

MARKET NEUTRAL INVESTING

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**Faculty and Institute of Actuaries
Investment Conference
Hatfield Heath, 25-27 June 2000**

ABSTRACT

This paper aims to introduce the concept of market-neutral investing and discusses the similarities as well as differences between the market neutral investing style and the traditional long only investment style. We demonstrate the additional flexibility provided by market-neutral investing. We consider market neutral style as an asset class (with a cash benchmark as an absolute return product) as well as an overlay strategy (with the benchmark determined by the investor). In addition to theoretical considerations we highlight the practical issues in implementing such strategies.

Market Neutral Investing

This paper was first published in 'Derivatives Use, Trading and Regulation', Volume 5, Issue 3 (1999), by Henry Stewart Publications, Museum House, 25 Museum Street, London WC1A 1JT, tel. 020 7323 2916; fax. 020 7323 2918; email. alex@hspublications.co.uk; website www.henrystewart.com

INTRODUCTION

In its broadest sense, market-neutral investing involves taking positions in a market while ensuring that the total portfolio has no net exposure to that market. Although definitions of market-neutrality vary (e.g. no net cash exposure, no net beta exposure, no net duration exposure, zero market correlation), a market-neutral manager will generally hold both long and short positions and may impose additional constraints (e.g. no net country or currency exposure for a global portfolio, no net sector exposure for a domestic portfolio).

As we discuss in this paper, although market-neutrality is, in itself, an interesting characteristic, there are other valuable aspects of the market-neutral approach: the freedom in shorting unattractive assets and the opportunity to leverage excess returns. In a simple example, we demonstrate the additional flexibility a manager has by using market-neutral on a given set of judgmental “alpha” signals. We also discuss the practical implications and implementation issues, and the place of market-neutral in the investor’s “basket” of investments.

DEFINITIONS

Excess return (R_{excess})	Excess return is the difference between the active portfolio return and the benchmark portfolio (e.g. FTSE100) return. Over time it is a measure of outperformance of the active portfolio relative to the benchmark portfolio.
Excess risk (σ_{excess})	Excess risk is standard deviation of a time series of excess returns.
Information Ratio	Information Ratio (IR) in the context of active portfolio management is defined as $IR = R_{excess} / \sigma_{excess}$. It is an ex-post measure of the active portfolio performance relative to the risks taken and, by convention, is calculated on an annual basis.
Alpha	In the context of active portfolio management it is a synonym for average excess return (ex-post alpha) or expected excess return (ex-ante alpha). (Also denotes stock specific return where market risk exposure has been removed)

Short selling	Short selling involves the sale of borrowed securities and their later repurchase ¹ .
Leveraging	A portfolio is said to be leveraged when its exposure to the market is greater than its underlying value ² . Leverage is measured as the ratio between the total exposure to markets and the portfolio's net value. In general, leverage can be achieved using derivatives without the need for outright borrowing. This concept is key to many arbitrage techniques, where the inefficiencies are small and the fund must leverage in order for arbitrage to be worthwhile.

FLEXIBILITY OF MARKET-NEUTRAL STRATEGIES

We start by using a simple qualitative example to illustrate the key differences between market-neutral and traditional investing and, in particular, the flexibility of the market-neutral approach. Although market-neutral can be applied to equities, stocks or asset classes, in the rest of this paper we confine ourselves to a market-neutral equity approach. Assume an analyst is actively following seven stocks in a market and currently regards four of those seven stocks as mis-priced (Stocks A and F are under-valued, Stocks E and G are over-valued)³.

Table 1: Analyst Recommendations

Stock	View
Stock A	Out-perform
Stock B	Neutral
Stock C	Neutral
Stock D	Neutral
Stock E	Under-perform
Stock F	Out-perform
Stock G	Under-perform

In our traditional “long only” portfolio, active management is based on overweighting some (and consequently underweighting other) stocks relative to our benchmark portfolio (for example, an index such as FTSE100 or the MSCI Europe). In this case, let's assume that our benchmark is equally weighted in stocks A through E but excludes stocks F and G. If the “long only” manager starts by holding his benchmark portfolio, to implement

¹ Although short selling can be used to make a profit by shorting over-valued stocks and repurchasing them at a lower price, in a market-neutral context much of the benefit of the short positions come from their removal of the market exposure of long positions.

² As one example, if we invest £100 in buying at-the-money FTSE Call Options, this will give us an exposure to the UK Equity market that is much greater than £100. We have leveraged our £100 investment.

³ Note that, in practice, managers of both market-neutral and conventional portfolio would expect to hold many more than four active positions to benefit from the diversification between holdings.

the analyst's views, they can over-weight Stock A, add Stock F to the portfolio and sell as much of Stock E as they hold (20% in this case). Unfortunately, they can not do anything about Stock G as this wasn't part of the benchmark. This is illustrated in Table 2 below.

Table 2 – Long-Only Portfolio

	Benchmark	Portfolio	Long-short
Stock A	20%	30%	+10%
Stock B	20%	20%	0%
Stock C	20%	20%	0%
Stock D	20%	20%	0%
Stock E	20%	0%	-20%
Stock F		10%	+10%
Stock G		0%	0%
<i>Total</i>	<i>100%</i>	<i>100%</i>	<i>0%</i>

The net result is that stocks A and F are overweight by 10% each, whereas stock E is underweight by 20%. Stocks A and F make a long-side and stock E makes a short-side of the long-short portfolio which is effectively the *active* component of the long-only portfolio. The long-short portfolio comprises 40% (i.e. 2x20%) active exposure.

For the market-neutral portfolio, our “shorts” aren't limited to the stocks we hold in the benchmark and, where our shorts do appear in the benchmark, our under-weight position isn't limited by the stock's benchmark weighting. Table 3 demonstrates a market-neutral strategy based on the same stock views as above.

Table 3: Long-Short portfolio

	Long-side	Short-side	Relative Long-Short
Stock A	+25%		25%
Stock B	0%		0%
Stock C	0%		0%
Stock D	0%		0%
Stock E	0%	-25% (DF2)	-25%
Stock F	+25%		+25%
Stock G	0%	-25% (DF1)	-25%
<i>Total</i>	<i>50%(DF 3)</i>	<i>50% (DF3)</i>	<i>0%</i>

In the case of market-neutral strategy there are some additional degrees of freedom (DF) that can be exploited. Firstly the short-side portfolio includes stock G - a stock outside the benchmark (DF 1). Secondly, the weights of the short-side portfolio are fully flexible (DF 2), so our “short” in Stock E can be more than 20%. In the case of the market-neutral strategy the proportion that is actively invested is also fully flexible (DF 3). In this example, our “longs” happens to be 50% and our “shorts” also 50%, but there is no practical reason why our “longs” should not be 150% and our “shorts” also 150%. Our traditional portfolio is limited to “longs” of 100% and “shorts” of 100% (in the special

case where we want to sell everything in our benchmark and buy only stocks outside our benchmark). Note that, from an active management perspective, the benchmark holdings in our long-only portfolio are “dead weight” as they’re not expected to add value. Finally, in conjunction with a market-neutral strategy, the benchmark can be re-engineered (methodology of market-neutral overlay explained later in section “The role of market-neutral investment style in institutional portfolios”) (DF 4). Table 4 summarises the flexibility of market-neutral strategies relative to a long-only strategy:

Table 4

Degree of freedom	Market-neutral	Long only
DF1	Flexibility to short stocks outside the benchmark (e.g. stock G)	Can’t include stocks outside the benchmark
DF2	No constraint on short portfolio weights (stocks E and G)	Weights of the short-side portfolio are limited by the benchmark
DF 3	No constraint on proportion actively invested, no dead weights	Constraints on proportion (e.g. max 200%) actively invested, normally some dead weights
DF 4	Flexible benchmark can be incorporated, re-engineered in line with the client strategic needs	Benchmark defined by active process (e.g. equity benchmark for equity added value)

“DOUBLE ALPHA” INVESTMENT STRATEGY

One of the most important consequences of the additional “degrees of freedom” offered by market-neutral is the potential to increase the portfolio alpha and improve the portfolio risk/reward trade-off. Although some practitioners refer to this as “double alpha” investing, this is a little over-generous as conventional active investing can already be thought of as “one-and-a-half alpha”, with under-performing under-weights benefiting the portfolio in the same way as out-performing over-weights. However, the important point about market-neutral is that with complete freedom on the short-side, the “short” investments are raised to the same level of importance as the “long” investments.

For our market-neutral strategy, we can consider buy and sell decisions separately. In essence, we need to sell short stocks we expect to under-perform, buy stocks we expect to out-perform and invest the proceeds in our “cash” portfolio. As we will show later, although market-neutral investing as an asset class takes “cash” as its benchmark, where it is used as an overlay we can offer investors any benchmark they require. However, in this cash-based example, total return consists of the excess return from the market-neutral strategy together with the cash return.

$$R_{mnt} = R_{mn} + R_b = R_l - R_s + R_b$$

Where:

R_{mnl} denotes total return

R_{mn} denotes excess market-neutral return

R_b denotes the benchmark (cash) return and

R_l, R_s denote long-side and the short-side return respectively

As we are concerned with excess returns so we will ignore benchmark returns for the rest of this analysis. The returns from the long and the short-side can be decomposed as follows:

$$R_l = R_m + \alpha_l$$

$$R_s = R_m - \alpha_s$$

Where:

R_m denotes market return

α_l, α_s denote long and short alpha (measures of long-side out-performance and short-side under-performance against the market)

We assume that both the long and short-side have equal betas (of 1). For a skilful manager we would expect the long-side to return more than the market and the short-side to return less than the market, so both alphas above should be positive.

It follows that:

$$R_{mn} = R_m + \alpha_l - R_m + \alpha_s$$

$$R_{mn} = \alpha_l + \alpha_s$$

The volatility of the market-neutral strategy depends only on the volatility of long and short-side alphas and the correlation between the alphas.⁴

$$\sigma_{mn} = (\sigma_l^2 + \sigma_s^2 + 2\rho\sigma_l\sigma_s)^{1/2}$$

Where

σ_l, σ_s denote long and short-side alpha volatilities and

ρ denotes alpha correlation.

The Information Ratio is a ratio of excess return to excess volatility and is a useful measure of success, adjusted for risk, for an active strategy. For a market-neutral strategy the Information Ratio is:

⁴ This is also true for the total return assuming short sale proceeds are invested in cash i.e. yield the risk free rate.

$$IR_{mn} = R_{mn} / \sigma_{mn} = (\alpha_l + \alpha_s) / (\sigma_l^2 + \sigma_s^2 + 2\rho\sigma_l\sigma_s)^{1/2}$$

If $\sigma_l = \sigma_s$ ⁵ the above equation can be simplified to:

$$IR_{mn} = (\alpha_l + \alpha_s) / [\sigma_l \sqrt{2(1 + \rho)}] = (IR_l + IR_s) / \sqrt{2(1 + \rho)}$$

In the simplest case we can assume that Information Ratios on the long-side and on the short-side are the same and that the correlation between long and short alphas is zero (provided there is no style bias, sector / country or currency exposure in the portfolio). In that case the above formula simplifies to:

$$IR_{mn} = \sqrt{2}IR_l$$

The market-neutral Information Ratio is greater than the long-side Information Ratio because of diversification of long-side and short-side risk. In the worst case of no long-short diversification (the correlation of 1) the market-neutral Information Ratio is the same as the long-side Information Ratio.

In a more general case, two key parameters that will affect the market-neutral strategy are the short-side Information Ratio and the long-short alpha correlation. The market-neutral strategy will yield a better Information Ratio than a long-side Information Ratio if the Information Ratio on the short-side is greater than on the long-side and/or the correlation between alphas on the long-side and on the short-side is less than 1.

Whereas the correlation should be well below one, there is potential for alpha on the short-side to exceed long-side alpha. This is because brokerage houses do not issue “sell” recommendations as frequently as they issue “buy” recommendations, because long-only portfolio managers form the bulk of the brokerage client base. As a consequence the universe of low return stocks will tend to be under-researched, the (bad) news may not be properly reflected in the price and this neglect generates selling opportunities for investors willing to research this universe.

The following chart shows sensitivity analysis for the overall market-neutral Information Ratio as a function of alpha correlation and the Information Ratio on the short-side, assuming that the “long” information ratio is equal to 0.5. As argued above, for a market-neutral product we would expect the “Short” Information Ratio to be at least as good as the “Long” Information Ratio. In the worst case where the “Short” Information Ratio is equal to the “Long” information ratio of 0.5 and the correlation equal to 1, the “Market-neutral” information ratio is also equal to 0.5⁶.

⁵ This assumption is rather robust – see the real life example below;

⁶ Note that the value of market-neutral investing is not dependent on a higher short-side alpha. Provided the correlation between alphas is zero, the overall Information Ratio (IR) will be higher than the long-side IR, provided the short-side IR is more than $(\sqrt{2} - 1)$ of the long-side IR. That is, if the short-side IR is more than half the long-side IR, the market-neutral IR will be improved.

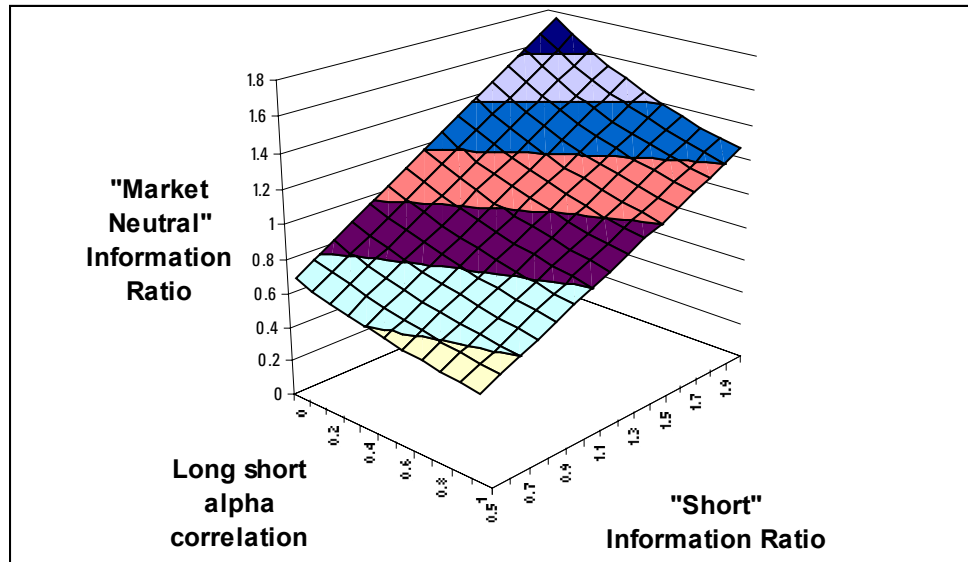


Fig 1: Sensitivity Analysis – Impact of DF1 and DF2

As the “Short” Information Ratio increases and the correlation reduces, the “Market-neutral” Information Ratio increases considerably. When the correlation reduces to 0 the “Market-neutral” information ratio increases to 0.75 even with no increase in the “Short” information ratio. When the “Short” Information Ratio reaches 2, the “Market-neutral” information ratio is 1.25 even with no reduction in the correlation (of 1).

How does this compare with the Information Ratio for a traditional portfolio? If we go back to our “degrees of freedom” comparison, DF1 and DF2 imply that the Information Ratio on the short-side will be greater for a market-neutral portfolio than for a traditional portfolio and that it will be constant, whatever the risk level. DF3 implies that the Information Ratio on both long and short-side will be constant whatever the portfolio risk level, and that the risk level can be raised to any target, and is discussed in the following section.

Can these theoretical results be observed in real life? We consider a case of a portfolio entirely driven by investment analyst recommendations that issue “buy”, “match” and “sell” ratings for each stock. We construct notional “long” and “short” portfolios from “buy” and “sell” recommendations respectively.⁷

The “Long” alpha is 3.9% and the “Short” alpha is 5.2% annualised. The standard deviations of the long alpha and the short alpha are close i.e. 3.9% and 4.1% respectively and the correlation is 0.22. Our results are presented in the table 4:

⁷ We construct portfolios by firstly equally weighting stocks on the “long” and the “short” side within each industry and then by equally weighting such industry portfolios; we ignore currency effects by considering returns in local terms and we consider the period Feb 1995-Feb 1999; we ignore transaction costs in our analysis.

Table 4

	Information Ratio
Long Side	1.0
Short Side	1.3
Market Neutral	1.5

The market-neutral Information Ratio is better than the long only Information Ratio due to the greater short-side Information Ratio and the low alpha correlation.

UNCONSTRAINED ACTIVE EXPOSURE

In addition to “double” alpha, market-neutral strategies can also benefit from the lack of constraint on their active exposure – their ability to leverage (DF3). Typically, at higher level of risks the long-only portfolio manager starts to hit constraints implicit in the benchmark holdings (e.g. can’t short stocks as much as they would like and hence also can’t over-weight stocks as much as they would like). This means the Information Ratio starts to fall as risk level increases. By contrast, for market-neutral strategies unconstrained by benchmark weightings, provided there are no additional constraints, the risk/reward trade off will be linear until the leverage limit is reached. To create a portfolio with double the risk, the manager simply needs to double the size of every position. Hence the Information Ratio is constant whatever the level of risk in the portfolio.

A graphical example can help with illustrating this point: the graph shows four efficient frontiers, including a long only strategy⁸, all generated from the same information set (i.e. same long and short alphas and information ratios). For the three market-neutral frontiers, the only constraint imposed is the overall degree of leverage. The maximum degree of leverage we show of 2:1 is sometimes called “Institutional market neutral”⁹ and it corresponds to a 200% (i.e. 100% long and 100% short) active exposure. The frontiers are indistinguishable at volatility levels below 1%, after which, the long only strategy becomes inferior to the market-neutral strategies as constraints are hit and the linear relationship breaks down. In the case of market-neutral investing, due to flexibility to leverage, greater risk tolerance does not lead to less reward per unit of risk. This makes market-neutral investing particularly valuable at levels of risk in excess of 2-3 %.

⁸ For ease of demonstrating leverage features, we associate the same information set to the long only strategy even though such strategy is unlikely to benefit from double alpha due to lack of flexibility on the short-side.

⁹ Barra (1999), “Part I The case for Market Neutral”, J. Lejonvarn and C. Lekander

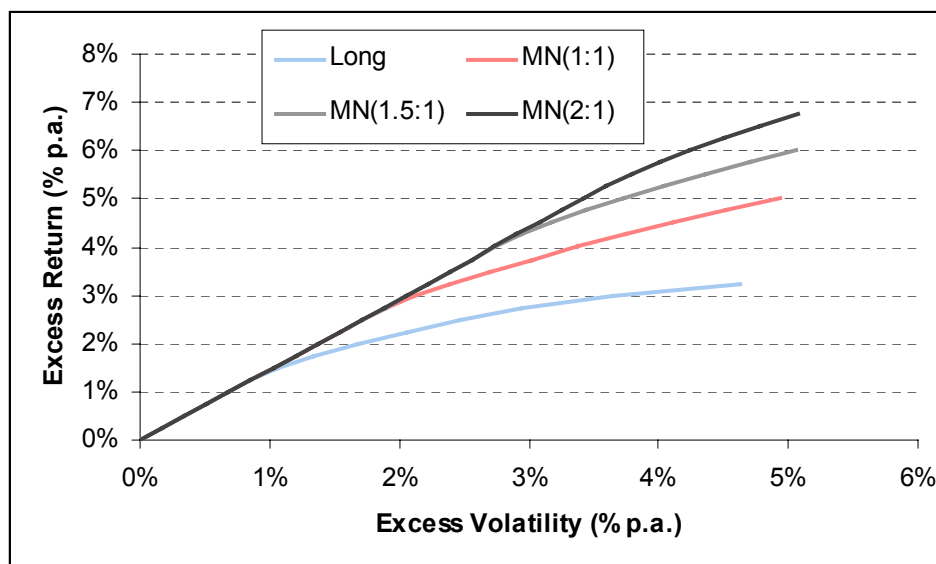


Fig 2: Impact of Leverage on Excess Risk / Excess Return Efficient Frontiers: DF3

THE ROLE OF MARKET-NEUTRAL INVESTMENT STYLE IN INSTITUTIONAL PORTFOLIOS

Over the last few years in the US and in the UK there has been an increasing trend towards a core and satellite approach. A core portfolio would usually be a passively run portfolio benefiting from low risk relative to an index benchmark at a low cost. The satellite or specialist portfolio management aims to deliver high performance at a cost of higher risk, turnover and fees.

This core satellite approach contrasts with the more traditional balanced portfolio approach where all assets (stocks, bonds, cash, currencies) are invested in the unified way by a single fund manager. Although balanced managers are also interested in including “alternative” asset classes in their portfolios it is in the context of the core satellite approach that market-neutral strategies become particularly easy to apply.

A natural extension of the core satellite approach would be to use a 100% passive portfolio, invested in line with the fund’s benchmark, supplemented with a market-neutral strategy. In this case, the market-neutral strategy can be considered an “active overlay”. By investing cash proceeds of the short sale into the strategic benchmark the total performance will be a performance of the benchmark *plus* the performance of the market-neutral strategy. The alpha from a market-neutral strategy can be exported anywhere hence the term “portable alpha”, de-linking the active skill and the benchmark. This should improve the ultimate investors return/risk trade off as they are no longer limited to investment skill in their chosen strategic asset classes. A further advantage of the strategy is that because it is skill based the degree of the correlation with the rest of the assets in an institutional portfolio will be very low (i.e. it should be close to 0). The overlay strategy is fully flexible as it allows risk targeting in line with the client risk tolerance requirement.

The following chart demonstrates the improvement in risk/return trade-off by adding a low risk market-neutral strategy to a portfolio of cash, bonds and stocks.¹⁰ We select our portfolio using a “shortfall” criterion – that is, the portfolio which is on the efficient frontier and has a 5% probability of shortfall. In this way we choose portfolio A which is invested 65% in cash, 25% in bonds and 10% in equity. In the second optimisation we include market-neutral as a possible asset. We can see that the difference between the two frontiers widens as risk increases and the exposure to the market-neutral strategy increases. Portfolio B is selected using the same shortfall criterion as portfolio A and has the same asset class exposure. However, the key difference between B and A is that, in addition to 100% invested into the strategic benchmark, B has 40% exposure to the market-neutral strategy. As a result its expected return is 1% greater than that of portfolio A.

This example illustrates the fourth degree of freedom, namely flexibility to choose the benchmark, as well as the third: that is, flexibility to choose the active exposure to market-neutral strategies.

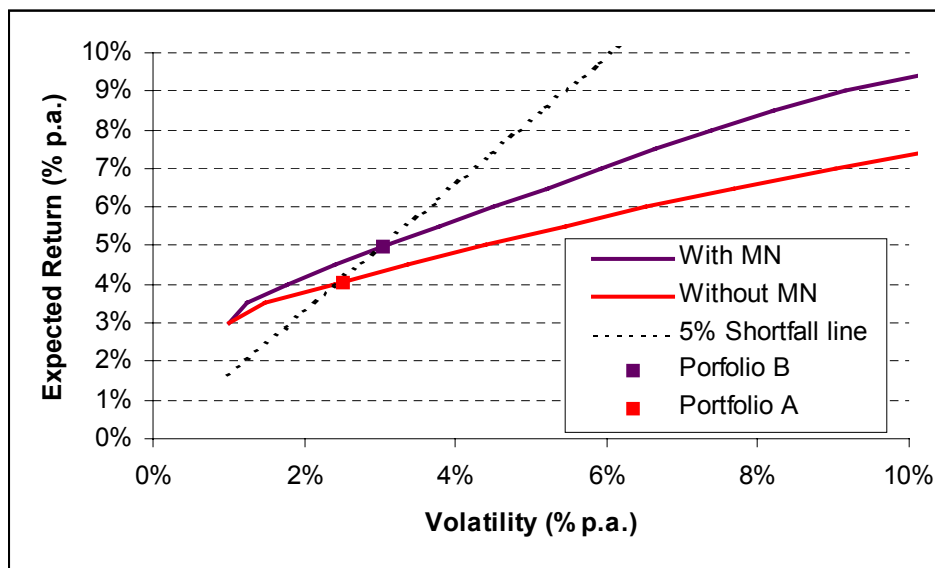


Fig 3: DF4 - Market Neutral and the Strategic Benchmark

We quote Barry Riley of the Financial Times who recently wrote¹¹:

“Quite a few UK pension plans are on the lookout for something different. This is partly because many of them have become disillusioned with the performances of the dominant

¹⁰ We make conservative assumption that market neutral overlay has an annual return of 2.5% at 5% annual volatility. The other asset assumptions are available on request.

¹¹ "If beta flags, try alpha" by Barry Riley – The Financial Times 27/1/1999

traditional managers. And they are not persuaded that simply switching to another balanced manager will solve the problem of disappointed expectations.

Pension funds have had no difficulty in achieving their target return of about 6% real. From this point in time, however, future returns look more problematical. Real returns on long gilts are only about 2%. On the formula of dividend yield plus trend economic growth, the prospective real return on UK equities is 4½-5% against the achieved 8% over the past 80 years. Conceivably, the good times could roll on for another year or two. But more funds are ready to look at alternative strategies for the long run.”

Indeed market-neutral strategies may well be suitable as the performance is skill based (as measured by Information Ratio) and volatility dependant rather than dependent on future asset class returns. (We invert the information ratio formulae to show this:

$$\alpha_{mn} = IR_{mn} \sigma_{mn}).$$

IMPLEMENTATION OF MARKET-NEUTRAL STRATEGIES

To set up a market-neutral strategy using a hedge fund, typically, an agreement (such as an Overseas Securities Lender's Agreement or OSLA) would be struck between the market-neutral fund manager and a prime broker. The prime broker simultaneously acts as a custodian and a clearer to the fund. The prime broker will usually hold all the long stocks and also the cash available from selling short the stocks borrowed¹².

Operationally, the long positions are the same as for any conventional long only portfolio. On the short-side, first, a search for the required basket of stocks would be carried out (sometimes, no lender can be found for a particular stock) and then that stock would be sold. Investment positions of the investment manager and the prime broker would be reconciled daily. Charges usually take the form of commission, bid-offer spread and borrowing costs.

An alternative to constructing the portfolio by buying and selling physical stocks would be to use equity swaps. They allow investors either a positive or a negative exposure to a particular stock or a basket of stocks, without the need to deal in the underlying market. Being long by entering an equity swap implies receiving the gross return on the stock (plus dividend) and paying interest to the broker. Being short by entering a swap means paying the return on the stock and receiving interest less the borrowing costs. Typically, prime brokers will require 10-20% of the market value of the stock by way of an initial margin for 100% exposure regardless of whether that exposure is long or short (so if we sell and buy two stocks we would need at least 10% + 10% = 20% in total). The portfolio would need to be marked to market each day.

¹² It is tempting to neutralise market risk of a long portfolio by shorting the benchmark future. However, performance of such strategies will not benefit from short-side flexibilities (leading to double alpha) or, at higher levels of risk, the use of leverage (i.e. DF 1,2 and 3). Furthermore such, strategies are limited in their benchmark flexibility (DF 4).

The stock borrowing costs can be significant (e.g. in continental Europe even for blue chip companies they can be in excess of 100bps p.a.). The borrowing costs could be reduced if index futures significantly representative of the “short” portfolio can be found. Some individual stock selling would still be needed – i.e. where the required (short) position in the stock is in excess of its weight in the index, this stock will have to be sold to reflect the difference and where the required position in the stock is below its weight in the index, some positive adjustment to this stock would be required.

The situation is further complicated in the multinational context as there are further risks to consider, namely currency and country risk exposures. Country risk could be removed in the portfolio construction process¹³. Currency risks can be hedged away using currency forwards (low cost, but involves counterparty risk) or currency futures (higher cost but exchange traded so no counterparty risk). Portfolio construction should also deal with sector and factor (e.g. size, value/growth) risk exposures.

CONCLUSION

We have shown how market-neutral investing benefits from four extra degrees of freedom:

- Flexibility to short assets outside the benchmark
- Flexibility to freely select weights of the short portfolio
- Flexibility to choose the level of active exposure (leverage)
- Flexibility to select the strategic benchmark

We have shown how these degrees of freedom can be exploited. The market-neutral information ratio can be improved by targeting low “long-short” alpha correlation and a high “short-side” information ratio. Leverage can be used as a tool to increase return expectation without having to worsen the risk return trade-off. (As a rule of thumb, market-neutral strategies become particularly useful at levels of active risk in excess of 2-3% and leverage in excess of 1.5:1) The strategic benchmark can be re-engineered and derived in conjunction with market-neutral degree of leverage (underleverage).

The positive factors are offset by:

- High transaction and stock borrowing costs
- Short-side liquidity costs
- Theoretically unlimited downside risk (even though for practical purposes this risk is negligible in a well diversified portfolio)
- High set up and running costs resulting in higher management fees than in the long only case

¹³ Country futures can also be used to hedge country risks but they would introduce further biases in the portfolio.

Overall, a skillful market-neutral manager can exploit the four degrees of freedom to more than offset these negative factors and generate useful risk-net return trade-offs for the client. Market-neutral investing has some benefits for an equity asset class investor, but as the 100% equity benchmark is already given, the disadvantages above could well outweigh the flexibilities on the short-side. The market-neutral style is most likely to be suitable for investors seeking absolute returns (cash benchmark), leveraged returns and where a flexible benchmark is required. Hence it fits well with an institutional core satellite approach.