



INSTITUTE OF ACTUARIAL
& QUANTITATIVE STUDIES

Subject: Risk Management
and Investment
Management II

Chapter: Unit 1,2,3 & 4

Category: Assignment
Solutions

1. :

(i) **Grouping by industry**

To reduce the number of factors that have to be taken into account when analysing the share.

Quite a lot of industry statistics are available and are usually grouped by industry.

Methods of raising finance are often similar within a group.

Experience similar labour problems, costs of raw materials, consumer demand, economy will affect them similarly.

Financial statements are prepared in a similar fashion and will use similar jargon.

No other factor has proven to correlate to shares as closely as industry statistics.

(ii) **Disadvantages**

Tend not to look at companies between sectors, only companies within sectors.

Some shares don't move with their industry.

Advantages

Can become expert in one sector and understand it very well.

We can decide which factors affect a share price within an industry, then analyse companies with this in mind.

Could group by:

Large cap/small cap — valuations tend to reflect growth/maturity/financial strengths differently for large and small cap stocks.

Growth/Value — reflects the different universes and economic/market drivers operating on these companies.

Exporters/Importers — reflects earnings from domestic or overseas influences and impact of different regions' economic growths and currencies.

Any two sensible suggestions should earn marks.

2.

There are many factors that will need to be addressed. The following is an illustrative list;

- purpose of index (this will help define answers to issues below)
- constituents and basis for inclusion/exclusion
- type of index (*eg* weighted arithmetic)
- frequency of calculation
- price data to use (*eg* mid-market prices)
- how to deal with capital changes (*eg* chain-linking)
- what to do about income (*eg* XD adjustments, total returns indices).

Some issues (*eg* the final issue relating to income) will need much detail in practice. For example, how to deal with tax, when to credit income, when to reinvest *etc.*

3. :

MWRR gives the rate of return actually achieved by an investment or portfolio. It is not good as a basis for comparing portfolios because the rate can be distorted by the size and timing of cashflows.

TWRR is unaffected by cashflows, so it is good as the basis for comparisons between funds and over time. It does not give the rate actually achieved, and it is potentially impractical if cashflows are frequent or if valuation is difficult.

LIRR is a practical approximation for the TWRR. The main downside is that it does not give the rate of return actually earned on the assets over the period.

4. :

Suppose that portfolio investment returns are assumed to be normally distributed and that it has been estimated that the 5% lower tail Value at Risk corresponds to a loss of 10% of the portfolio's value over the next year. Dividing this 10% Value at Risk by the 5% lower tail value of 1.645 from the Normal tables gives a maximum permitted tracking error of approximately 6% *pa*.

5. :

The *shortfall probability* is the estimated probability that the fund value or surplus falls below a pre-specified benchmark level, eg \$100m or 10%.

The *expected shortfall* is the expected amount of the shortfall below the pre-specified benchmark level given that the fund value or surplus has fallen below the benchmark level.

6. :

Use in active management:

- Multifactor models can be used to estimate the appropriate expected return on a share given a set of risk factors and its estimated factor returns (the coefficients of the risk factors used in the model). If the risk factors can be predicted with greater accuracy than the market, then the outperforming shares or sectors can be identified. When the model is used to calculate expected return, this can then be compared with the expected return based on a discounted dividend or PE ratio model. If the expected return indicated by the multifactor model is lower than that indicated by the current share price the share appears cheap.

Use in passive management:

- Multifactor models can also be used to identify and control the exposure of a portfolio to the different risk factors and to change the risk profile of the portfolio to better match the exposure of the liabilities.

7. :

The risks that are incurred by extreme market events can be identified and investigated by the process of financial stress testing. This involves subjecting a portfolio to extreme market moves by radically changing the underlying portfolio assumptions and characteristics, in order to gain insight into portfolio sensitivities to predefined risk factors. This pertains in particular to asset correlations and volatilities.

There are two types of stress test:

- i. to identify “weak areas” in the portfolio and investigate the effects of localised stress situations by looking at the effect of different combinations of correlations and volatilities.
- ii. to gauge the impact of major market turmoil affecting all model parameters, while ensuring consistency between correlations while they are “stressed”.

A major part of establishing a comprehensive stress testing framework should therefore focus on constructing stress test scenarios that apply to the specific portfolio.

8. :

i.

The fund manager only has to track the performance of the index.

So replicating the index is not essential.

Investing in many stocks and so having relatively small individual holdings in each stock will result in high dealing costs (necessary each time the relative sector weightings change).

This would reduce the performance of the fund and so cause underperformance relative to the index.

Research has shown that, after overall market movements have been taken into consideration, the share price movements of companies within industrial groupings tends to correlate more closely with each other than with companies in other industries, so holding a subset may well replicate the performance of the sector.

The share price movements reflect the changes that have occurred in the operating environment, and such changes affect companies in the same industries in similar ways.

A specific sector may only represent a small percentage of the index and within that sector the small number of stocks the manager proposes to use may represent a substantial proportion of the total market capitalisation of the sector.

Stratified sampling of the performance of each sector may have shown that the performance of the chosen stocks is a very accurate measure of the performance of the sector as a whole.

Sampling may enable the fund to choose its timing in addressing whether or when to replicate changes to the underlying index.

ii. Compare dividend yields, earnings growth and price earning ratios with the Index.

For example, within each sector for the fund and the index:

- Rank the holdings by increasing yield
- Split each sector into an equal number of holdings (e.g. quintiles)
- Calculate the weighted average yield of each quintile allowing for the value of shareholdings as weights

This will help to determine:

- Consistency with the portfolio
- Identify any style biases (e.g. growth or value)
- How risky the portfolios are relative to the index

Historic comparison of the fund performance with the index quarterly over a period of around three years to determine how well the fund has tracked the index.

Comparison of risk adjusted performance measures e.g. Sharp or pre-specified standard deviation.

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9. :

- (i)
 - (a) Global Funds
Event-driven Funds
Market Neutral Funds
 - (b) Describe the main investment characteristics of a Hedge Fund
Placing large bets on different asset classes
High level of borrowing
Mix of investments
Willingness to trade in derivatives
Illiquid
High Fees
High risk
- (ii) Partial market coverage
Survivorship bias
Selection bias
Marking to market bias

(iii) Issues for scheme, trustees and sponsors

Capital management or financing

Pension management

- Liability cash flow management
 - Compensation for inadequacies of bond markets
- Deficit reduction
 - Regulatory, financial and peer group pressures
 - “Finite” repair term imposed by regulators – scope for absolute return structures
- Surplus control
 - Short term “fix” may prove over cautious

Sponsor may be more concerned with volatility of deficit and earnings/corporate activity impacts rather than size of deficit itself

- Cash flow hedging coupled with Regulator proposals for Deficit Repair terms change pension funds from Relative (to yields, inflation) to Absolute/Targeted Return investors
- Alternative assets, including hedge funds, have obvious role in Deficit Repair

- Market neutral hedge funds plus swaps/bonds equal “Liabilities Plus” fund
- Bulk of exposure is through Fund of Funds

Hedge funds have a role as the alpha generator in new products, but could lose their separate identity

- Not all managers, perhaps even the majority, are skilful
- Need a rigorous and different process to identify and invest in persistent skill

10. :

- (i) There are various reasons why the performance of an investment portfolio will be measured:
1. *To improve future performance.* First, data collected during performance monitoring can form the inputs for planning future strategy. Secondly, if fund managers know that their performance is being measured, it might give them an extra incentive to maximise the returns of the funds they manage.
 2. *Comparison of the rate achieved against a target rate.* Many funds will have one or more “target” rates of return. For example, the trustees of a pension fund will want to know the rate of return achieved on the investments compared with the rate of return assumed in the actuarial valuation.
 3. *Comparison against the performance of other portfolios, an index and/or a benchmark portfolio.* Those responsible for the funds will want to know how the performance of the portfolio compares with other portfolios. On the basis of this information, they are able to make decisions regarding the future investment of the assets, e.g. should a new fund manager be hired?

Also, by analysing the performance against a notional portfolio, it may be possible to identify some relative strengths and/or weaknesses of individual fund managers (e.g. in sector or stock selection).

Other reasons could include the assessment of performance related fees or more generic assessments of success/failure of the portfolio.

- (ii) There are several limitations and disadvantages of portfolio performance measurement.

Projection of past results: the fact that a particular result was attained in the past does not mean that it will occur in the future. There is a random element in investment returns and it may be difficult to determine how much a fund manager's results are due to method and how much to luck. Furthermore a technique that proved successful in a particular set of circumstances may not work so well in changed circumstances in the future.

Risk: in the long term we would expect a riskier strategy to produce higher average returns. The measurement of relative performance should therefore take account of the degree of risk taken on by a fund manager.

Timescale: determining the frequency of performance measurement calculations requires a delicate balance between assessing performance frequently enough so that problems can be spotted and corrected and avoiding spurious conclusions based on too short a measurement period.

Differing fund objectives: different funds may have different objectives and constraints. Comparisons between such funds may not be valid.

Impact on fund manager behaviour: knowledge of how, and how often he will be assessed is likely to influence the investment strategy of a manager. This may not be in the fund's best interests. For example, frequent monitoring can encourage a short term approach to investment.

Cost: users of performance measurement services must balance the value of the service against the cost. Also, for a number of assets (e.g. property), valuation is difficult, time-consuming and very subjective. Detailed, frequent calculations based on subjective valuations are inappropriate.

- (iii) Index statistics will be influenced by:

- *Survivorship bias* — unlike in other asset classes, it is difficult to obtain data on hedge fund failures when “backfilling” a history at the time an index is launched by an index provider. This will create an upward bias.
- *Selection bias* — funds with a good history are more likely to apply for inclusion at the time of reviewing index constituents. Similarly, it is not always possible to obtain accurate performance information from a failing hedge fund so the provider may only be able to exclude the fund rather than report its full losses. Both of these factors will create an upward bias.
- *Marking to market bias* — where underlying securities are illiquid, funds may use “stale” prices or mark asset values to a valuation model. Whilst this does not necessarily result in a bias to the return data, it is likely to result in lower volatility figures than would be the case otherwise.

$$(iv) \quad S = \frac{R_p - r}{\sigma_p}$$

where R_p is the return on the portfolio

r is the risk-free rate of return (usually taken to be 3 month LIBOR)

σ_p is the standard deviation of portfolio returns

- (v) The Sharpe ratio is widely understood by investors.
 The Sharpe ratio can be calculated without reference to the beta of a portfolio...
 ...making it more practical to compare strategies across different asset classes...
 ...including asset classes where there may not be an obvious market portfolio that can be used as a reference point.
 Both the Jensen and the Treynor ratios rely on beta being a proxy for the level of active risk taken by the asset manager.
 [Credit was awarded for any other reasonable points made]

- (vi) The key limitations of the Sharpe ratio with regard to hedge fund returns are as follows:

- **Mismatch with utility function** – the Sharpe ratio falls as downside or upside volatility increase. In practice, investors will specifically be concerned to avoid downside risks within their utility function.
- **Sampling issues** – historic calculations will be limited by the length of available history. With hedge fund strategies, it is possible to employ a strategy that appears low risk for an extended period but has a large tail risk (e.g. selling volatility by writing out-of-the-money put options), and the Sharpe ratio will not capture information about low frequency high severity events.
- **Non-normal return distributions** – the Sharpe ratio will give a consistent measure of excess return to risk for normal distributions, however standard deviation is not a useful proxy for risk for all return distributions. This is particularly the case for many hedge fund strategies.

All of these sources of distortion can result in sub-optimal investment decisions.