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A FUNDAMENTAL PREFERENCES MODEL OF EQUITY SHARE RETURNS

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SUMMARY

The paper develops a new model for equity share returns that is based on share price changes being the complex resultant of investor preferences relating not only to expected future earnings growth but also to specific generic attributes that investors take into account when deciding which shares to buy or sell. A growth/rating utility ranking measure that is predicated on acute disequilibrium being the rule rather than the exception in stockmarket behaviour is shown to be a very powerful predictor function for future equity share returns and accordingly constitutes the value-driven kernel of the new model. It is shown that the new model not only explains many facets of real world stockmarket behaviour that are still the subject of controversy within modern finance theory but also provides a common sense practical framework for equity portfolio management that appears to be far more powerful than any rival framework based on the principles of modern finance theory.

> "For the investigation of the laws of history, we must completely change the subject of observations, must let kings and ministers and generals alone, and study the homogeneous, infinitesimal elements by which masses are led."
>
> Tolstoy

1. INTRODUCTION

1.1 *Objective*

The objective of this paper is to develop a new model for the price formation process within equity markets that is based on empirical evidence relating to investor preferences rather than on abstract, and possibly unrealistic, concepts such as rational behaviour, mean-variance efficiency, perfect information, and the absence of arbitrage opportunities.

1.2 *Adam Smith on Fundamental Preferences*

In "The Wealth of Nations", Adam Smith begins his painstaking analysis of the factors that determine rates of wages and profit with the following observation:

> "If in the same neighbourhood there was any employment evidently more advantageous than the rest, so many people would crowd into it in the one case, and so many would desert it in the other, that its advantages would soon return to the level of other employments."

Smith concludes that there are two classes of preferences which account for observed rates of wages and profit - those which are real in that they correspond to genuine characteristics (such as the unpleasantness of a trade or the cost and time required to train for it), and those which exist "only in the minds of men". The present paper follows a similar empirical approach in the case of observed price behaviour within equity markets with a view to identifying which fundamental investor preferences, whether justified by any currently accepted scientific theory of human behaviour or not, actually determine share price movements.

1.3 *The Financial Economics Approach*

The financial economics approach, on the other hand, assumes that, as least as a good first approximation, share prices can be regarded as being in equilibrium as a result of some type of rational behaviour on the part of the majority of investors and that any mispricings can be identified by comparing the actual price at a particular time to the "fair value" price obtained in terms of the best statistical fit at that point in time.

Extensive empirical studies in the sixties that were based on this approach suggested that exploitable mispricings could not be identified on a regular basis, giving rise to the Efficient Market Hypothesis and to the belief on the part of many financial economists that fundamental analysis could not enhance portfolio returns and hence that a mean-variance optimisation framework represented the only scientific approach to equity portfolio management.

1.4 *Anomalous Behaviour*

Both the actuarial literature and the financial economics literature now contain numerous studies which suggest that the key assumptions and teachings of modern finance theory are fatally flawed. For example, Mandelbrot (1963) shows that the statistical behaviour of share price movements is quite different from what had previously been assumed; fundamental share selection models described by Weaver & Hall (1967) and Clarkson (1981) have strong predictive powers as regards long term returns; the mean absolute deviation approach described by Plymen & Prevett (1972) can detect strong cyclical patterns and can be used to enhance investment returns; Shiller (1989) shows that the observed volatility of share price returns is vastly in excess of what would be expected in terms of rational behaviour models; Peters (1991) describes a "long term memory" effect which is inconsistent with the teachings of modern finance theory; Fama & French (1992) and Haugen & Baker (1996) describe the strong predictive powers of certain factor models; and, in an empirical study going back more than 40 years, O'Shaughnessy (1996) shows that investors tend to overreact systematically to certain important fundamental attributes such as historic earnings growth.

1.5 *Limitations of the Human Mind*

The unaided human mind, while immensely powerful in certain crucial areas such as pattern recognition, is very weak in essentially numerical areas such as the comparison of different investment opportunities involving future uncertainty. For example, Keynes (1936) concludes that:

> "Human decisions affecting the future, whether personal or political or economic, cannot depend on strict mathematical expectation, since the basis for making such calculations does not exist; it is our innate urge to activity which makes the wheels go round, our rational selves choosing between the alternatives as best we are able, calculating where we can but often falling back for our motive on whim or sentiment or chance",

and Von Neumann & Morgenstern (1944), the foundation work of modern utility theory, contains an even more pessimistic observation:

> "Evidently the common individual, whose behavior one wants to describe, does not measure his utilities exactly but rather conducts his economic activities in a sphere of considerable haziness".

1.6 *Reasoned Self-Interest Behaviour*

Adam Smith describes the immense power of his "invisible hand" economic force of individual self-interest as follows:

> "The natural effort of every individual to better his own condition, when suffered to exert itself with freedom and security, is so powerful, that it is alone, and without any assistance, not only capable of carrying on the society to wealth and prosperity, but of surmounting a hundred impertinent obstructions with which the folly of human laws too often encumbers its operations".

The present paper similarly assumes that the price formation process within equity markets is driven by the self-interest buying and selling actions of different investors. Accordingly, the new model is based on the assumption of "reasoned self-interest behaviour", which embraces not only the strong self-interest motivation but also the realisation that the reasoning underlying specific decisions to buy or sell will in general be seriously incomplete and will often be wrong.

1.7 *Scientific Paradigms*

Kuhn (1970) suggests that successively better scientific explanations involve quantum leaps in "levels of understanding" rather than the continuing refinement of any one paradigm of scientific thought. The present paper puts forward for discussion a new paradigm for the price formation process within equity markets, the suggested quantum leap being the abandonment of the rational behaviour and mean-variance cornerstones of modern finance theory and their replacement by empirical studies, along actuarial lines, of actual share price behaviour.

1.8 *Structure of the Paper*

Section 2 gives an overview of the "strategy investment" approach described in Clarkson (1997b, 1998) and in particular describes two previously undetected elements of share price cyclicality. After the utility approach underlying "strategy investment" has been generalised in Section 3, other fundamental investor preferences - some of which are essentially qualitative rather than quantitative in nature - are discussed in Section 4. The fundamental preferences model is then developed in Section 5, and in Section 6 it is shown how this new model can successfully explain many patterns of observed price behaviour (such as the "excess

volatility" phenomenon) that are inconsistent with the teachings of modern finance theory. Some might claim that if a new and better scientific theory of equity share price movements existed then it would have been discovered long before now. However, the astronomy parallel of the geocentric Ptolemaic system displacing for nearly two thousand years the "correct" and ultimately victorious heliocentric system demonstrates that the vector of genuine scientific progress does not always move forward with time. Accordingly, Section 7 describes some parallels between our understanding of the physical world and our understanding of equity share price returns. Finally, Section 8 sets out some general conclusions as to the practical merits of the new fundamental preferences model.

2. STRATEGY INVESTMENT RESULTS

2.1 *General Approach*

The starting point of the strategy investment approach described in Clarkson (1997b, 1998) is the realisation that the future is highly uncertain and that investors, while endeavouring through very strong self-interest motives to act in an anticipative manner that might be called "intelligent", often make three quite different types of systematic mistakes in their investment reasoning. They sometimes place far too much reliance on the future being similar to the recent past, they sometimes get caught up collectively in fads and fashions and thereby drive share prices to dizzy and unsustainable heights, and they sometimes adopt a collective "once bitten twice shy" mentality after some unexpected bad news and thereby drive share prices to unrealistically depressed ratings. In particular, if a "high growth" company on a very demanding price-earnings ratio announces earnings growth that, while still well above average, is less than the consensus expectation, an exceptionally severe price setback often occurs. Conversely, if an unfashionable company on a very low rating announces better than expected results, analysts and investors often jump prematurely to the conclusion that is has entered a "growth phase" and accordingly deserves a higher rating. The combination of higher earnings and a higher price-earnings ratio then leads to a very dramatic price rise. This asymmetric price response to symmetric variations between actual and expected earnings implies a strong bias towards long term underperformance for highly rated shares and long term outperformance for lowly rated shares. The central feature of the strategy investment approach is to rank shares in order of attractiveness using a utility function with a very strong bias or tilt that is designed to exploit both the "short-termism" and the "systematic irrationality" of the typical investor.

2.2 *Pilot Tests*

To test this new approach in general and the conjectured asymmetric price response in particular, two sets of UK stocks - the FTSE-100 constituents and 71 other major

stocks - were analysed as at 29th July 1996. To ensure reasonably homogeneous samples, companies with serious setbacks in earnings, either over the past few years or on future projections, were excluded from the analysis, as were investment trusts and property companies. The remaining companies in each set were partitioned into five equal subsets in terms of prospective price-earnings ratio twelve months hence using "real time" earnings per share. Within each subset, the shares with high expected earnings growth over the next twelve months can be regarded as relatively cheap and similarly the shares with low expected earnings growth can be regarded as dear. For an equity market in equilibrium, the "top 10" shares would comprise the two from each subset with the highest expected earnings growth, while the "bottom 10" shares would comprise the two from each subset with the lowest expected earnings growth. Given the conjectured asymmetry, a more effective "top 10" should be obtained by taking the top four shares in terms of earnings growth from the lowest price-earnings subset, the top three from the next subset, and top two from the middle subset, and one from the second highest price-earnings subset. The "bottom 10" would be obtained similarly, starting with the bottom four shares in terms earnings growth from the subset with the highest price-earnings ratios. For the FTSE-100 companies, the capital performances relative to the FTSE All-Share Index are summarised at various durations in Table 1 below on both the "level" basis corresponding to equilibrium and on the "diagonal" basis designed to exploit the conjectured asymmetric price response.

TABLE 1

RELATIVE PERFORMANCE OF SELECTED FTSE-100 STOCKS

	LEVEL BASIS		DIAGONAL BASIS	
Duration	Top 10	Bottom 10	Top 10	Bottom 10
3 months	103.6	97.9	104.8	96.3
6 months	101.0	97.2	107.4	90.4
9 months	100.9	97.5	111.1	90.6

These results represent exceptionally strong evidence that the conjectured asymmetric price response provides a far more realistic framework for equity share returns than the constructs of modern finance theory such as the Capital Asset Pricing Model and Arbitrage Pricing Theory which are predicated on assumptions of equilibrium and the absence of arbitrage opportunities. O'Shaughnessy (1996) reports similar results, and derives identical conclusions, in the context of US stockmarket behaviour.

2.3 *The "Group of 70"*

It is very desirable to construct a homogeneous group of "high quality" companies for further analysis. Accordingly, decision rules were constructed to obtain at each selection date a constant number of FTSE-100 constituents that might be considered for long term investment on earnings growth considerations. First, property companies and investment trusts, where the shares are normally assessed on a net assets per share basis, are excluded. Second, those companies are excluded for which there is a loss or a fall of more than 50% in earnings per share in the period of five years consisting of the last three reported financial years and the next two years on consensus stockbroker estimates. Third, further exclusions - to reduce the group to 70 in number - are made of those companies with the poorest quality of earnings, as measured by the largest fall in earnings per share within this period of five years subject to a very high weighting being applied to forecast falls in earnings per share on a "real time" basis over the next 12 months.

2.4 *Utility Rankings*

The partitioning approach for selecting the "top 10" and "bottom 10" companies, while powerful enough for the pilot tests, clearly lacks mathematical rigour. Accordingly, a broadly equivalent utility measure U(G,R,c) was devised, where G is the forecast growth in earnings per share over the next 12 months, R is the prospective price-earnings ratio 12 months hence, and c is an optimality parameter. This utility measure provides a complete ordering of the "Group of 70" companies, from rank 1 (most attractive) to rank 70 (least attractive) in terms of expected future share price performance.

2.5 *Relative Performance Profiles*

The continuous performance investigation described in Clarkson (1998) applies the approach set out in Sections 2.3 and 2.4 at monthly intervals from the beginning of June 1997 to the beginning of May 1998, giving 12 "cohorts" of monthly selections of FTSE-100 stocks in terms of disequilibrium utility ranks which reflect the strong asymmetry of price response detected in the pilot studies. The results are summarised in Table 2, which shows, for durations of 3, 6, 9 and 12 months from the selection date, the average capital performance relative to the FTSE All-Share Index of the "top 10", "top 20", "top 30" and "top 40" stocks in terms of disequilibrium utility ranks.

TABLE 2

AVERAGE RELATIVE PERFORMANCE OF "GROUP OF 70" FTSE-100 STOCKS

Duration	Observations	Top 10	Top 20	Top 30	Top 40
3 months	10	101.7	101.3	101.9	101.7
6 months	7	103.7	103.8	102.6	101.9
9 months	4	110.5	108.1	105.7	104.7
12 months	1	115.2	112.0	108.7	109.1

The degree of outperformance, which increases - as would be expected - as the number of stocks decreases but which also increases - as might not be expected - over the medium term of up to 12 months from selection, is quite remarkable. For instance, an equally weighted portfolio of the 40 most attractive FTSE-100 stocks in terms of utility rank shows an average relative outperformance to date of almost 5% over 9 months.

2.6 *Risk Profiles*

Those whose training has involved any significant exposure to the teachings of modern finance theory may suggest that this apparently superior performance could only have been achieved by accepting far higher than average levels of risk. But on any common sense approach to risk, which in this instance must relate to both the observed probability and the observed magnitude of any underperformance of the FTSE All-Share Index, this is simply not the case. Bawa & Lindenberg (1977) and many other financial economists recommend a downside approach to risk using lower partial moments, but this is still highly unsatisfactory in that it measures shortfalls from the mean portfolio return rather than from the obvious benchmark of the market return. A far better conceptual approach, as suggested in Clarkson (1989, 1990) is to use the root mean square shortfall in relative performance. The commonly used standard deviation of return, on the other hand, is essentially the root mean square deviation, whether positive (and hence "good") or negative (and hence "bad") about the mean return, which could be either above or below the market return. The nul hypothesis, corresponding to the "risk increases with expected return" cornerstone of modern finance theory, is now that risk - as measured by the root mean square shortfall in relative performance - increases as the relative performance increases for successively smaller numbers of "attractive" shares. The root mean square shortfall risk values are set out in Table 3, and correspond to the relative performance data in Table 2.

TABLE 3

ROOT MEAN SQUARE SHORTFALL RISK VALUES

Duration	Observations	Top 10	Top 20	Top 30	Top 40
3 months	10	2.7	1.7	1.1	0.5
6 months	7	0.1	0.0	0.0	0.0
9 months	4	0.0	0.0	0.0	0.0
12 months	1	0.0	0.0	0.0	0.0

Only at 3 months from selection, where the average outperformances of the "top 10", "top 20", "top 30" and "top 40" are very similar, does risk increase as the number of shares decreases. At durations of 6 months and more the risk is - for all practical purposes - zero, and accordingly the increase in expected return as the number of shares decreases does not involve higher risk.

2.7 *Efficiency Ratios*

It is well known that the efficiency of even a fairly sophisticated steam engine is very low, perhaps around 15% or so, by which we mean that only 15% of the calorific energy generated by burning the fuel is converted into effective motive energy. It would be most illuminating if we could devise a similar efficiency ratio for stockmarket behaviour to measure the effectiveness with which the variability of stock prices is converted into above average relative performance. Suppose that, for a particular universe of stocks available for investment, the "best 30" on some stock selection procedure produce an average performance over a given holding period which is 5% in excess of the overall average return, whereas the 30 stocks that, with hindsight, had the highest returns over the period outperformed by 25%. Then for the selected group of "top 30" stocks the hindsight efficiency ratio is 20%, in that 20% of the theoretical maximum outperformance of 25% for an equally weighted buy-and-hold portfolio of 30 stocks has been converted into the actual relative outperformance of 5%. The Efficient Market Hypothesis implies that there is no stock selection procedure for which this hindsight efficiency ratio - which is a function both of the cut-off number of "most attractive" stocks and of the holding period - is significantly and consistently greater than zero. Most financial economists, while now accepting that capital markets might not always be completely efficient, still believe that exploitable inefficiencies will not only be difficult to find but will also be short-lived in nature. A typical exposition of this present day viewpoint is given by Asher (1998):

> "If investment markets were perfectly efficient in processing new information and adjusting prices accordingly, then it would be impossible to outperform the market except by luck. If, on the other hand, there are inefficiencies then

a good investment manager can act before the prices respond to new information. Such delays are likely to be relatively short, so the wisdom of a particular transaction should soon be apparent. It would, in fact, be surprising if an investment manager saw opportunities more than a few weeks before the market price responded."

The nul hypothesis corresponding to this "no arbitrage" cornerstone of modern finance theory is that, for intensively researched stocks such as the constituents of the FTSE-100 Index, the hindsight efficiency ratios defined above will seldom attain values significantly and consistently greater than zero and that any such positive ratios will reach their maximum values within a few weeks. The reality of the situation when the disequilibrium utility rank is used as the predictor variable for the future relative performance of "Group of 70" FTSE-100 stocks is shown in Table 4.

TABLE 4

AVERAGE HINDSIGHT EFFICIENCY RATIO FOR "GROUP OF 70" FTSE-100 STOCKS

Duration	Observations	Top 10	Top 20	Top 30	Top 40
		%	%	%	%
3 months	10	8.5	9.4	18.5	19.2
6 months	7	13.5	24.7	17.4	17.1
9 months	4	25.9	27.4	23.9	24.6
12 months	1	32.1	36.2	33.1	47.7

Not only are the ratios astonishingly high, but they also exhibit a steadily increasing trend up to durations of 12 months. Accordingly, the "no arbitrage" nul hypothesis of modern finance theory must, again without any possible shadow of doubt, be rejected.

2.8 *Quality-Driven and Liquidity-Driven Behaviour*

It might have been thought that the very high variability of equity share returns of "Group of 70" companies was essentially random in nature at the individual company level. However, when the performance results were calculated and then compiled on a weekly basis from the beginning of June 1997 onwards it soon became clear that there were two quite different sources of systematic variability. The first was a very strong quality-driven effect whereby, in times of acute investor uncertainty such as at the onset of the Asian crisis in the autumn of 1997, shares in solid "blue chip" companies such as Glaxo Wellcome, Shell and Unilever tended to

outperform companies such as Ladbroke, LucasVarity and Rolls-Royce which, although attractive on forward-looking earnings considerations, were perceived to be of lower quality in terms of being able to withstand adverse economic conditions without serious long term damage. The second was a moderately strong liquidity-driven effect whereby, once a strong market trend became established, the highly liquid large capitalisation stocks, again such as Glaxo Wellcome, Shell and Unilever, would outperform or underperform respectively since the over-riding priority of many investors was either to put money into a rising market or to take money out of a falling market; relative value considerations were temporarily accorded a far lower priority. A more detailed description of the periodicity and magnitude of these two systematic effects is given in Clarkson (1998).

3. THE UTILITY OF GROWTH

3.1 *Adam Smith Utility*

Adam Smith's use of the word "utility" as applied to any social sciences framework can be interpreted as meaning "practical usefulness as a frame of reference for intelligent and successful human behaviour in the face of future uncertainty". We can accordingly obtain two "Adam Smith utility" axioms relating to future equity share returns; the first is obvious, and the second reflects the strong asymmetry of price response discussed in Section 2.2.

Axiom 1
For equity shares on the same current or prospective price-earnings ratio, utility increases with the likely future growth in earnings per share.

Axiom 2
For equity shares with the same likely future growth in earnings per share, utility decreases very rapidly as the current or prospective price-earnings ratio increases.

3.2 *Complete Orderings*

We now invoke present day utility theory and postulate the existence of a utility function U(G,R), G being the forecast earnings growth rate and R being the current or prospective price-earnings ratio, which satisfies the Von Neumann & Morgenstern (1944) utility theory axioms. The undernoted partial differential inequalities follow immediately from the above "Adam Smith utility" considerations:

$$\frac{\partial U}{\partial G} > 0,$$

and

$$\frac{\partial U}{\partial R} << 0.$$

If a practical utility function with these general properties can be found, the resulting "complete ordering" of equity shares in terms of expected future price performance will overcome many of the computational limitations of the unaided human brain discussed in Section 1.5. The way forward now lies in finding a tractable utility function U(G,R) which not only satisfies these two partial differential inequalities but is also optimal in the sense of having the maximum predictive power as regards future equity share returns.

3.3 *Fixed Period Comparisons*

Consistent with the general scientific principle of "dividing difficulties", it is highly convenient to assume in the first instance that all investors assess equity shares on the forecast prospective price-earnings ratio at the end of some fixed period. The underlying simplifying assumptions, such as the earnings growth rates for all companies being identical beyond the fixed period horizon, can then be relaxed one by one to obtain a more realistic model.

3.4 *Varying Investment Horizons*

Many investors assess equity shares on the basis of profits and earnings per share that will be reported in the near future, while others take into account forecasts a year or two into the future. A very limited number of investors, using a dividend discount model or similar structured approach, base their decisions on expected earnings and dividend growth over a period of five years or more.

3.5 *Varying Knowledge Bases*

The "perfect information" assumption of modern finance theory conveniently ignores the very real cost/benefit and budget considerations that preclude many institutional investors and virtually all private investors from having access to potentially useful investment research that is "publicly available". Accordingly, it must be recognised

that different investors will base their decisions on widely differing knowledge bases and accordingly will often reach diametrically opposed investment conclusions.

3.6 *General Properties*

Given the varying investment horizons and the varying knowledge bases, the utility ranking function can be regarded as the resultant of the (purely hypothetical) corresponding utility function of each investor, weighted by the scale of operation of each investor. Practical experience of the behaviour of various classes of investor suggests that the effective horizon of the resultant utility function will be fairly short, and probably less than a year. Clearly this utility function can only reflect or predict average behaviour in the same way as mortality rates used in the practice of life assurance and pensions business can only predict the average mortality of a group of lives of the same age.

3.7 *A Specific Utility Measure*

A specific utility measure which is computationally convenient, satisfies the partial differential conditions in Section 3.2, and is broadly equivalent to the "diagonal" basis of the pilot tests is:

$$U(G,R,c) = G - cR,$$

where G is the forecast growth in earnings on a real-time basis to 12 months hence, R is the prospective price-earnings ratio 12 months hence, and c is a positive constant. The absolute value of utility is irrelevant since it is only rankings that are required.

3.8 *Optimality*

The optimal value of c as regards predictive or explanatory power can only be obtained by empirical testing. In the course of the strategy investment analysis described in Section 2 it was found that the predictive power as measured by the hindsight efficiency ratios was almost constant over a surprisingly broad band of values of c.

4. GENERIC PREFERENCES

4.1 *Perceived Quality*

It is clear from the strategy investment results that "perceived quality" in terms of being able to withstand adverse economic conditions without serious long term damage is not only a key factor in many buy/sell decisions but also that its importance rises considerably in times of acute investor nervousness. Accordingly,

this switch from "value-driven" to "quality-driven" behaviour generates very high price volatility that does not, at first sight, appear to be justified by "new information".

4.2 *Liquidity*

As described in Section 2.8, the understandable preference for liquidity in periods of rapidly moving markets can over the short term of two or three weeks distort the general price trends caused by the "value-driven" behaviour encapsulated in, and predicted by, the growth/rating utility rankings.

4.3 *Momentum*

There are two general reasons why - as confirmed both by O'Shaughnessy (1996) and the success of mean absolute deviation analysis - a rising or falling price trend tends to continue longer than equilibrium-based theories would suggest. First, institutional investors cannot change their portfolios overnight, and the buying or selling of part of their holdings that led to recent price trends often continues over the medium term. Second, the financial press tends to "explain" recent behaviour in terms of a bias towards "good" background conditions when prices have risen and towards "bad" background conditions when prices have fallen, thereby perpetuating the price trend.

4.4 *Size*

Many investors restrict their holdings to the largest and most widely researched companies. Accordingly, smaller companies, such as those outside the FTSE-100 Index, may be neglected by most investors despite being attractive on growth/rating considerations.

4.5 *Concept*

Many investors, both institutional and private, will often assess "new" investment opportunities on a one-off "yes/no" basis on the psychological and emotional appeal of the concept rather than on a reasoned growth/rating assessment against all other investment opportunities at the time. For example, the "blue sky" marketing messages for carefully timed launches of new investment themes such as "emerging markets" and "European privatisation" often generate initial premiums to net asset value for the shares of investment trusts exploiting these exciting new opportunities; the "unexpected" economic and political vicissitudes that tend to occur within a few years thereafter can translate into discounts to net asset value of the order of 20% and a highly unsatisfactory investment return. Another manifestation of this "concept" behaviour is the understandable, but often myopic, belief that investment in the

shares of perceived "long term growth" companies is justifiable regardless of medium term growth/rating considerations. Not surprisingly, shares in the three largest UK pharmaceutical companies - Glaxo Wellcome, SmithKline Beecham and Zeneca - tend to be very unattractive in terms of the unemotional utility ranking basis described in Section 3.

4.6 *Dividends*

Many institutional investors, particularly registered charities, trust funds, and high yield unit trusts, have an over-riding requirement to obtain on their equity portfolios a higher dividend yield than that of the broad market index. Also, many private investors regard equity dividends as "spendable" without reducing the real capital value of their long term equity investment, and accordingly will have a strong preference for shares that give a higher than average dividend yield. This preference for dividend yield over capital appreciation on the part of many investors is consistent with the behaviour of the fitted dividend payout ratio parameter in the Clarkson (1981) equity selection model but is inconsistent with the "dividend irrelevance" conjecture of modern finance theory.

4.7 *Ethicality*

A significant number of institutional investors, particularly churches, registered charities, and "ethical" unit trusts, are precluded from investing in companies with any significant involvement in armaments, tobacco, or alcohol. Also, some investors will not invest in companies which are perceived to be spoiling the environment or failing to meet certain standards of corporate governance. Again these ethicality preferences can over-ride the so-called rational behaviour postulates of modern finance theory.

4.8 *Familiarity*

Investors who are distrustful of equity investment in general often feel much more confident about investment in companies which impress them either in customer value or in the quality of customer care. Not unreasonably, they associate these positive personal experience attributes with the likelihood of the company prospering in the long term. These familiarity preferences tend to cause the shares of major UK "household name" companies such as Marks & Spencer, Safeway, Sainsbury and Tesco to stand on premium ratings as compared to what might be expected on impersonal growth/rating utility rankings.

5. THE FUNDAMENTAL PREFERENCES MODEL

5.1 *The Market Index as "Central Value"*

Adam Smith explains how market prices fluctuate around the central value represented by the "natural price" corresponding to the present day concept of "fair value":

> "The natural price is, as it were, the central price, to which the prices of all commodities are continually gravitating. Different accidents may sometimes keep them suspended a good deal above it, and sometimes force them down even somewhat below it".

The "general reasoning" statement of the new model is accordingly that while a growth/rating utility measure predicated on acute disequilibrium is the best predictor function for performance relative to the market index, there are numerous generic attributes - the 8 most important of which are described in Section 4 - which investors take into account, often in a qualitative if not highly emotional manner, when deciding which shares to buy or sell.

5.2 *The Descriptive Model*

This "general reasoning" statement can, in an obvious notation, be translated directly into the following expression for the price change of the nth share in the market over some future time period:

$$\Delta P_n = \Delta I + U(G_n, R_n, c) + Q_n + L_n + M_n + S_n + C_n + D_n + E_n + F_n + \ldots$$

where it is assumed that the utility and preference attributes are "normalised" so that the portfolio represented by the broad market index has zero value in each case. The initial values for P_n, the price of the nth stock, and I, the market index, can without loss of generality be taken to have unit value. The 8 generic preference terms correspond to the factors discussed in Section 4 (Q = perceived quality, L = liquidity, etc.), and a crucial feature is that their absolute values can vary with time as well as with the underlying company characteristics. Similarly, the absolute value of the utility function will decrease at times when investors in the aggregate increase the importance they attach to quality or liquidity at the expense of fundamental value on a forward-looking basis.

5.3 *A Predictive Model*

The predictive model corresponding to the strategy investment analysis described in Section 2 is :

$$\Delta P_n = \Delta I + U(G_n, R_n, c)$$

where the utility measure is interpreted as the ranking using the expression:

$$U(G_n,R_n,c) = G_n - cR_n.$$

The generic preference attributes, while "explaining" current prices to some extent, are not used to predict future price trends.

5.4 *Possible Enhancements*

It might be possible to enhance the predictive power over the medium and long term by incorporating into the utility rankings some ranking measure of earnings growth beyond, say, a one year horizon by using the 4-component growth ranking approach described in Clarkson (1981). By taking recent price momentum into account, it might be possible to enhance the short term or medium term predictive power. Also, a small enhancement to predictive power would probably follow from the incorporation of a dividend payout ratio parameter along the lines of that used in the fitting of the Clarkson (1981) equity share model.

6. THE NEW MODEL AND STOCKMARKET REALITY

6.1 *Investor Behaviour*

The "reasoned self-interest behaviour" incorporated in the new model explicitly recognises that:

i) different investors use widely differing investment horizons in their decisions;

ii) different investors have widely differing knowledge;

iii) different investors have widely differing skill levels

iv) many investors, institutional as well as private, base their decisions not on a structured comparison of all available investment opportunities but rather on a few generic preferences, often in a purely qualitative if not highly emotional manner;

and v) investor preferences in the aggregate as between future earnings growth and perceived quality in terms of ability to withstand adverse economic circumstances can change violently in response to unexpected changes in economic and political conditions.

Those with practical experience of the investment world will see this framework as being far more realistic than the "perfect information" and "rational behaviour"

framework of modern finance theory and hence as being far more likely to lead to a practical model that could be used to enhance performance.

6.2 *Expected Return*

The breakthrough in the highly successful three-dimensional gilts model described in Clarkson (1978) was the realisation that the relationship between price and coupon might not be strictly linear as had previously been assumed. Similarly, the strongly asymmetric price response to symmetric variability in factors that drive equity share returns suggests that expected returns which are based on central forecasts - as is invariably the case within modern finance theory - are inappropriate building blocks for any realistic theory of capital market behaviour. Accordingly it seems unlikely that any predictive model which incorporates expected returns on the basis of central forecasts will be able to come anywhere close to matching the hindsight efficiency ratios described in Section 2.7.

6.3 *Optimality*

The key themes of the "certum ex incertis" (certainty out of uncertainties) and the "ad finem fidelis" (faithful to the end) mottos of the Institute of Actuaries and Faculty of Actuaries respectively have now been incorporated in the "making financial sense of the future" description of the role of the UK actuarial profession in present day society. The optimality approach of the predictive fundamental preferences model, which is to maximise predictive power as regards medium term and long term investment returns, is fully consistent with this forward looking philosophy. Optimality in the context of models constructed within the framework of modern finance theory, on the other hand, normally relates to the "best" statistical explanation of market prices at a particular point in time on the assumption (erroneous, as shown conclusively in Section 2) that market prices of intensively researched securities always represent good approximations to "fair value".

6.4 *Speculative Bubbles*

Adam Smith concluded from everyday observations of human behaviour that "the chance of gain is by every man more or less over-valued, and the chance of loss is by most men under-valued". This innate human trait of financial myopia, when acting in conjunction with the generic preference of "concept", can sometimes lead to speculative bubbles which, while emotionally irresistable to almost everyone at the time, are afterwards seen as instances of irrational financial exuberance driven by crowd behaviour. Modern finance theory, on the other hand, denies the existence of such behaviour in that it is inconsistent with the cornerstone assumption of rational behaviour on the part of all economic agents.

6.5 *The Small Company Effect*

While it has been observed that small companies can from time to time outperform larger companies on a systematic basis, no coherent explanation for such behaviour can be found within modern finance theory. However, as illustrated by the following commentary on the UK experience from around 1980, the fundamental preferences model provides a highly plausible explanation of the underlying causal mechanisms. Despite initial scepticism on the part of most economists, the Thatcher government generated strong economic growth in the early eighties. Smaller companies could increase first of all their turnover then their profits far more rapidly in proportionate terms than larger companies, and by around 1983 and 1984 the consequent outperformance in share price performance was - under the "momentum" characteristic - amplified in various ways. Institutional portfolio guidelines were amended to accommodate higher weightings; smaller company unit trusts and investment trusts were launched; more stockbrokers provided research and made markets in smaller companies in line with their own perceived self-interest; and financial press articles about the success of smaller companies added fuel to the fire. When the inevitable economic setback arrived at the end of the eighties, the process went sharply into reverse. Overdependence on a limited product range, combined with poorer financial controls than more mature larger companies, led to many highly publicised profit and share price collapses; the flow of new money first of all stopped and then went into reverse when institutions, some of them very large, reduced their commitment to smaller companies or withdrew completely; some market-makers withdrew, thereby restricting liquidity and amplifying the magnitude of the price falls; and the sentiment of financial press articles turned strongly negative in response to the new trend of poor performance.

6.6 *The Efficient Market Paradox*

A phenomenon that future historians of the social sciences will almost certainly perceive to be as fruitful of research as the Copernican Revolution in the physical sciences is the importance still attached today to the Efficient Market Hypothesis, even although many of the original proponents of the efficiency conjecture now accept, following real world investment experience, that stockmarkets are far from efficient. The fundamental preferences model not only produces practical and exploitable counter-examples but also explains why the so-called "irrefutable scientific evidence" of around 30 years ago was invalid in that the simplifying assumptions on which the results were dependent were inconsistent with the realities of stockmarket behaviour. "Weak level" tests such as spectral analysis assumed that any cyclical effects had constant periodicity and amplitude, whereas "shocks" such as the Asian crisis that began in the Autumn of 1997 are by their very nature unpredictable in terms of both timing and severity. "Semi-strong level" tests of the "event study" variety are simplistic in the extreme in that the data sets usually

include only historic and recently announced factual information rather than, for instance, earnings forecasts to a year or more into the future. Also, the most influential "strong level" tests use the equilibrium-based Capital Asset Pricing Model as the measuring rod, whereas the fundamental preferences model explains why acute disequilibrium is the rule rather than the exception. A fuller discussion on the efficiency saga from the perspective of an investment actuary rather than a financial economist is given in Clarkson (1996, 1997a).

6.7 *Excess Volatility*

Shiller (1989) and others have shown that the observed volatility of both equity market levels and equity share returns relative to the market index are vastly in excess of what would be expected in terms of the modern finance theory teachings that prices are in equilibrium and that all price changes are the result of new information. The fundamental preferences model, on the other hand, shows that there are various generic preferences, particularly perceived quality and liquidity, that generate very high levels of price variability in addition to the "value-driven" variability corresponding to the growth/rating utility component.

6.8 *Mean Reversion and Long Term Memory*

Other manifestations of fatal flaws in modern finance theory descriptions of capital market behaviour are the mean reversion characteristics encapsulated in the Wilkie (1986) stochastic investment model for actuarial projections and the "long term memory" effect that Peters (1991) describes as corresponding to a chaos theory Hurst exponent significantly in excess of 0.5. The mean reversion characteristics identified by Wilkie are a prediction of the fundamental preferences model, while a Hurst exponent in excess of 0.5 is broadly equivalent, as discussed in Clarkson (1996), to the optimal mean absolute deviation multiplier being less than 2. Peters observes that we do not yet have a full model of investor behaviour that explains the general price patterns he describes; the fundamental preferences model fills this vacuum.

7. PARALLELS WITH THE PHYSICAL WORLD

7.1 *"Water Will Find Its Own Level"*

The conjecture that stockmarkets are broadly efficient is often justified by statements to the effect that "if exploitable anomalies existed, then alert traders would recognise them, and, by acting to attempt to profit from them, cause them to disappear". This is similar to arguing that "water will find its own level" as a result of the earth's gravity. However, equilibrium of large bodies of water in terms of a flat surface at a constant level tends to be the exception rather than the rule. Oceans and open seas

exhibit regular tidal variations that are periodic in nature both in frequency and in amplitude; winds often cause surface waves, sometimes of very large amplitude; and essentially random events such as the passing of a ship can temporarily disturb a previously calm surface.

7.2 *Galileo and the Telescope*

Financial economists may claim that extensive empirical investigations of share price returns have failed to detect the value-driven trends described in Section 2 or the quality-driven, liquidity-driven and momentum-driven cyclicality discussed in Sections 4.1, 4.2 and 4.3. There is a clear parallel with the Copernican Revolution in astronomy. The geocentric nature of the Ptolemaic system became untenable when Galileo turned his telescope to the heavens and found incontrovertible evidence in favour of the heliocentric Copernican system. Similarly, the disequilibrium-based actuarial mathematics framework incorporating strategy investment and mean absolute deviation analysis provides an "actuarial telescope" that identifies dynamic patterns of share price behaviour that are unobservable using the equilibrium-based measurement tools of modern finance theory.

7.3 *Roemer and the Speed of Light*

In 1676 the Danish astronomer Roemer, after carefully measuring the times between successive eclipses of the four largest moons of Jupiter, realised that light was not, as had previously been thought, an instantaneous effect but had a measurable speed. A cornerstone of modern finance theory is the supposedly instantaneous manner in which capital market prices react, leading to an equilibrium position where the risk-adjusted returns on all securities are equal and where all price changes are the result of new information. The empirical evidence in Section 2 shows that these crucial teachings are no longer tenable.

7.4 *Newton's Universal Force of Gravity*

One of the most important break-throughs in our understanding of the physical world was Sir Isaac Newton's "universal principle of gravity", which, in Adam Smith's description in his "History of Astronomy", "made the most happy, and, we may now say, the greatest and most admirable improvement that was ever made in philosophy, when he discovered that he could join together the movements of the Planets by so familiar a principle of connection". Similarly, the common sense utility ranking approach described in Section 3, which compares expected futures earnings growth to price-earnings ratio, appears to be the most powerful predictor mechanism yet discovered for the future relative performance of intensively researched stocks.

7.5 *Einstein's Special Theory of Relativity*

In 1905 Einstein produced his Special Theory of Relativity, which expresses, in mathematical language, the fundamental principle that the laws of physics are independent of the frame of reference of the observer. A central feature of the theory is that the speed of light, which is constant to all observers, is a limiting value which cannot be exceeded. In the stockmarket context, we can interpret the "laws of physics" as the evolution of share prices over time, and the "frame of reference of the observer" as the expected return as perceived by one particular investor. The empirical results set out in this paper suggest that the evolution of share prices is an essentially probabilistic phenomenon which is the resultant of the actions of all investors, who differ greatly in the knowledge and skills that they employ in their stock assessment procedures, rather than being predictable in accordance with the knowledge base and selection criteria of any particular investor. Furthermore, the limiting value of the speed of light has as its obvious stock market parallel the eclectic average performance on a hindsight basis of the "top n" stocks that is used as the denominator of the efficiency ratio described in Section 2.7. By far the most important practical application of Einstein's Special Theory of Relativity is the ability to transform mass into energy in accordance with the famous equation:

$$E = mc^2,$$

where E is energy, m is mass, and c is the speed of light. The strategy investment parallel in the context of transforming stock price variability into optimal investment performance is the equation:

$$U = G - cR,$$

where U is the utility measure of the attractiveness of a stock, G is the forecast earnings growth rate, R is the forecast prospective price-earnings ratio, and c is a positive constant which is estimated using an actuarial mathematics approach.

7.6 *Einstein's General Theory of Relativity*

Einstein's General Theory of Relativity, which he proposed in 1915, expresses, in mathematical language, the fact that physical behaviour (including the component of time) in a particular locality is not absolute, but depends, amongst other things, on the quantity of matter in that locality. In particular, gravity is not, as is assumed in classical Newtonian mechanics, an invariant force of attraction dependent only on the masses of, and the distances between, two bodies, but is also dependent on the amounts of mass and energy within a particular locality. The stockmarket equivalent of the force of gravity varying with the quantity of matter in the locality is the variation over time in the importance that investors in the aggregate attach to a forward-looking "value-driven" basis of stock selection. When the economic

outlook appears to be stable, investors will perceive it to be in their own self-interest to attach a relatively high weight to likely returns on the basis of consensus forecasts and a relatively low weight to events in the known past. Also, since most long term investors are acutely aware of the risks of adopting too defensive an investment stance when stock prices appear to be on a rising trend, they perceive the likelihood of a setback to be low as long as they think that everyone else thinks that the upward trend is intact. When any unexpected bad news shatters this often over-optimistic illusion, confidence in the previous consensus forecasts collapses, investors attach far more weight to the known past than to the now highly uncertain and dangerous future, and their perceptions of risk change violently. There tends to be a massive swing in preference away from the previously exciting "growth" stocks towards the previously dull and boring "blue chips" that are now seen as likely to ride out any economic storm without serious long term damage. This is precisely the type of swing away from "value-driven" behaviour towards "quality-driven" behaviour that is described in Section 2.8.

7.7 *Relativities in the Physical World*

In celestial mechanics, Newtonian dynamics based on a uniform force of gravity would be sufficiently accurate in virtually all practical applications involving the paths of space probes and comets within the solar system. Special Relativity, while essentially redundant, is, however, normally built into the computational systems. Only when a space probe passes very close to the sun and its exceptionally strong gravitational field does General Relativity have to be taken into account.

7.8 *Relativities in Capital Markets*

In capital market behaviour, on the other hand, the "value-driven" centralising force, the equivalent of gravity, is normally the dominant force but is often completely overwhelmed by understandable swings in aggregate investor confidence in response to unexpected events in the very recent past. In short, the standard equilibrium assumption of modern finance theory, which corresponds to a uniform force of gravity being the only underlying force, is indefensible even as a reasonable first approximation to capital market reality.

8. PRACTICAL MERITS OF THE NEW MODEL

8.1 *Parallels with Life Assurance*

The crucial insight that led to the construction of the pioneering Breslau Table of actuarial science described in Halley (1693) was that there is an underlying smooth progression of mortality rates as a function of age, so that observed irregularities could be "attributed to chance" and "would rectify themselves were the number of

years much more considerable". Similarly, the disequilibrium utility ranking procedure of the fundamental preferences model appears to be the most powerful framework yet discovered for predicting future equity share returns. Accordingly, it is difficult to avoid the conclusion that Halley (1693) offers a far better conceptual framework than Markowitz (1959) for a successful scientific approach to equity share portfolio management. Also, the highly practical framework described in Day, Green & Plymen (1994) for the measurement of investment performance would appear to have a far sounder theoretical foundation than "risk-adjusted" approaches using the Capital Asset Pricing Model.

8.2 *Country Transitivity*

While the empirical results set out in O'Shaughnessy (1996) suggest that the strategy investment approach described in Section 2 in a UK context is likely to be equally successful in the US stockmarket in terms of attainable hindsight efficiency ratios, the number of highly liquid "investment grade" stocks in some other countries such as Australia and South Africa may be far too low for the strategy investment approach to be practicable. However, given the world-wide availability of cost-effective derivative contracts, the systematic outperformance of either the UK or the US stockmarket can be translated into similar outperformance of any country's equity market for which financial future contracts are available. For example, the combination of:

i) a strategy investment portfolio of UK stocks,
ii) a short futures position in the FTSE-100 Index,
and iii) a long futures position in the French CAC 40 Index

results in a synthetic portfolio of French equities with precisely the same market outperformance characteristics as the underlying UK portfolio.

8.3 *A Perpetual Money Machine?*

Given the known impossibility of constructing a "perpetual motion machine" in the physical world, a very understandable reaction to any apparently successful new investment philosophy is to say that it will cease to work once enough people know about it and attempt to use it. However, the major elements of innate "investor irrationality" that lie behind the great practical success of strategy investment have been in existence since before the days of Adam Smith and seem unlikely to disappear in even the distant future.

8.4 *Concluding Remarks*

In Clarkson & Plymen (1988) it is conjectured that the actuarial approach, rather than the modern finance theory approach, offers the more powerful framework for successful stockmarket investment. The present paper first of all highlights the very satisfactory performance that can be achieved using a strategy investment methodology which is unquestionably actuarial in nature and then develops the fundamental preferences model as a theoretical framework within which this new investment paradigm can be formalised and improved.

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