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IS BETA BETTER ?

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SYNOPSIS

The article describes modern portfolio theory clearly in non-mathematical language and it explains how betas which are measures of the riskiness of a share, are calculated, how they can be used to monitor the performance of investment portfolios and also to estimate the cost of equity capital. It then shows two diagrams, one of the betas of companies in the FT Actuaries 500 share index and the other of the cost of equity for these companies. These diagrams demonstrate that most companies have a beta of nearly 1 and their cost of equity is very close to 18%. This is why financial managers shouldn't spend too much worrying about the precise level of their beta.

IS BETA BETTER?

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Modern Portfolio Theory (MPT) is still regarded with suspicion by many financial analysts, stockbrokers and finance directors, despite the numerous articles appearing in both academic and professional journals. Is MPT theory so abstruse that it can be only understood by those with a knowledge of advanced statistics? Are its results and measurements too unreliable to be useful? Or are practitioners so conservative and suspicious of academic models that they dismiss valuable lessons which may provide real benefits for their companies?

This article briefly describes Modern Portfolio Theory (MPT). It explains a measure of the riskiness of shares, beta, and considers why many practitioners do not use MPT.

MODERN PORTFOLIO THEORY

Modern portfolio theory recognises two different kinds of risk, diversifiable risk and non-diversifiable risk. (see Table 1 for a list of synonymous terms.)

Table 1

TERMS USED TO DESCRIBE RISK IN PORTFOLIO THEORY

Diversifiable	+	Non-diversifiable	=	Total Risk
Specific	+	Non-specific	=	Total Risk
Non-systematic	+	Systematic	=	Total Risk
Non-market	+	Market	=	Total Risk

Diversifiable risks are those which are specific to individual companies rather than those which relate to the economy as a whole. For example the risk of operational difficulties with a new production process would be a specific (diversifiable) risk while the possibility of an increase in interest rates would be a non-diversifiable risk.

Specific risks can be eliminated by holding portfolios of shares. Not having all ones eggs in one basket has always been a cornerstone of investment advice. Studies have shown that even small portfolios of shares from different market sectors can significantly reduce specific risk and that this rate of reduction diminishes rapidly as the size of the portfolio increases. This is illustrated in figure 1.

Figure 1

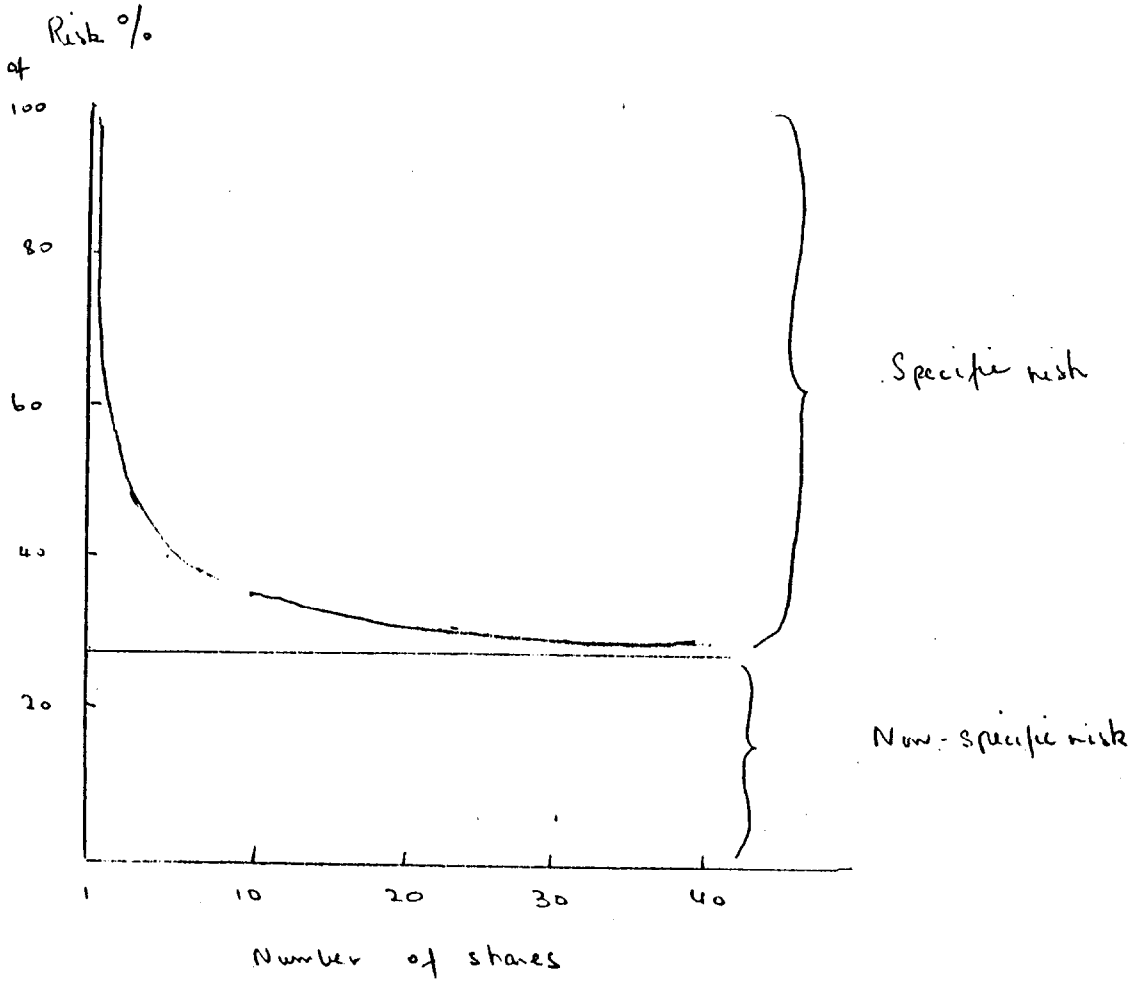

Risk %
of
100
80
60
40
20
Specific risk
Non-specific risk
1
10
20
30
40
Number of shares

Figure 1

A portfolio of 30 widely chosen shares typically eliminates 99% of specific risk. The risk remaining is called non-specific or market risk. This is the risk that shareholders bear by investing in the market as a whole rather than in individual securities. Further studies have shown that the prices of some shares are more sensitive to market movements than others.

The sensitivity of a share's price movements compared with those of the market as a whole is measured by the share's beta. For example, if a company has a beta of 1, we would by and large, expect its share price to move in line with the movement of the market index. If a company's beta was 2 then its share price would be expected to increase by 2% for every 1% increase in the market index. If the beta was 0.5, a 1% increase in the market index would result in only a 0.5% increase in the share price. In the same way decreases in the market would lead to proportionately greater falls in the price of higher beta shares than in the prices of lower beta shares. High beta shares are therefore considered to be more risky than low beta shares.

HOW BETA IS MEASURED.

Beta is broadly measured by comparing the change in share price for a period, usually one month, with that of a general stock market index. If this process is repeated a number of times its results can be plotted on a graph, (see Figure 2).

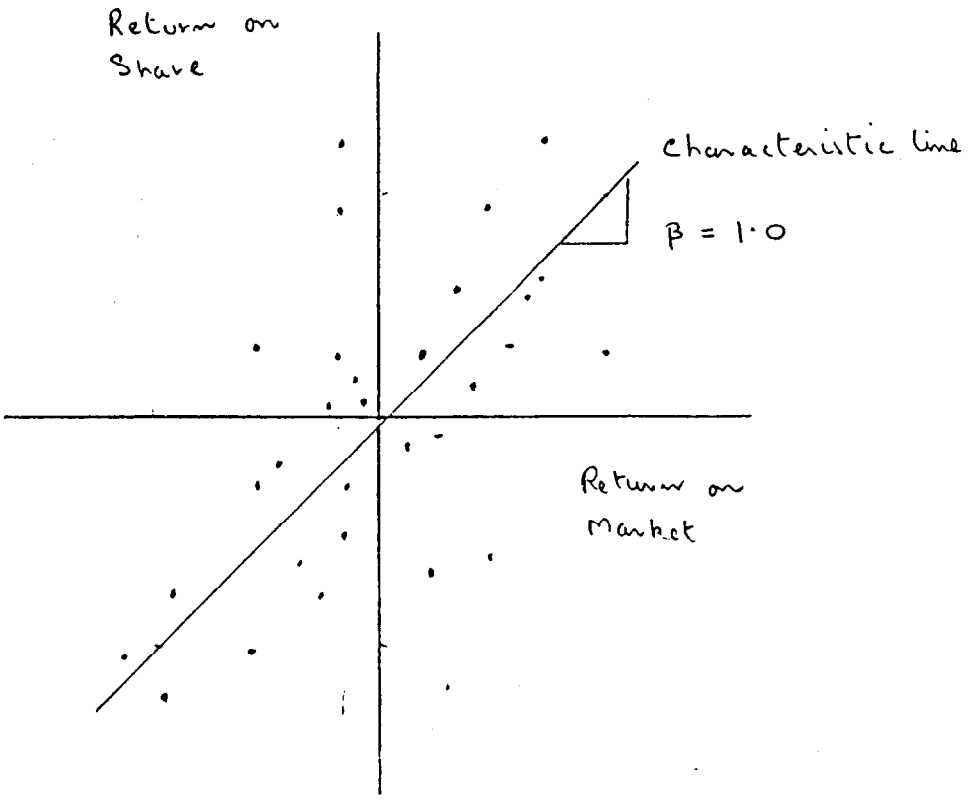


Figure 2

Figure 2

A line of best fit can then be drawn. This line is known as the share's "characteristic line", and its slope is measured by beta. A gradient of 45^{O} represents a beta of 1, a steeper gradient a beta higher than 1 and a lower gradient, a beta of less than 1.

In practice there are a number of difficulties in measuring betas of companies shares. Firstly the data used are not just share price movements but total returns, i.e. share price changes plus dividends. Secondly, many shares are infrequently traded so their listed share price remains unchanged during a period in which the market as a whole may have moved. This makes the share appear insensitive to market price changes and attributes to it an unrealistically low beta.

Furthermore it is not easy to decide the best length of period on which the estimation of beta is based. A short period reflects recent market conditions but it will not measure the impact on the company's share price of longer term stock market movements. A longer period will include share movements when economic circumstances may have been different from today's, and thus may not be useful for predicting the future riskiness of the share. Most beta estimates are based on five years data using monthly observations and this is considered to be a reasonable compromise between short and long term requirements.

Finally betas have a tendency over time to revert to 1, low betas increasing and high betas decreasing. In other words risky shares become less risky and safe shares less safe. To allow for this calculated betas are centred towards one by applying a factor which is estimated from experience.

Evidently beta's are not easy to estimate. A large data base of share prices and a sound knowledge of statistical theory is necessary, as well as experience and judgement which can only be gained from calculating and interpreting betas over a lengthy period.

HOW BETAS CAN BE USED

Betas have two main uses. Firstly they can be used by investment analysts to design portfolios to match the risk preferences of their clients, for high risk/high return, choose high beta shares and for low risk/low return, low beta shares. This approach is sometimes described as "interior decoration". The method can also be used to monitor the performance of portfolios of shares. A high beta portfolio may, by definition be expected to outperform the market when shares are rising. But the portfolio has only really done "well" if it performs better than predicted by the theory. For example if, the portfolio has a beta of 1.5 and the market has given investors a return of 10%, then we would expect our portfolio to give us a 15% return. A 12% return, even though better than the market would be judged to be poor given the level of systematic risk (as measured by beta) of the portfolio.

The second use of beta is to enable financial managers to estimate the cost of equity capital using the capital asset pricing model (CAPM). This equates the cost of equity to the risk free interest rate plus a premium for risk depending on the beta of the firm. The formula applied is $ke = Rf + \beta (Rm - Rf)$ where ke is the cost of equity, Rf is the risk free interest rate and Rm the expected return on the stock market. If the risk free rate (post tax) is 10%, the stockmarket estimated to return 18% and the 1.4, we have:-

$$ke = 10\% + 1.4\,(18\% - 10\%)$$

$$ke = 21.2\% \quad \text{say } 21\%$$

The great advantage claimed for using the CAPM over other methods of estimating the cost of equity is that the finance manager can calculate a cost which reflects investors' perceptions of the riskiness of his company's shares. This, when combined with the cost of other sources of finance, can be used to calculate the weighted average cost of capital which can then be used as a cut-off rate to discount cash flows and determine the acceptability of capital investment proposals.

CHARACTERISTICS OF BETA

The difficulties arising from the use of betas become readily apparent when we examine published beta statistics. For this article I have focused on the betas of shares included in the Financial Times Actuaries 500 share index since this includes large industrial and commercial companies who are more likely to use the CAPM for calculating the cost of their equity than smaller companies or financial institutions. These betas are estimated by the Risk Measurement Service at the London Business School. Figure 3 shows a frequency distribution for the 492 out of the 500 companies in the index. (Eight companies had been trading for insufficient time for betas to be calculated.)

Figure 3

The figure shows that most companies have betas very close to 1, 43% being between .9 and 1.10 and 67% between 0.81 and 1.20. Not only are betas close to 1 they are also subject to estimation

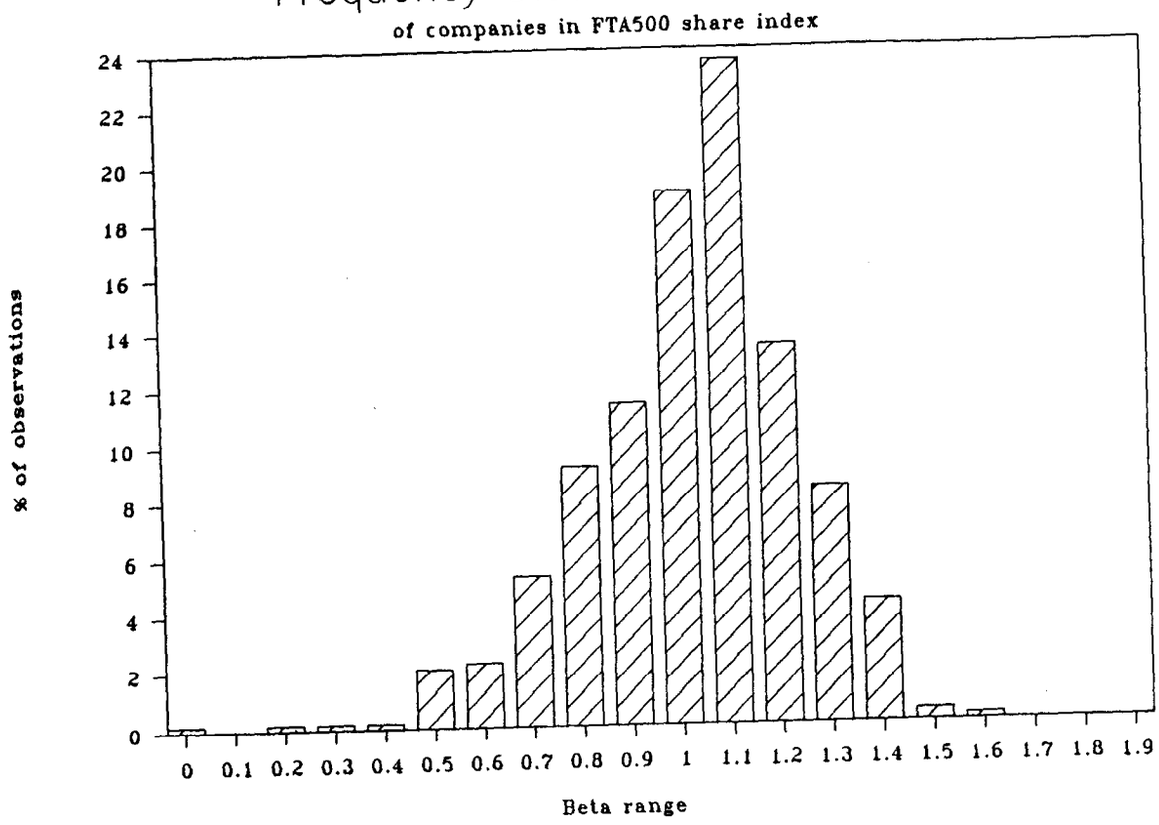

Frequency Distribution of Betas
of companies in FTA500 share index
% of observations
24
22
20
18
16
14
12
10
8
6
4
2
0
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9
Beta range

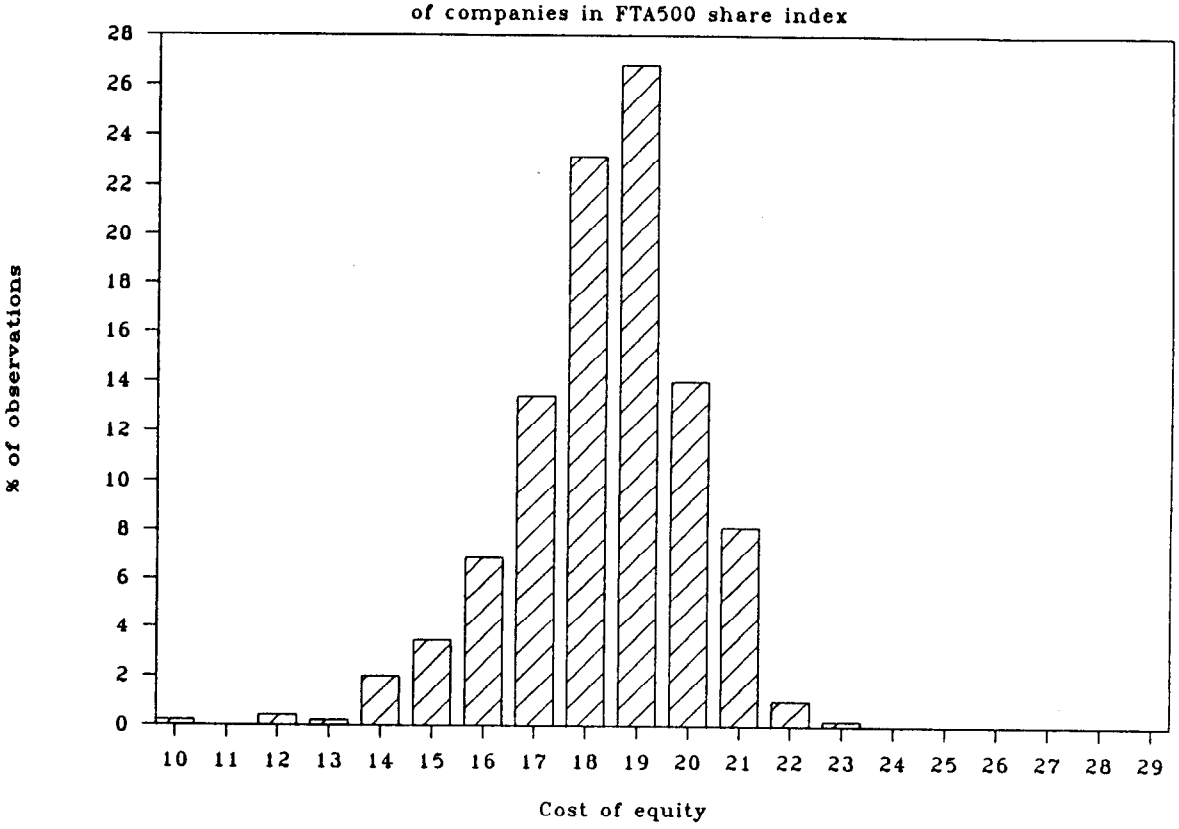
Figure 3

errors. If we examine figure 2 we notice that most of the points are scattered around the characteristic line. This means that we cannot be sure that its slope represents the true beta, which might be higher or lower. Fortunately statistics gives us a measure of the possible error in our estimate, known as the standard error. We know that there is a 95% chance that the true beta lies within 2 standard errors of the estimated beta and a 68% chance of the standard error being within 1 standard error. If we apply this to the 492 betas in the sample we find that we can only be 95% certain that the true beta is different from 1 for 18% of the published betas and 68% certain for 45% of the betas. In other words, most finance directors cannot be sure that the beta of their company is different from 1.

The effect of betas being so close to 1 is demonstrated in Figure 4 which shows the frequency distribution for the cost of equity for the companies in the Financial Times Actuaries 500 Share Index. This figure has been calculated using the capital asset pricing model and the assumptions used in the earlier example.

Figure 4

The figure indicates that the cost of equity for most companies is very close to 18%, the expected return from the stockmarket. Given the difficulties in estimating this return, the small differences in the cost of equity may not, for the vast majority of companies whose beta is close to 1, frankly matter.


Distribution of Cost of Equity
of companies in FTA500 share index
% of observations
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29
Cost of equity

Another problem in using betas is that their value may change from one period to the next. For example using data from 1976 to 1980 may result in a beta of 1.2 while 1981-1985 data may give a figure of 1.1. This change may arise either from the estimation errors mentioned earlier or from the company changing its risk profile through time either by shifting its emphasis into new industries or by changing its gearing. Clearly the company needs to take into account any change in its circumstances when it estimates its cost of capital. To be useful to managers, betas should not change dramatically from one period to another, without good reason, since this would make them useless in estimating the cost of equity. A study[1] has shown that while betas of individual shares are very unstable, the betas of portfolios made up of shares of similar betas are very stable, the stability increasing with the size of the portfolio. Thus a portfolio of high beta shares will usually do well in a bull market while a portfolio of low beta shares will perform poorly.

From what I have said the reader may deduce three conclusions:

1) It may be difficult for the company accountant or treasurer to explain to a sceptical chairman that total risk is unimportant in assessing the riskiness of a project since his company's shareholders can diversify this risk by holding portfolios. The consequences of the failure of a large investment proposal may not be disastrous for the average investor but for the firm it may mean the end of its existence and for the employees the loss of their jobs. In these circumstances even the most rigourous theory will lack intuitive appeal.

2) Many published betas are very close to 1. They are subject to large standard errors which makes it difficult for the user to be confident as to their real level. If they varied more widely, as in the US, there would be greater differences in the cost of equity between companies. It would then be easier to identify companies with high and low betas by relatively informal examination of share price

1 The stability of UK risk measures and the problem of thin trading. E Dimson and P Marsh, Journal of Finance , June 1983.

movements. Beta's then would have greater instinctive appeal. They would be easier to explain and probably be more widely used.

3) Most treasurers or accountants should not spend too much time estimating their precise cost of equity. This article suggest that for the vast majority of companies an estimate of about 18% wont be far out.

about 12%