

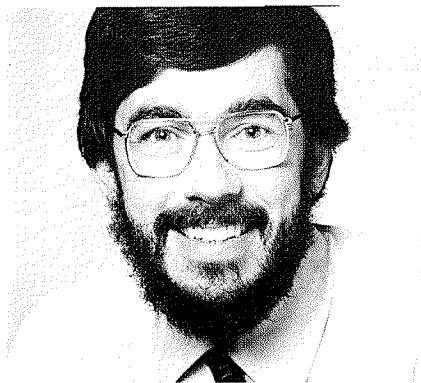
# SHARPE INDEX: IS IT OUT OF PLACE?

## NEW MEASURE NEEDED FOR SUPER FUNDS

by ROHAN PROWSE and DAVID KNOX



Rohan Prowse



David Knox

**Although it is in common use as a guide to funds performance, the Sharpe Index itself might be a poor performer in providing measurements for a \$100 billion industry.**

With the level of superannuation assets now around \$100 billion, it is of utmost importance that the investment performance of pooled fund managers be accurately measured. In Australia, the most commonly used risk-adjusted measure of the investment performance of superannuation is the Sharpe Index. This is now published monthly by both Tower Perrin Forster and Crosby (TPF&C) and Mercer Campbell Cook and Knight (MCC&K).

While Sharpe<sup>1</sup> initially derived his index to measure the investment performance of mutual funds, which invest only in equities, the use of the index has extended to many other areas, including measuring the investment performance of superannuation funds.

But **should** the Sharpe Index be used to measure superannuation investment performance?

The three fundamental components required in a measure of performance are measures of return and risk, and comparison with a benchmark. The simplest, most concise way to summarise and compare the past performance of alternative investment managers is to calculate a single statistic possessing each of the following characteristics:<sup>2</sup>

- Calculation of a time-weighted rate of return which:
  - applies an appropriate method to value each asset
  - adjusts for the expenses of investing and
  - incorporates the new investment tax;

- Measurement of investment risk as the probability of receiving an unacceptably low performance return;
- Comparison of performance to a benchmark representing a realisable superannuation portfolio;
- An absolute level of performance, thereby giving the measure meaning in itself;
- A result which is independent of the performance of the market;
- The use of appropriate assumptions.

Following a brief discussion of the Sharpe Index, this paper will examine whether it does in fact possess the above-mentioned characteristics; and hence, whether the Sharpe Index is suitable as a measure of superannuation investment performance.

### What is the Sharpe Index?

The Sharpe Index aims to show which among a number of funds offers the best risk-return trade-off, where risk is taken as the variability in the return, and is measured by the standard deviation of return.

The main idea is that if an investor can borrow and lend money at some risk-free rate of return, say  $R_f$ , then the possible portfolios,  $P$ , available to the investor are all those lying on the

*Rohan Prowse is an actuarial graduate with Capita Benefits Planning, Sydney. Dr David Knox is a senior lecturer in Actuarial Studies at Macquarie University, Sydney. This article is adapted from an honours thesis written by Rohan Prowse, guided by David Knox, titled "An Evaluation of Investment Performance Measurement Methods for Australian Superannuation Funds".*

straight line connecting  $R_F$  and the risky fund, A, as shown in Figure 1.

The equation of this line is:  

$$R_P = R_F + \frac{(R_A - R_F)}{s.d.A} \cdot s.d.P$$

where  $R_A$  and  $R_P$  are the rates of return on Fund A and Portfolio P;  $s.d.A$  and  $s.d.P$  are the corresponding standard deviations; and  $R_F$  is the risk-free rate of interest.

The slope of this line,  

$$\frac{(R_A - R_F)}{s.d.A}$$

can be used as a measure of relative investment performance, since any fund having a certain slope will always offer a higher return for each given level of risk, than funds with lesser slopes. From Figure 1, all combinations of Fund A and  $R_F$  outperform the corresponding combinations involving Fund B and  $R_F$ , because:

$$S_{At} = \frac{(R_A - R_F)}{s.d.A} > S_{Bt} = \frac{(R_B - R_F)}{s.d.B}$$

where  $S_{At}$  and  $S_{Bt}$  are the Sharpe (Reward to Variability) Indices for Funds A and B respectively, at time t.

The implication is that on the basis of past performance, the best fund is that which has the highest value of the Sharpe Index.

The question then is: "Should this index be used to measure the investment performance of a superannuation fund?"

### Shortcomings

This question is answered by considering the Sharpe Index in the light of the characteristics stated earlier.

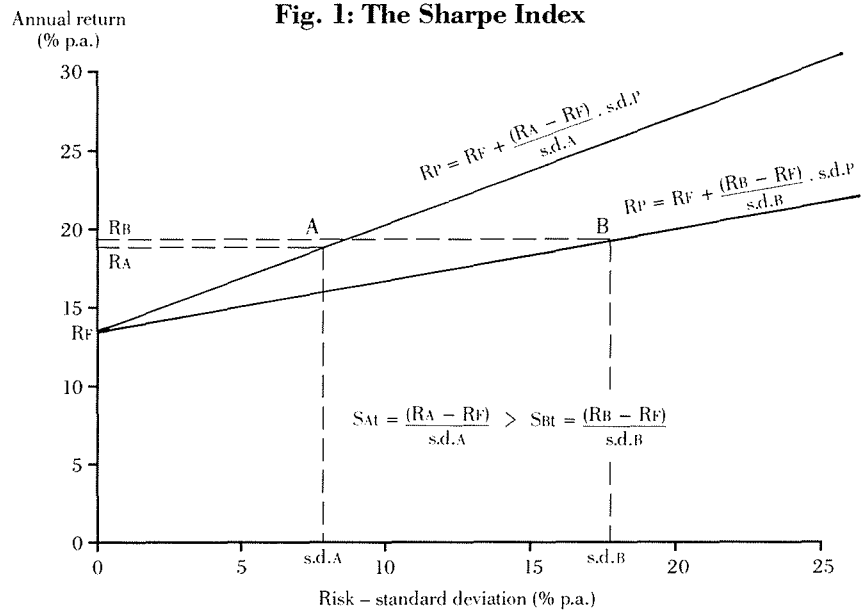
*The measure of risk used:* Fundamentally, investment risk is related to uncertainty in the future value of assets. An investment is risky if there is a chance that it will produce a return lower than that which is acceptable to the investor.

In the case of a superannuation fund, the investor is the fund trustees. Now, a superannuation fund's assets exist solely for the purpose of paying benefits to members when they leave the employer. Often, particularly with respect to defined benefit schemes, these liabilities are related to salary. It follows that a minimum acceptable return should be linked in some way to the rate of salary growth.

Combining these facts, an appropriate definition for the investment risk of a superannuation fund<sup>3</sup> is:

*Risk is the probability of an unacceptably low investment return which jeopardises the payment of benefits as and when they fall due.*

Fig. 1: The Sharpe Index



The Sharpe Index measures risk as the standard deviation of return. Given the above definition, this is not a good measure of risk, since it only measures the variability in the monthly or quarterly returns, without considering the likelihood of earning an *unacceptably low* return.

A more appropriate measure of the investment risk of a superannuation fund is the semi-standard deviation of return, which only considers a fund to be risky when it is earning returns which are less than some agreed minimum rate.

Empirical studies<sup>4</sup> done by this author suggest that the relative risk differences between funds are altered when the semi-standard deviation of return is used, instead of the standard deviation, as a measure of investment risk. The implication of using this measure in conjunction with the Sharpe Index will, however, not be examined in this article, since the Sharpe Index also fails to meet some of the other criteria desired in a performance measure. These shortcomings will now be examined.

*Comparison to an appropriate*

*benchmark:* It is important that performance comparisons are not simply made between similar funds, but also with an external indicator within the economy, so as to show whether:

- individual funds have invested in the best available alternatives;
- fund managers are adding value to the funds in their care; and
- superannuation as a whole is a viable product in the community.

The Sharpe Index, however, does not measure investment performance relative to a benchmark. The major shortcoming indicates that comparison to benchmarks is an area of investment performance measurement requiring considerably more work.

One way that this could be corrected would be to calculate a modified index of the form: Absolute index =

$$\frac{\text{Sharpe Index for Fund}}{\text{Sharpe Index for Market}}$$

The Sharpe Index for the market would be calculated from what is known as the Capital Market Line. If an efficient frontier quantifies the efficient combinations of assets yielding the

***Fundamentally, investment risk is related to uncertainty in the future value of assets.***

highest return for each given level of risk, as shown in Figure 2, then the Capital Market Line is the line extending from the risk-free rate of return,  $R_f$ , tangential to the efficient frontier. The market portfolio,  $M$ , is then the optimal combination of risky securities.<sup>5</sup>

Modern Portfolio Theory, upon which the Sharpe Index is based, claims that if the market is operating efficiently, then all funds should hold this market portfolio,  $M$ , and lie somewhere on the Capital Market Line. The exact position on the line would depend on the actual level of investing or borrowing at the risk-free rate of return.

The Capital Market Line assumes that investors can borrow money. However, superannuation funds are forbidden by the Occupational Superannuation Standards Act to borrow money.<sup>6</sup> Hence, the use of the Capital Market Line when assessing the investment performance of superannuation funds is both inappropriate and unrealistic.

Rather than trying to compare performance to such an unrealistic point benchmark, performance should be compared against a benchmark which varies for each level of risk, such as the efficient frontier.

Figure 2 is actually based on real data for the three-year period ending 30 June 1988. Comparing the slopes of the lines shows that Fund A has definitely underperformed the market as measured by the line  $R_fM$ . However, Fund A is clearly lying on the efficient frontier! That is, Fund A has achieved the same level of return as the best combination of assets, passively invested in market indices so as to have the same level of investment risk as does Fund A.

This highlights a major shortcoming of the Sharpe Index. Not to compare performance to a benchmark, as is the case with the Sharpe Index, leads to an incomplete picture of a fund's investment performance. To use an inappropriate benchmark, such as the Capital Market Line, is downright dangerous, as incorrect conclusions will be reached.

*The absolute meaning of the index:* A further problem with the Sharpe Index is that it has no absolute level of performance.<sup>7</sup> The Sharpe Index allows performance to be interpreted relative only to the performance of other funds, measured in precisely the same way.

For example, MCC&K calculate their Sharpe Index using quarterly data, whereas TPF&C's uses monthly data.

**To use an  
inappropriate  
benchmark . . . is  
downright dangerous,  
as incorrect  
conclusions will be  
reached.**

The different frequency of data affects the values calculated. For the three years to 30 June 1988, the MCC&K value for BTA was 1.81, whereas the TPF&C value was 0.86.

Thus, an index value on its own has no meaning. To assess a particular value, calculated in a certain way, it is necessary to calculate the indices for all other similar funds. Only then can any comment concerning performance be made. This makes the Sharpe Index a very cumbersome measure of investment performance.

*The stability of the index across time:* Not only does the Sharpe Index not have an absolute level of performance, but values also fluctuate across time, making inter-period comparisons almost impossible.

For example, considering BTA

again, and using monthly data over the three years to 30 June 1987, its value was 2.32. For the three-year period to 30 June 1988, the index was 0.86. So, even with two overlapping years, a major market movement, such as the stock market crash of 1987, has led to dramatic changes in the actual values of the Sharpe Index.

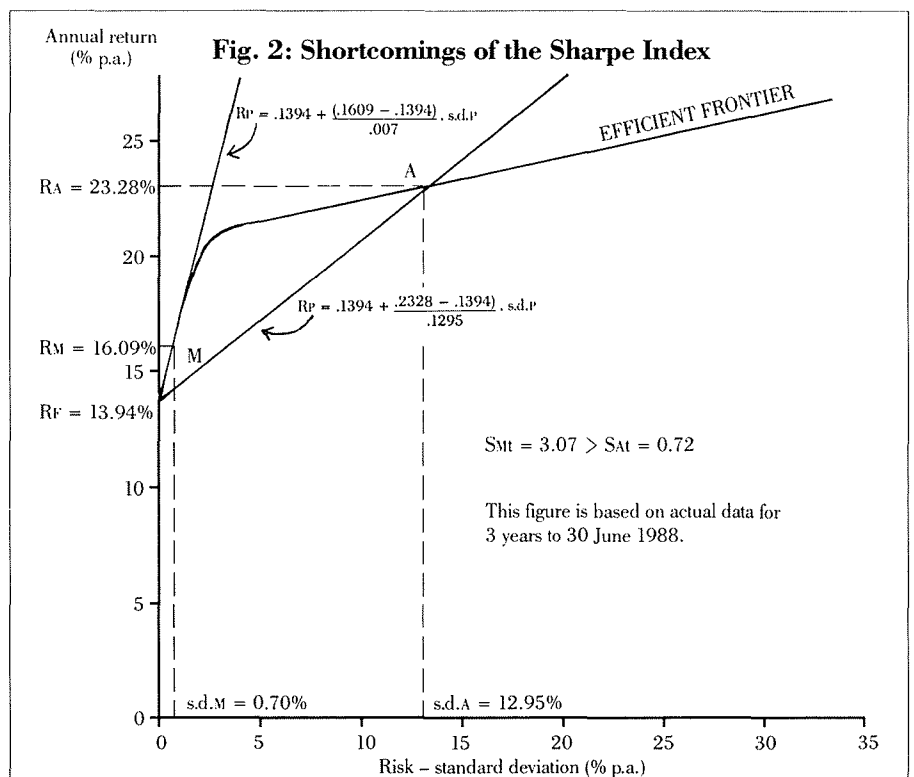
Thus, the relative magnitude of the index values depends upon the time period considered. Hence, a single calculated value of the Sharpe Index is next to useless, providing very little beneficial information concerning the investment performance of a fund.

*The assumptions on which the index is based:* As if it is not enough that the Sharpe Index does not use an appropriate risk measure, does not compare performance to a benchmark, and produces a number which lacks any real meaning, it is also based on some inappropriate assumptions so far as superannuation funds are concerned. Chief among these is the faulty assumption that funds can borrow money at a risk-free rate of interest.

**Conclusion**

It is fair to conclude, on the basis of the evidence presented here, that the Sharpe Index should not be used for measuring the investment performance of superannuation funds, because:

- the standard deviation is not a good measure of the investment risk of a superannuation fund;



- there is no comparison of performance to a representative benchmark;
- there exists no absolute level of performance;
- it is unstable across time; and
- it is based on inappropriate assumptions.

If the Sharpe Index is unsuitable, then what other options are there? Rather than try to modify an inappropriate measure, a new measure is required which satisfies the criteria outlined at the beginning of this paper.

One such possibility is a statistic which calculates the difference between each fund's return and the return on an appropriate efficient frontier for the fund's level of risk, where risk is measured by the semi-standard deviation of return. Such a model would not be too far removed from the Sharpe Index, since the efficient frontier can in many respects be viewed as an extension of the Capital Market Line, where there is no longer one optimal, efficient market portfolio, but an optimal combination of the various assets at each level of risk.

However, unlike the Sharp Index, such a measure would:

- measure risk using the semi-standard

***Rather than  
try to modify an  
inappropriate measure,  
a new measure is  
required which satisfies  
the criteria.***

deviation of return;

- compare performance to a representative benchmark;

- possess an absolute value of 0, which corresponds to market performance, and is unaffected by both the frequency of calculation (i.e. monthly or quarterly data) and the time period which is being considered.

If the performance measurement industry in Australia is to maintain credibility at this critical point, when the demand for accurate assessment of investment performance is greater than ever before, then such options must be given serious consideration. □

1. Sharpe W.F., 1966. *Mutual Fund Performance*. Journal of Business, XXXIX(1), January, pp119-138.
2. A fuller treatment of these qualities can be found in Prowse, R., 1989. *Measuring Investment Performance: Essential Qualities of a Performance Measure*. Quarterly Journal of the Institute of Actuaries of Australia, forthcoming.
3. This definition could quite easily be adapted to other investment situations, particularly where there is a particular objective to be met.
4. These studies form part of the unpublished honours thesis of Prowse, R., 1988. *An Evaluation of Investment Performance Measurement Methods for Australian Superannuation Funds*.
5. The Efficient Frontier and Capital Market Line shown in this diagram are not quite as some textbooks might suggest, because this figure is based on actual data.
6. Occupational Superannuation Standards Act 1987, Regulation 16(1)(b).
7. There is an absolute level in that value above zero represents a return above the risk-free rate; this is not really an appropriate benchmark. All funds would be expected to have a Sharpe Index exceeding 0, and an index value below this, for a reasonable period of time, should make the trustees do some serious questioning.

## SETTING THE INSIDER PENALTIES

### From Page 22

to supervise their employees vigorously.

According to Professor Cox, the Australian Securities Industry Code contains some important deficiencies which erode the deterrent value of its proscription of insider trading. For instance, it depends too heavily on private actions to recover losses caused by insider trading.

"Because this civil remedy will never exceed more than the profits the insider wrongfully obtained, or the loss he has illegally avoided, the contemporaneous trader's remedy cannot be expected to be a sufficient disincentive for insider trading. The insider is hardly worse off by failing to trade on his confidential information than if he trades, and is reprimanded by a mere disgorgement of what he would have lost he had not traded."

The real deterrent to an insider must be the prospect of losing significantly more than his potential illicit gains, in addition to the stigma of jail and loss of professional status, Professor Cox says.

"Secondly, Australia's enforcement mechanism does not include the

efficiencies concomitant with the ancillary remedy available to American government prosecutions. The NCSC does not enjoy authority to undertake the type of ancillary remedy on behalf of investors as the SEC enjoys in its civil prosecutions. This obviates the need for a wasteful secondary action and further recognises the primacy of the issuer's action against insiders."

Australia's remedies against insider trading, together with the absence of class actions and contingency fee arrangements, act as a disincentive to civil actions for several reasons, the professor says:

- the amount of recoveries cannot exceed the insider's illicit trading profits, so the legal costs of the proceeding may overwhelm the plaintiff's expected recovery;

- no single investor may have lost a sufficient amount to make individual litigation worthwhile, a problem exacerbated by the absence of class suit actions in Australia;

- investors faced with an uncertain or small recovery will be most reluctant to incur substantial lawyers' fees. This

problem is overcome in America by the contingency fee device.

"Finally, America has enacted strong measures to stimulate various market professional organisations to undertake significant efforts to deter and detect insider trading. The benefits of this process can be seen as recognising that such employers may incur lower marginal costs either to deter or to detect insider trading than an additional enforcement effort from a centralised body. The legislation recognises that employing organisations have an important role to play in the regulation of insider trading."

In contrast, Professor Cox notes, Australia merely relies on "Chinese walls" to protect the trading activity of the business organisation. "Chinese walls" are designed to isolate trading departments from corporate advisory departments whose employees may have access to confidential information. "This response," he says, "provides no incentive for employer organisations to join the cause of reducing the incidence of insider trading with proactive surveillance and safety mechanisms." □