READING

10

Investment Performance Appraisal
(an excerpt)

by Stephen E. Wilcox, PhD, CFA, Edward W. Aw, CFA, Yusif Simaan, PhD, and Gregory Y. Sivin, CFA

Stephen E. Wilcox, PhD, CFA, is at Minnesota State University, Mankato (USA). Edward W. Aw, CFA, is at Bessemer Trust (USA). Yusif Simaan, PhD, is at Fordham University (USA). Gregory Y. Sivin, CFA, is at Bessemer Trust (USA).

3.10 Performance Appraisal: An Analysis of Three Funds

In this section, we examine the historical performance of three equity funds invested primarily in the United Kingdom. All three funds are authorized unit trusts and categorized as UCITS (Undertakings for Collective Investment in Transferable Securities). UCITS follow a set of European Union directives that allow collective investment schemes to operate freely throughout the EU on the basis of a single authorization from one member state. The three funds are

- **Fund 1.** The fund aims to provide long-term capital growth. It is likely to have a bias toward medium- and smaller-sized companies, and it has the freedom to invest outside the fund's principal geographies, market sectors, industries, or asset classes. It can use derivatives for risk or cost reduction or to generate additional capital or income in line with the fund's risk profile.
- **Fund 2.** The fund seeks to exploit areas with excessively negative sentiment and a catalyst for change. Stocks are selected on the basis of fundamental and technical analysis. Currency hedging may be used to protect against exchange rate risk.
- **Fund 3.** The fund invests primarily in large and mid-capitalization stocks, with smaller companies limited to a maximum 10% total weight. The fund's investment philosophy is to invest in companies that have a durable economic advantage that allows them to sustain a higher-than-average level of profitability. The fund is permitted to use derivatives for the purpose of efficient portfolio management and for investment purposes.

The market and benchmark portfolio that is used to evaluate the performance of these funds is the FTSE All-Share Index. It represents the performance of all eligible companies listed on the London Stock Exchange's (LSE) main market that pass

screening for size and liquidity. The index captures 98% of the UK's market capitalization. The FTSE All-Share is the aggregation of the FTSE 100, FTSE 250, and FTSE Small Cap Indices.

The proxy chosen for the risk-free rate is the one-month constant maturity British pound London Interbank Offered Rate (Libor) interest rate. It is the average interest rate at which a selection of banks in London are prepared to lend to one another in British pounds with a maturity of one month. The Libor interest rates are frequently used by banks as the base rate in setting the level of their savings, mortgage, and loan interest rates.

Monthly data for the five-year period of April 20X1 through March 20X6 were used in this analysis. Exhibit 21 presents summary statistics for the evaluation period and also the results of a market model regression for all three funds. Exhibit 22 presents the performance measures for all three funds. Computations are based on the data presented in Exhibit 21.

Exhibit 21 Summary Statistics and Market Model Regression Results, April 20X1–March 20X6

Summary Statistics

Variable	FTSE All-Share	BAML British Pound Libor (one month constant maturity)	Fund 1	Fund 2	Fund 3
Annualized return	12.37%	—	15.98%	18.45%	17.98%
$\text{SR} = \frac{E[r_p] - r_F}{\sigma_p}$	—	—	1.33%	1.50%	1.44%
$\bar{r}_p$	—	—	4.27%	3.93%	3.40%
$\hat{\sigma}_p$	—	—	2.23%	1.88%	1.70%
-MD	—	—	8.49%	8.11%	6.71%
$\bar{r}_F$	—	0.05%	—	—	—
$\widehat{\text{SR}} = \frac{\bar{r}_p - \bar{r}_F}{\hat{\sigma}_p}$	1.06%	—	—	—	—
$\left(\widehat{\text{SR}} = \frac{0.12 - 0.04}{0.2} = 0.4\right)$	4.04%	—	—	—	—
$\bar{r}_F$	—	—	1.28%	1.45%	1.39%
$\bar{r}_{SPY}$	1.01%	—	—	—	—
$\bar{r}_{SPY} - \bar{r}_F$	—	—	0.27%	0.44%	0.39%
$\hat{\sigma}_{SPY}$	—	—	1.30%	1.84%	1.85%

Exhibit 21 (Continued)

	Market Model Regression Results		
Variable	**Fund 1**	**Fund 2**	**Fund 3**
$\bar{r}_F$	0.27%	0.57%[a]	0.64%[b]
$\bar{r}_{SPY}$	1.01[b]	0.87[b]	0.75[b]
$\bar{r}_{SPY} - \bar{r}_F$	1.30%	1.76%	1.55%
R^2	0.9077	0.7984	0.7930

[a] Statistically significant at the 5% significance level.
[b] Statistically significant at the 1% significance level.
Note: The target semi-standard deviation and Sortino ratio are based on an assumed target return of 0%.

Exhibit 22 Performance Appraisal Measures, April 20X1–March 20X6

Performance Appraisal Measure	Formula or Variable	Fund 1	Fund 2	Fund 3
Sharpe ratio	$\hat{\sigma}_{SPY}$	0.30	0.37	0.41
M^2	$\widehat{SR}$	1.26%	1.54%	1.71%
Treynor ratio	$\widehat{SR}\sqrt{t}$	0.0127	0.0166	0.0186
Jensen's alpha	$\widehat{SR} = \frac{10\% - 3\%}{14\%} = 0.50$	0.27%	0.57%	0.64%
Active return	$\sqrt{52}$	0.27%	0.44%	0.39%
Information ratio	$\sqrt{12}$	0.21	0.24	0.21
Appraisal ratio	$\frac{E[r_p] - r_F}{\sigma_p}$	0.21	0.32	0.41
Sortino ratio	$M^2 = \left(E[r_p] - r_F\right)\frac{\sigma_B}{\sigma_p} + r_F = SR \times \sigma_B + r_F$	0.60	0.79	0.85
Calmar ratio	$\widehat{M^2} = \left(\bar{r}_p - \bar{r}_F\right)\frac{\hat{\sigma}_B}{\hat{\sigma}_p} + r_F = \widehat{SR} \times \hat{\sigma}_B + r_F$	1.88	2.28	2.68

A review of Exhibit 21 shows that all three funds earned higher returns than the FTSE All-Share during the evaluation period. The highest return was earned by Fund 2, with an annualized return of 18.45% compared with 12.37% for the FTSE All-Share. The annualized returns for Fund 3 and Fund 1 were 17.98% and 15.98%, respectively. All but Fund 1 earned those return with lower return volatility than the FTSE All-Share Index.

If investors could foresee the future—knew what returns were going to be—everyone would have selected Fund 2. However, because returns are risky it is appropriate to consider not only the magnitude of gains, but also the risks taken.

Investment performance appraisal measures matter most when analysts are trying to assess what might happen to fund returns in the future. Essentially, interpreting these performance appraisal measures reduces to whether the risk assumed from investing in a fund is "worth it" given the potential for returns to exceed those of the benchmark portfolio. Thus, they are best viewed as *ex ante* selection tools that allow investors to make informed decisions.

Exhibit 21 shows that the volatility measures for Fund 3 are the lowest of the three funds. The standard deviation of monthly returns $\overline{r}_F$, the target semi-standard deviation $\overline{r}_p$, and the maximum drawdown (–MD) are all significantly lower for Fund 3. Thus, it was the least risky of the three funds during the evaluation period.

The performance of Fund 1 most closely tracked that of the FTSE All-Share benchmark. As Exhibit 21 shows, the tracking risk $\widehat{SR} = \frac{0.14 - 0.04}{0.25} = 0.4$ and the standard deviation of the residual error terms from the market model regression $\widehat{\mathrm{M}^2}$ are the lowest for Fund 1. The market model R^2 of 0.9077 indicates that more than 90% of the changes in Fund 1's excess returns are explained by changes in the excess returns for the FTSE All-Share. This result compares with an R^2 of less than 80% for the other two funds.

Exhibit 22 shows that most of the risk-adjusted performance measures favor Fund 3. Of the three funds, it has the highest Sharpe ratio and the highest M^2. Both of these measures use standard deviation to adjust for risk and thus control for the total risk of the portfolio. Using the Sharpe ratio and M^2 to appraise performance is most appropriate if they are applied to an investor's entire portfolio.

Adjusting fund performance for market risk is considered a preferred approach to performance appraisal if the funds under consideration are a small part of the investor's total portfolio. As Exhibit 22 shows, Fund 3 also had the highest Treynor ratio, Jensen's alpha, and appraisal ratio. Note from Exhibit 21 that the Jensen alpha coefficient estimate is statistically significant at the 1% significance level. All of these performance measures assume the CAPM is the theoretically correct pricing model and that a fund's market risk is correctly reflected by its beta.

Exhibit 22 also shows that Fund 3 had the highest Sortino ratio and Calmar ratio. Both of these performance measures adjust for downside risk. Their use is considered to be most appropriate when returns are believed to be asymmetrical or if a primary concern of the investor is capital preservation.

There are two performance measures that favor Fund 2 in Exhibit 22. The first, active return, is not a risk-adjusted measure and simply reiterates that Fund 2 outperformed the FTSE All-Share by more than the other two funds. The information ratio, which is a risk-adjusted measure, favors Fund 2 because it has the highest active return and a tracking risk that is approximately equivalent to that of Fund 3.

In summary, the majority of the risk-adjusted performance measures presented in Exhibit 22 favor Fund 3 as the top performer. These results support the hypothesis that Fund 3's management demonstrated superior investment skill during this evaluation period. "Skill," in this sense, means investors were compensated well for the risks taken.[1] These measures were first developed to study public investment funds, in particular US mutual funds.