes responsibility for the selection of the underlying funds (rather than the platform provider). The discretionary master trust segment of the market also grew substantially over the last five years, equivalent to 613 per cent, and represented $155 billion as at March 2003.[2]

This study examines portfolio selection, performance and risk by examining the relationship between investment performance and diversification properties arising from the construction of actively managed equity fund-of-fund portfolios. The

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analysis considers the performance and risk trade-offs achieved by adding individual active Australian equity funds into a FoF portfolio structure, and provides evidence concerning how bundling can lead to an optimal investment approach. Essentially, our study provides a simulation analysis of the properties of FoFs.

Research to date on FoFs has focused on US mutual funds (O'Neal (1997), Potter (2001)) and hedge funds (Lhabitant and Learned (2002), Amin and Kat (2002), Park and Staum (1998)) and their reported findings are comparable to those reported in this study.

Using simulations to construct return distributions from active fund return data, this paper seeks to identify the extent to which FoFs experience traditional (mean-variance) diversification benefits from the use of multiple managers and products in their portfolios. The impact on skewness and kurtosis is also examined as these higher moments of the return distribution have additional information content with respect to performance and risk. The study also examines the sensitivity of the FoF portfolio's configuration according to the underlying investment style of a fund, and the fund's past performance.

This paper considers the diversification benefits of FoFs. However, there are a number of trade-offs in the use of FoFs that also need consideration. The number of funds utilised by investors should also be influenced by the size of assets and the additional administrative, search and review costs when engaging multiple investment managers. Furthermore, the diversification benefits may then be significantly eroded, given that the FoF portfolio charges active management fees for a product that may essentially mimic the stock holdings and index weights of the underlying benchmark.

Data and research approach

Ten years of monthly return data for a subset of active wholesale Australian general equities managers was obtained by merging information provided by three asset consultants between October 1989 and September 1999.

The final sample comprises 134 funds offered by 65 investment managers, benchmarked to the ASX All Ordinaries Accumulation Index. Reported returns are measured before taxes and before management fees.

The data set includes non-surviving funds, which enable the effects of survivorship bias to be mitigated. Each of the funds in the sample is classified on the basis of investment style. Investment managers are classified into one of four style categories based on a fund's self-stated style (i.e. 'growth', 'growth-at-a-reasonable-price' (GARP), 'value' and 'other' (includes style neutral)).

Methods of FoF portfolio construction

In order to understand the extent to which FoFs experience diversification benefits from including between one and *n* randomly selected funds in their portfolio, it is necessary to obtain the return distribution properties as a function of the number of funds in the portfolio. For each of the following investment strategies, 10,000 portfolios comprising between one through *n* funds are formed. The performance of portfolios of funds can then be simulated using the returns data over a three year holding period.

A naïve strategy for portfolio

FIG. 1 **PLOT OF THE MEAN OF MEAN OF RAW MONTHLY PORTFOLIO RETURNS AS A FUNCTION OF THE NUMBER OF FUNDS IN THE PORTFOLIO**

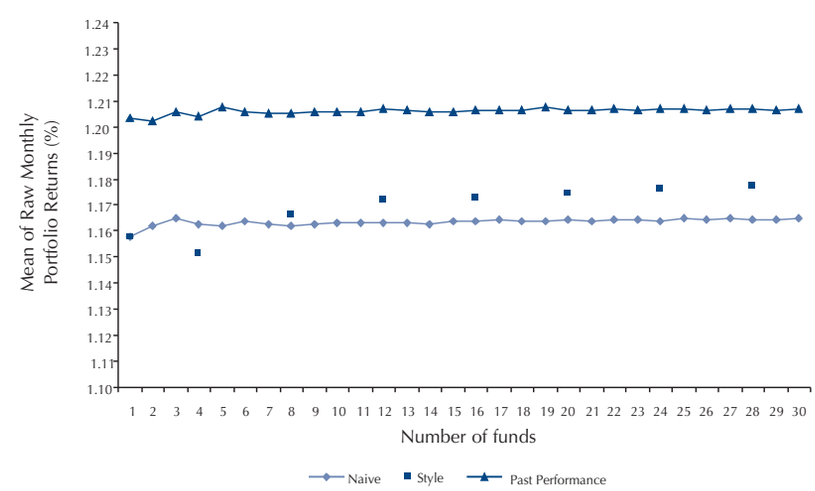


FIG. 2 **PLOT OF THE MEAN OF THE VARIANCE OF RAW MONTHLY PORTFOLIO RETURNS AS A FUNCTION OF THE NUMBER OF FUNDS IN THE PORTFOLIO**

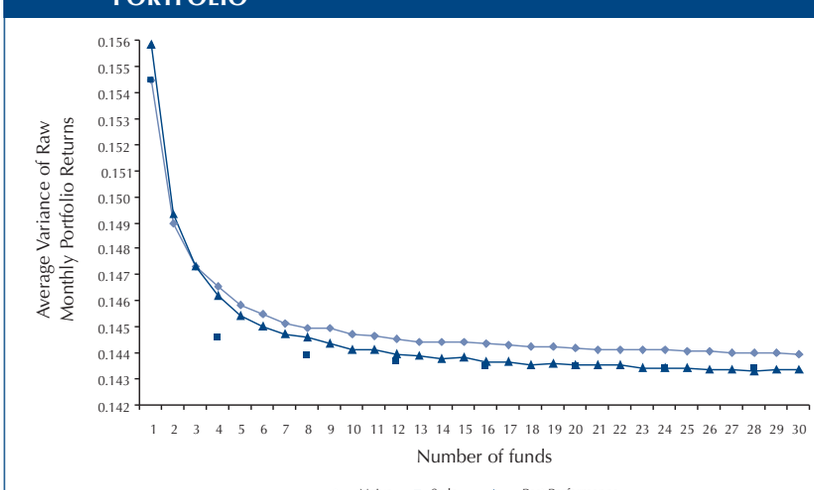


FIG. 3 TERMINAL WEALTH STANDARD DEVIATION (TWSD) AS A FUNCTION OF THE NUMBER OF FUNDS IN THE PORTFOLIO

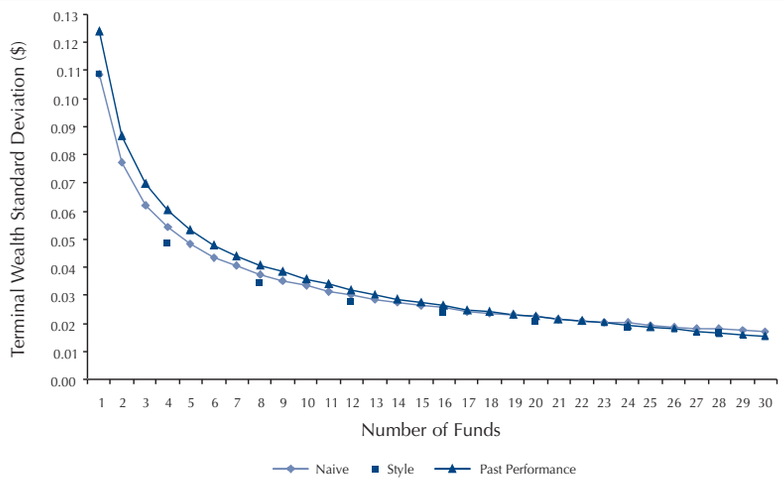


FIG. 4 PLOT OF THE MEAN OF THE SKEWNESS OF RAW MONTHLY PORTFOLIO RETURNS AS A FUNCTION OF THE NUMBER OF FUNDS IN THE PORTFOLIO

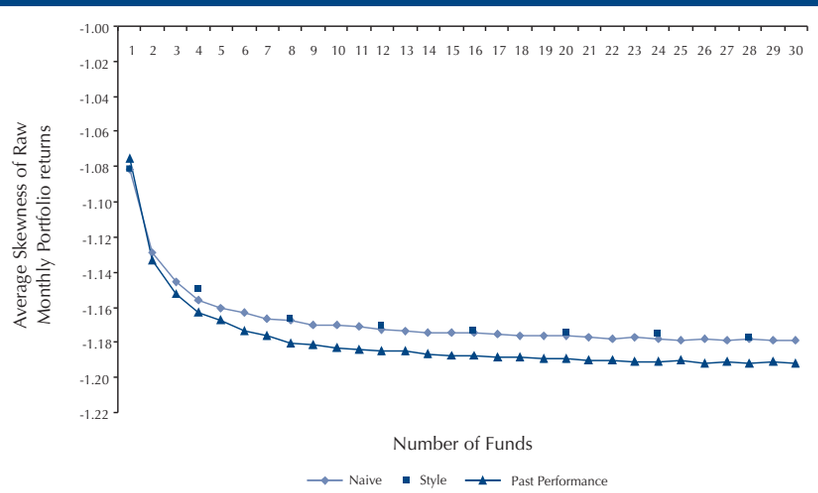
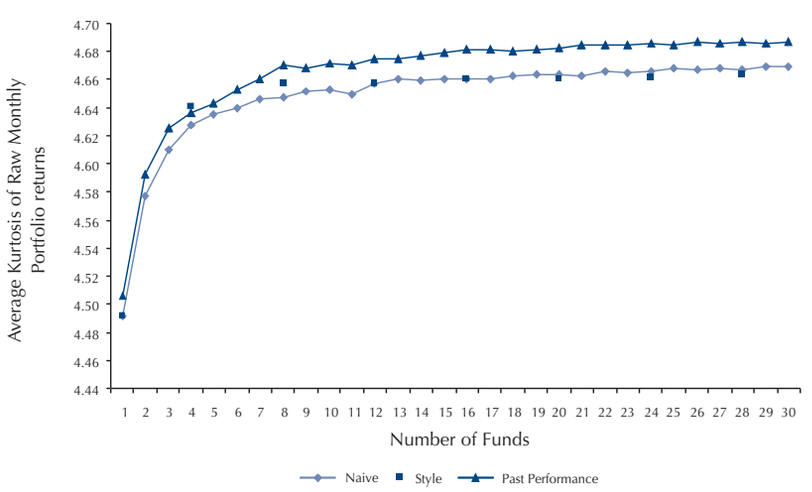


FIG. 5 PLOT OF THE MEAN OF THE KURTOSIS OF RAW MONTHLY PORTFOLIO RETURNS AS A FUNCTION OF THE NUMBER OF FUNDS IN THE PORTFOLIO



construction involves random selection without replacement from the entire sample, and equally weighting all funds. An alternate strategy involves stratifying the sample on the basis of manager investment style and forming portfolios such that there is equal representation across each of the styles.

Stratified sampling in the portfolio construction process refers to the partitioning of the sample from which portfolios are formed. It is employed to improve upon the simple naïve selection procedure (i.e. accounting for information and decision making in the investment process). The sample is stratified on the basis of past individual fund performance. Portfolios are formed from a sub-sample of funds that exhibit above-median performance, as measured by raw returns using a selection period of 12 months.

Performance attributes

For the above strategies, the following statistics are reported as a function of the number of funds in the portfolio. In a mean-variance framework, measures of time-series variance, terminal wealth standard deviation (TWSD) and mean return are appropriate. TWSD is an alternative risk measure in evaluating the performance and risk properties of FoFs. This statistic measures the standard deviation of the terminal wealth levels of a series of simulated FoFs, where wealth levels assume a fixed initial $1 investment that is valued over the duration of the holding period. The TWSD enables investors to understand the ability of their investments to meet future monetary obligations, and consequently is attractive and relevant to investors who exhibit a long-term investment horizon (e.g. superannuation funds). Performance is also measured using the four-factor alpha and Sharpe Ratio to adjust for risk.[3]

Skewness is the third moment of the return distribution, and refers to the lack of symmetry of the return distribution about the sample mean. Kurtosis is the fourth moment of the return distribution, and refers to the peakedness of the distribution. According to Bird and Gallagher (2002), risk-averse investors should prefer

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distributions that are positively skewed and have lower kurtosis (i.e. less peakedness).

Results

1. DIVERSIFICATION PROPERTIES OF FOFS (ACROSS ALL STRATEGIES)

a. Mean-Variance

Figure 1 illustrates the change in mean of mean return as a function of the number of funds in the FoF portfolio. For each of the 10,000 simulated portfolios a time-series of raw monthly returns was generated. The mean of this series was determined for each simulation, and it is the average of these means that is reported as a function of *n*. For all strategies this value is relatively constant, with a tendency to drift upward slightly. Marginal increases in the number of funds tend not to lead to significant changes in the mean of mean return.

Investors should also be concerned with the risk of FoF portfolios, defined as the time-series variance of returns. Figure 2 demonstrates that average time-series variance decreases as a function of the number of funds in the portfolio, but at a decreasing rate. Independent of the portfolio selection strategy, the majority of diversification gains are achieved with a portfolio comprising six funds. These results can be explained by a diminishing increase in the number of unique securities added to the FoF as the number of the funds in the portfolio rises, deriving from high levels of common holdings across funds.

Terminal wealth standard deviation (TWSD) exhibits similar diversification properties to time-series variance, although this measure appears to be more sensitive to increases in the number of funds in the FoF portfolio. Figure 3 illustrates that there are clear gains from diversification in terms of TWSD. Increasing a FoF portfolio from two to 30 funds reduces TWSD to less than 20 percent of the initial level; however the majority of gains are attained with 10 funds.

The risk-adjusted return measures provide a means of quantifying the joint effect of the mean-variance observations considered above. The four-factor alpha and the Sharpe ratio increase as funds are added to the FoF portfolio, although the marginal benefit is decreasing. The Sharpe Ratio and four-factor alpha are not particularly sensitive to increases in the number of funds in the FoF portfolio.

B. SKEWNESS AND KURTOSIS

FoF skewness becomes increasingly negative as a function of the number of funds, albeit at a decreasing rate. Figure 4 demonstrates that as the FoF portfolio increases beyond six funds, any marginal increases in the number of constituents do not give rise to a statistically significant change in mean skewness. The kurtosis of FoF portfolio returns is positive across all portfolios, increasing with the number of funds in the portfolio as illustrated by Figure 5.

The marginal change in kurtosis falls as a function of the total funds included in the FoF portfolio. Marginal increases in portfolio constituents beyond four funds generally do not lead to significant increases in kurtosis.

According to finance theory, investors prefer positive skewness and are averse to high kurtosis and fat tails. While FoFs achieve diversification benefits in a mean-variance framework, this research finds evidence of FoF portfolios exhibiting deterioration in the preferred moments of skewness and kurtosis as the number of fund constituents increases. However, the deterioration stabilises for FoF portfolios comprising around 10 funds (for both measures), and in an economic sense is relatively insignificant.

2. STRATIFIED SAMPLING

Employing a selection strategy which stratifies the sample on the basis of investment style leads to FoF performance which is superior to that observed for a naïve strategy. The mean of the mean raw and risk-adjusted returns are higher, and reductions in variance provide diversification benefits to investors. Furthermore, skewness becomes less negative for the investment style strategy, whereas kurtosis remains indifferent.

Selecting funds from a sample of superior past performers improves mean-variance FoF performance. Average monthly mean return is higher than for all other strategies examined. For low levels of *n*, time-series variance remains relatively high. However, for portfolios greater than four funds, this strategy provides lower variance than all strategies (with the exception of the 'style' strategy). Terminal wealth standard deviation behaves similarly. However, the initial higher levels of volatility remain until FoF portfolios are comprised of around 12 funds. Furthermore, the two measures of risk-adjusted return are highest for this strategy (for all *n*). However, employing this strategy has adverse consequences in that skewness is increasingly negative and kurtosis is also higher than all other strategies considered.

Summary

This research examines the performance and diversification properties of fund-of-fund (FoF) portfolios constructed using a sample of actively managed institutional Australian equity funds. The results show that as the number of funds in a FoF portfolio is increased:

- In a mean-variance framework, volatility (time-series return and terminal wealth) is reduced while the mean time-series return remains constant;
- Risk-adjusted performance (four-factor model and Sharpe Ratio) increases slightly;
- There are minor deteriorations in skewness and kurtosis.

Construction of FoF portfolios on the basis of investment style leads to more optimal portfolios than a simple naïve selection process across all performance measures examined. Selecting FoF portfolios on the basis of above median 12-month past performance gives rise to the best performance in a mean-variance framework. However, there are also costs related to the higher moments (albeit small).

Across each of the FoF construction strategies, the majority of diversification benefits are realised when a portfolio of approximately six active equity funds are included. However this result does not account

Continued on page 40

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In one case, an insurance policyholder was entitled to receive shares after the insurance company had demutualised and listed on the ASX. However, she had not been aware of her entitlement and a male relative impersonated her, received the shares, then sold them through a broker.

The male relative had a different surname to his female victim and it seemed extraordinary that the broker allowed him to sell the shares.

Financial institutions and brokers should always ensure that they thoroughly check the identity of a customer, especially one that is not personally known to them.

Customers who only conduct transactions on the internet should be identified correctly at the time they open the account. Institutions and brokers who are cash dealers must comply with the account-opening procedures outlined in the Financial Transaction Reports Act.

Another securities fraud that has deprived numerous Australians of their savings is 'boiler room' or 'cold-calling' fraud. This scam usually involves a call from someone you have never heard of before. The caller sounds very professional and is obviously a very experienced salesman.

The caller offers to sell international securities at a "bargain, one-off" price that is "never to be repeated". Being cautious you probably ask the caller to send details. The details are eventually sent. The caller keeps ringing and eventually you succumb to the pressure and send off a cheque for $25,000. Later you receive documents purporting to be share certificates and receipts. You continue to buy and sell shares through this caller, until you have a paper profit of say approximately $200,000. However, by this time, you have sent off cheques totalling $88,000. You then decide to cash in the portfolio and ring the salesman.

Unfortunately, the phone number had been disconnected, their website is gone—they seemed to have disappeared into thin air. This was obviously a cold-calling scam, and is based on an actual incident.

Boiler room is the name used to describe the environment in which these cold-calling salespeople work. (A racket was recently exposed in Thailand.)

Some of the salespeople involved have actually been Australian tourists. It is believed that they work in very torrid, back-breaking conditions—hence the term 'boiler room'.

To avoid becoming a victim of these types of scams, always remember the adage: if it sounds too good to be true, it probably is. J

In December 2003 the Attorney General's Department published a suite of issues papers on proposed anti-money laundering reforms. The proposals relate to how the Government intends to implement the revised Financial Action Task Force (FATF) Forty Recommendations in Australia. The Securities Institute is currently working on its response to the issues paper that relates to the financial services sector.

Continued from page 36

for differences in FoF portfolios on the basis of size of assets invested. In addition, wholesale superannuation funds were reported to average eight mandates (overall) in the Rainmaker Mandate Analysis 2001.[4]

An important caveat of this study is that the costs of increasing the number of funds in the portfolio have not been considered. Investors must acknowledge that differing economies of scale will apply to FoFs of varying asset sizes, where costs relate to the administrative, search, review and transaction elements. These issues are also being examined in future research.

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1 ASSIRT Market Share Report, March Quarter 2002

2 ASSIRT Market Share Report March 2003; ASSIRT Market Share Reports – March 1997 and March 2002

3 Four factor alpha accounts for market, size, book-to-market and momentum factors

4 For comparison purposes, Rainmaker Distribution Platforms Report 2002 indicates that FoFs employ an average of 15 fund managers. J

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