WHY PORTFOLIO MANAGERS SHOULD BE USING BETA FACTORS

by

Peter John C. Burke†

Although Beta factors have been around for at least a decade they have not been extensively used by Portfolio Managers. Recent innovations in the techniques of Modern Portfolio Theory have demonstrated how Beta factors should be used to increase portfolio management performance.

After the development of the concept of a "Beta factor" by Sharpe and others in the late 1960s, Beta factors became available for use by Portfolio Managers. It has only been in the last few years, however, that a theory has evolved which demonstrates how Beta factors should be used to increase portfolio management performance.

The aim of this article is to introduce the reader to these new techniques, to outline arguments for and against their introduction and then to review efforts being made to produce a Beta factor service more capable of providing the measures required by these techniques.

WHAT IS A BETA FACTOR?

A Beta factor gives an expected coupling between security price movements of one company and the price movements of the market as a whole. It is a statistical concept which resulted from the observation that the movements in security prices are highly correlated and tend to move together in response to external influences.

The average security is expected to have a Beta of 1.0 which means it will rise or fall the same percentage amount as the market as a whole in response to external influences. A security with a Beta of 2.0 is more volatile and more risky. It will rise or fall twice as much as the market in response to an external influence.

An important tenet of modern portfolio theory is that while equity securities may reasonably be expected to show an excess reward in terms of dividends and capital gain, compared with the yield of relatively safe fixed interest alternatives, the excess reward is determined solely by the Beta factor of the security. This means that although a large component of a security share price behaviour is independent of movements in the market Index, such a component carries no reward for risk and it is up to the portfolio manager to reduce such risks to zero through diversification.

WHO USES BETA FACTORS?

Initially Beta factors were used by portfolio managers and their advisers as an aid to portfolio management.

Such portfolio managers attempt to use Beta factors so that the risk-reward trade-off of the portfolio is matched to the needs of the beneficiaries of the fund.

Typically, a target Beta for a fund would be established so the Beta factor of the portfolio as a whole, which is found by averaging individual security Betas, can be monitored. Subsequent trading should be directed to achieving a given target Beta.

Lately, Beta factors are being used by corporate finance executives, security analysts and merchant bankers as an aid in determining such things as the cost of equity capital, in pricing a new issue or a takeover target, and so on.

COMPONENTS OF PRICE VOLATILITY

A typical Australian security has a price behaviour which is correlated with other securities and groups of securities both locally and worldwide. These correlations can be reduced to a number of factors such as:

1. Movements in the World Index.
2. Movements in the Australian Index.
3. Movements in Industry and Common factor groups.

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To determine how much each of these factors influence a typical Australian security a number of studies were conducted firstly to determine the degree of influence of the World Index on the Australian Index and then to determine the average degree of influence of the Australian Index on the top sixty Australian companies. The results of these studies are shown in Diagram 1.3.

**THE IMPACT OF DIVERSIFICATION**

The need to keep portfolios diversified is readily accepted by most fund managers. Diversification reduces risk by spreading the fund exposure over many companies.

Diversification will however make a portfolio resemble the market as a whole in price behaviour so that a portfolio with incomplete diversification might have a price behaviour as shown in Diagram 1.

One thing is immediately obvious from this representation; the price behaviour of the portfolio is dominated by movements in the World and the Australian Indices.

Surely then, if a portfolio manager is to perform better, the most important aspect of this increased performance will come from a better management of the exposure of the portfolio to the volatilities represented by the World and Australian Indices?

If this proposition is accepted then Beta factors can contribute to portfolio management. The steps involved in this method are:—

(i) to determine what the most appropriate Beta of a portfolio should be, then
(ii) to find out what the Beta of the portfolio actually is by using a source of Beta factors and forming a weighted average for the portfolio, then
(iii) to implement a trading plan to adjust the portfolio Beta towards the most appropriate Beta. This plan may be combined with general trading patterns aimed at selecting better quality securities for the portfolio.

**DIAGRAM 1**

**COMPONENTS OF PRICE VOLATILITY FOR A TYPICAL AUSTRALIAN SECURITY AND FOR A DIVERSIFIED PORTFOLIO**

<table>
<thead>
<tr>
<th>32%</th>
<th>FACTORS SPECIFIC TO AN INDIVIDUAL COMPANY</th>
</tr>
</thead>
<tbody>
<tr>
<td>9%</td>
<td>INDUSTRY &amp; COMMON FACTORS</td>
</tr>
<tr>
<td>19%</td>
<td>COMMON TO AUSTRALIAN SECURITIES</td>
</tr>
<tr>
<td>40%</td>
<td>COMMON TO ALL SECURITIES WORLD WIDE</td>
</tr>
</tbody>
</table>

A TYPICAL SECURITY

<table>
<thead>
<tr>
<th>7.5%</th>
<th>SPECIFIC TO INDIVIDUAL COMPANIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5%</td>
<td>INDUSTRY &amp; COMMON FACTORS</td>
</tr>
<tr>
<td>23%</td>
<td>COMMON TO ALL AUSTRALIAN SECURITIES</td>
</tr>
<tr>
<td>62%</td>
<td>COMMON TO ALL SECURITIES WORLD WIDE</td>
</tr>
</tbody>
</table>

A DIVERSIFIED PORTFOLIO

The security price behaviour of a typical Australian company can be explained by factors which also affect other securities. 40 per cent of the behaviour is explained by factors which affect all securities worldwide. 19 per cent is explained by factors common to all Australian securities. 9 per cent is explained by factors common to industry groups and groups of companies with similar financial characteristics. This leaves 32 per cent explained by factors specific to each company. When a number of securities are combined into a diversified portfolio diversification tends to reduce the influence of company specific factors and industry factors so that the behaviour of the portfolio becomes dominated by factors which also affect the world and Australian indices.
SELECTING THE MOST APPROPRIATE BETA — THE RISK-RETURN TRADE-OFF

Effective portfolio management is more than a matter of maximising the return from the portfolio. Risk is an important consideration. This is so because the consequences of an unfavourable price movement usually outweigh the beneficial consequences of a favourable movement.

For example, suppose a particular investment plan may on average yield a payout of $100,000, but there is a 50 per cent chance that this will be $33,000 and a 50 per cent chance that this will be $300,000.

For, say, a retiree who was expecting to receive $100,000 the lower amount could prove to be a disaster, as $33,000 will not go very far these days. The possibility of receiving $300,000 will not compensate for the possibility of receiving $33,000.

So in selecting the most appropriate Beta for a portfolio there will be a trade-off between return and risk and to do this a variable called suitability has been devised.

Suitability combines the desirable consequences of return with the undesirable consequences of risk and the objective is to maximise suitability as shown in Diagram 2. Three variables are used in the formation of suitability. These are:

1. Expected return on the Index (per cent p.a.)
2. Variance of the Index (per cent p.a.)
3. Risk tolerance

Estimates of these first two variables can be made firstly from the historical values which a Beta factor service should provide. These may be modified by the portfolio manager if desired to reflect perceptions about the current state of the market.

Risk tolerance depends on the fund and its investment objectives. For example, some banks have set up an internal fund for their staff which acts as a form of investment club. Contributions from members are limited to money which can be easily lost altogether if this should happen. Such a fund would be governed by a high risk tolerance. On the other hand, a fund set

![Diagram 2: The Risk-Return Trade-Off](image)

Choosing a Beta for a portfolio is a question of forming a trade-off between return and risk. In the long term reward for risk exposure will increase with Beta. But increasing Beta also increases the risk that in the short term the value of the portfolio will change in a way unforeseen by the portfolio manager. Although such unforeseen movements are as likely to be favourable as they are to be unfavourable, the consequences of an unfavourable movement for most people outweigh the beneficial consequences of an equally favourable movement. In this diagram expected return and expected risk are combined to form a new variable suitability which has a positive term for the reward factor and a negative term for the risk penalty for a particular Beta. A factor called Tolerance is used in this combination and is a measure of the degree of risk which can be tolerated by the fund.
Why Portfolio Managers Should Be Using Beta Factors

up to invest the reserves of a general insurance company would be governed by a relatively low risk tolerance.

Risk tolerance can be ascertained by posing a number of "which would you prefer — X or Y" type of questions.

POSSIBLE REASONS FOR NOT USING A BETA FACTOR SERVICE

Beta factors are not used to any great extent by Australian portfolio managers. One possible reason for this is that the risk-reward trade-off technique as outlined in this article is a comparatively recent innovation. Beta factors were attributed to, among other authors, W.F. Sharpe in the late 1960s — early 1970s. Beta factors became part of a theory called the "Capital Asset Pricing Model" which was taught in universities during the seventies.

Publications on a topic called "Modern Portfolio Theory" (MPT) which includes the risk-return trade-off concept started to become popular in the late 1970s and early 1980s.

However, even in America, few portfolio managers have adopted the recommendations. For example, a conference of portfolio managers in New York® was asked by a show of hands to indicate how many were using MPT and only a dozen out of two hundred responded affirmatively. In response to a question as to how many intended to initiate or had already initiated a process of international diversification more than 50 per cent responded affirmatively.

So why were these portfolio managers reluctant to adopt the methods of MPT? It was generally felt that increased performance from using MPT could only be demonstrated after a considerable period — say 100 years, which is too long to influence the career prospects of the individual portfolio manager. It seems that portfolio managers still feel safer with measures of performance which ignore the question of risk.

The problem is one of educating and selling the concept. Once a portfolio manager has accepted that MPT is the way to go, his clients and associates need to be sold on the idea as well before his efforts will be appreciated. Once this has been done and MPT has been installed, these people will have a greater contribution to make than in previous times when establishing investment policy.

There are a number of other reasons sometimes put forward for not using Beta factors. Briefly:

- The large portfolio can be made as a replica of the total equity market and some fixed interest alternatives. This way the Beta of the portfolio will be obvious without the need of a Beta factor service.
- Attempting to manage Beta will hinder the freedom of the manager to select securities expected to outperform.
- It is impossible to form an average risk tolerance from a number of individual risk tolerances.
- Beta factor services are plagued by sources of error which make the measures unreliable, and they have failed to cover the total market of investment alternatives.
- Before MPT can be used it will be very helpful to have an on-line portfolio system. Many portfolio managers do not have such an advantage or are still in the process of going on-line.

In answering these objections it should be noted that:

- Fixed interest securities often have non zero Betas because when interest rates rise the Stock Market falls, but so also do bond prices so as to increase yield to maturity. A good Beta factor service should provide Betas for the grey alternatives such as bonds, convertible notes, debentures etc.
- That MPT applies the risk-reward trade-off to other measures as well as the Beta measure. For example, to industry groups and to company specific factors. The portfolio manager still has the freedom to select securities judged as being of a higher quality.
- That once a policy has been established as to the Beta of a fund which has a number of individual members, the portfolio manager needs to keep these members informed as to the riskiness of the fund.
- That much has been done to improve the technology of Beta factor production during the last decade and that now Beta factors can be produced with a higher degree of accuracy.
- That Automated Portfolio Systems for a large fund can easily pay for themselves by reducing the costs of clerical effort and of auditing fees.
- That additional measures and a more complete market coverage will be provided by Beta factor suppliers if and when the value of such a service becomes widely accepted by our industry.
THE ADVANTAGES OF USING A BETA FACTOR SERVICE

There are several important reasons why portfolio managers should be using a Beta factor service. Notable amongst these are:—

• In a dynamic investment environment things happen which tend to move the Beta of a portfolio in random directions.
• Beta factors can be very helpful in gauging analytical skills and portfolio manager performance.
• The methodology of MPT creates a communication channel between the portfolio manager and his clients. This channel once in use will increase the esteem of the portfolio manager.

THE DYNAMIC INVESTMENT ENVIRONMENT

Many things can happen which tend to move the Beta of a portfolio around in an unplanned way. For example, the steady accumulation of contributions and income, payouts, placements, underwritings, acceptances of rights, issues, takeovers for cash etc. Another reason is that companies tend to change the nature of their businesses, for example, by moving into the resource development sector.

These random movements are very likely to move upwards during the euphoria of a bull market and downwards during a bear market. A moderate level of control with a target Beta determined to some extent by a review of the current investment climate can give the portfolio manager the opportunity to take advantage of market inefficiency.

For a last word on the changing investment environment, see Table 1. It would appear that the degree of influence of the international market on the Australian market has increased over the last ten years. Some degree of caution should be used when interpreting these values. Back in 1973 there were many restrictions placed on the movement of capital from country to country so that each stock market acted with more independence than is the case today. Under these conditions a small stockmarket such as the Australian market will appear to have a low Beta value. However, not all of the increase in Beta value can be explained in this way.

TABLE 1

EVIDENCE OF A CHANGING MARKET
THE BETA OF THE AUSTRALIAN MARKET AGAINST THE WORLD

<table>
<thead>
<tr>
<th></th>
<th>DEC '81</th>
<th>DEC '76</th>
<th>DEC '71</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R^2$</td>
<td>68.3%</td>
<td>60.77%</td>
<td>47.94%</td>
</tr>
<tr>
<td>BETA</td>
<td>1.409</td>
<td>0.593</td>
<td>0.395</td>
</tr>
<tr>
<td>STANDARD ERROR: BETA</td>
<td>0.17</td>
<td>0.19</td>
<td>0.19</td>
</tr>
<tr>
<td>VOLATILITY WORLD INDEX</td>
<td>12.6% pa</td>
<td>16.3% pa</td>
<td>12.8% pa</td>
</tr>
<tr>
<td>VOLATILITY AUSTRALIAN INDEX</td>
<td>26.6% pa</td>
<td>30.4% pa</td>
<td>20.9% pa</td>
</tr>
</tbody>
</table>

NOTE:
1. $R^2$ is the percentage of the volatility of the Australian Index explained by the World Index.
2. Volatility is the standard deviation of price movements over one year.
3. Each period covers approximately 7.5 years ending on the date above.
4. Data used came from the Capital International Perspective Service.
**USING BETA FACTORS TO GAUGE ANALYSTS’ AND PORTFOLIO MANAGERS’ PERFORMANCE**

Gauging performance can be difficult in volatile markets because the value which a manager can be reasonably expected to add to a portfolio is small in relation to overall market volatility.

For example, suppose that a manager is given the task of managing $20 million in equities. If he were to add one half of one per cent to the portfolio value in one year through diligent efforts then he would have more than covered his fee. But how can one determine that one half of one per cent has been added to the portfolio value when stock markets can rise or fall by 27 per cent in a year?

If the Beta of the portfolio has been pre-established at a higher level in the organisation, or through separate consultations with the client, the task becomes easier. From the total return of the portfolio is deducted that component which is explained by movements in the Index. Portfolio performance will then be measured against a background which is less volatile. For example, the component of the portfolio volatility not explained by the Index for the portfolio depicted in Diagram 1 has a volatility of 10.3 per cent per year.

Some proponents of MPT would have analysts give rankings to securities, eg. from A highest to E as lowest: These rankings to be judged as describing that component of the securities behaviour not explained by the market.

Once these rankings have been given they can be turned into estimates of return by the portfolio managers and used with risk measures from a Beta factor service to select the most appropriate holdings in each security.

Now surely the job of the analyst is simplified by this process? After all, he need not be concerned with global economic conditions that his rankings compare companies which are reasonably similar in industrial classification and financial characteristics.

**MPT ESTABLISHES COMMUNICATION BETWEEN PORTFOLIO MANAGER AND CLIENT**

If the portfolio manager were to be genuinely interested in the needs of his clients for return on investment and for security and if he were desirous that his efforts be recognised through times of good fortune and through times of misfortune, is there any other way he could go other than down the MPT road?

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**STRIVING FOR A BETTER BETA FACTOR SERVICE**

A Beta Factor service has been provided through The Sydney Stock Exchange STATEX Data base since 1975. The quality of this service is currently in the process of being upgraded. In particular the new system will have the following improvements:

- Price files will be screened for extreme outliers — mistakes which have entered the file which can distort the results.

- Dividend reinvesting will be included. This will remove a minor distortion which is created by companies tending to pay dividends in the same months. More importantly however it will allow us to produce historical measures of risk and return on holding the Index. These measures are required by MPT methods and were not produced by the old system.

- There will be a variable weighting scheme which gives more weight to recent data, which has the potential to halve the degree of error in Beta factor production.

- The Accumulated Coefficient Method used by the London Business School7 will be used to remove infrequent trading bias from the measures. When securities are subject to infrequent trading their Betas can be biased downwards by large amounts (30 to 40 per cent) while the frequent traders can be biased upwards.

- Statistical corrections will be applied to move the Betas of the less easily determined securities back towards 1.0.

- The service will provide the additional risk measures required for use in MPT and will give standard errors with its Beta factors.

- The service, as with all STATEX data base information will be available on magnetic tape for direct entry into the customer’s computer.

There are many things that could be done in the future. For example, price data from all interstate exchanges is currently extracted on a daily basis and the data screened for extreme outliers. This data may be used in the future to improve the accuracy of Beta factors because it will allow us to switch to weekly observations. Currently monthly observations are used.
A start may be made to use the data base of financial data to apply Bayesian analysis and generate predictors of Beta. A more complete coverage of the market may be introduced to generate Betas for fixed interest securities and surveys of the total market size including equity, fixed interest and real estate alternatives. It may prove possible to differentiate the Australian Index from the World Index so as to produce additional measures and to measure Betas, risks, and returns against a world market background.

**FOOTNOTES:**

1. The Capital International Perspective Service was used to prepare Indices for the World Market and for the Australian Market.
2. The Beta factors for the top 60 Australian companies were prepared against an Index of 500 Australian companies. Their weighted average \( R^2 \) has been used here to determine the degree of influence. \( R^2 \) is also known as the coefficient of determination and is a measure of how much of the security price movement is explained by its Beta factor and movements in the Index.
3. The degree of influence of industry and common factor groups has not been properly determined. However, the degree of contribution from company specific factors shown here is about the same as shown in a similar diagram in SHARPE W, 1981 “Investments”, second edition, Prentice Hall International Editions, Investment Management P.353.
4. A more detailed presentation of the method may be found once again in Sharpe, op.cit., pp.576-609.
5. The Annual Conference of the Financial Analysts Federation was held in May 1981 and was reported in Barron’s National Business and Financial Weekly, May 18, 1981. A Dow Jones and Company Inc. publication.
6. A review of packages and services available for portfolio accounting is beyond the scope of this article. There would seem to be many packages available in Australia but none of them have incorporated MPT technology, as far as the author is aware.
7. The major supplier of Beta factor services in the U.K.