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ABSTRACT

Over the last half century UK defined benefit pension schemes have followed the cult of the equity by investing a large proportion of their assets in equities. However, since the turn of the millennium this cult has faced two serious challenges - the halving of equity prices, and the complete rejection of equity investment by the Boots pension scheme. This paper summarises the history of the cult in the UK and the arguments advanced at the time to support its adoption. It then presents the case for the cult (excluding taxation, risk sharing and default insurance). This is followed by a detailed consideration of the validity of this case, including an examination of the relevant empirical evidence. It is concluded that, in the absence of taxation, risk sharing and default insurance, the asset allocation is indeterminate; and depends on the risk-return preferences of the trustees and employer.

Key words: pension funds, asset allocation, cult of the equity, time diversification, mean reversion, liability matching, equity risk premium.

The allocation of a pension fund between equities and other asset classes is a key decision for trustees (Blake, Lehmann and Timmermann, 1999; Brinson, Hood and Beebower, 1986; Brinson, Singer and Beebower, 1991; and Ibbotson and Kaplan, 2000). The Boots Pension Scheme announced in July 2001 that they had liquidated the 75% of their assets invested in equities, and moved to a 100% bond portfolio, Ralfe (2001, 2002), Ralfe, Speed and Palin (2003). This constitutes a clear rejection by Boots of the cult of the equity[1]; which may be defined as investing a large proportion of the assets of a long term investor (e.g. a pension fund or a life assurance company) in equities. This paper shows how the cult has become established in the UK, and examines the arguments for its continuation.

The total deficit of private sector UK defined benefit pension schemes was estimated in July 2003 by the Confederation of British Industry (2003) at £160 billion (although they note it might have been as high as £300 billion). The CBI also estimated that company profits would be depressed by about £16 billion per year over the next decade because of the need to increase employer pension contributions to fill this pensions deficit. A major cause of this deficit is the cult of the equity. Over the period January 2000 to March 2003, the FTSE All Share index fell to less than half its initial value. The UK cult of the equity meant that pension scheme losses from this stock market fall were much larger than would otherwise have been the case. These equity losses were an important factor in pension schemes reporting large deficits, closing to new members and increasing their contribution rates.

This paper considers the origins of this cult and the rationale given at the time for its adoption. The modern case for the cult is then presented, followed by a detailed consideration of these reasons. Three factors are excluded from this analysis, but are considered at length in Sutcliffe (2004) - taxation, risk sharing and default insurance[2]. Analysis of the reasons advanced for the cult which

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[1] Throughout this paper, except where specified otherwise, equities is taken to mean a well diversified portfolio of shares, e.g. the market portfolio.

[2] Taxation is irrelevant for public sector pension schemes, while default insurance has not applied in the UK. Risk sharing may mean that the employees and the employer have different

are considered here, together with the available empirical evidence, leads to the conclusion that the asset allocation is indeterminate. In the absence of taxation, risk sharing and default insurance, the asset allocation is based on the risk-return preferences of the employer and employees; and so varies between schemes, probably in an unpredictable manner. This conclusion means that, where they apply, the asset allocation should be determined primarily by taxation, risk sharing and default insurance; and not by an appeal to the arguments used to support the cult of the equity which are considered in this paper.

Section 1 has a brief outline of the origins and magnitude of the cult of the equity in the UK. In section 2 the traditional reasons behind the cult for defined benefit pension schemes are presented, followed in section 3 by a critique of these reasons. The conclusions appear in section 4.

1. History of the Cult of the Equity

In the nineteenth century, the primary securities market in the UK was bonds, and to the extent that long term institutional investors existed, they invested in bonds. The switch of assets from bonds to equities by UK institutional investors was begun by life assurers after the First World War, Scott (2002). At this time "ordinary shares with fluctuating dividends were not considered respectable", and "it was Keynes who demonstrated to the life offices that investment in industrial and commercial ordinary shares as well as in insurance and investment trust equities was a desirable investment policy", Davenport (1975)[3]. Scott (2002) shows that the proportion of net investment by life assurance companies going into equities rose from −2% in 1932 to 27% in 1937. In that year 10% of life assurance assets were in held in equities. In April 1937 H.E. Raynes, actuary of the Legal and General Assurance Society, delivered a paper to the Institute of Actuaries on the relative performance of equities and fixed-interest securities, which concluded that equity investment was preferable (Raynes, 1937). The chairman of the meeting, Leslie Brown of

attitudes towards the cult of the equity, with the asset allocation decision depending on which group prevails.

[3] Between 1919 and 1938 John Maynard Keynes was a director, and then chairman, of the National Mutual Life Assurance Society.

Prudential Assurance, declared that sufficient evidence was now available to support the contention that ordinary shares deserve to take an important place in the portfolios of life assurance companies.

Funded pension schemes were unimportant at the start of the twentieth century, but grew in importance throughout the century. For example, in 1957 the market value of the assets of UK pension funds was £2.071 billion. By 2000, this figure had grown by over 360 times to £755.3 billion (Blake, 2003b, p. 453). This represents an annual compound growth rate of 14.7%. Until the 1940s UK pension funds invested most of their money in government bonds (Hannah, 1986, p. 73, Wincott, 1961). George Ross Goobey, who was employed by the Imperial Tobacco pension fund in 1947, liquidated all the fund's bonds and invested the pension fund entirely in equities. "I am convinced that in the long run ordinary shares will prove a much more advantageous form of investment for long-term funds than the more traditional gilt-edged securities" (Ross Goobey, 1956). Ross Goobey (1955) set out six reasons why "pension funds could hold a much higher percentage of equities in their portfolios than life assurance funds" and these reasons summarise his case for the cult of the equity.

1. Inflation Matching. "The assets of pension funds should be invested in securities which provide an opportunity of growth arising from inflation".
2. Duration Matching. "The assets of a pension fund could be extremely long dated or even undated. Ordinary shares, of course, fulfil this latter requirement".
3. Lower Risk. "Statistical evidence has been produced to show that in the long run equities can prove to be a far more safe investment, both as regards capital and income, than fixed interest securities."
4. Volatility of Reported Profits. "Pension funds have an advantage over life funds in so far as they are not under a statutory obligation to show each year a state of complete solvency based on market values. The former can afford to ignore a temporary adverse position which will ultimately correct itself."

5. Market Depth. "Pension funds are not yet at a stage when they are so vast that investments in gilt-edged are almost essential to keep up with the amount of funds available for investment."
6. Liquidity. "Pension fund membership is inevitably bound up with employment, and even in the most advanced state of mobility of labour, it is highly unlikely that a fund would have to deal with an unexpectedly large number of withdrawals."

Ross Goobey's views caused great controversy in the 1950s, and he was barred by the Institute of Actuaries from teaching students about investment (Hobson, 1999). However, his move into equities was increasingly copied by other UK pension funds. At the time this rising cult was criticised by the Bank of England, as the resulting drop in the demand for bonds led to a rise in interest rates, (Hobson, 1999, p. 1034).

In the 1940s and 1950s some pension schemes were prevented from adopting the cult of the equity. For example, until the Trustee Investments Act (1961) local authority pension schemes were banned from investing in equities (Hobson, 1999, p. 1034), while other pension schemes were prevented by their trust deed. Therefore, the spread of the cult amongst pension funds was initially restricted. In 1957 the Radcliffe Report (1959, p. 89) found that UK pension funds had invested 20% of their assets in equities[4]. By 1964 this equity percentage was estimated to have risen to 37% (Littlewood, 1998, p. 123), and by 1978 it had risen to 50% (Wilson Report, 1980, p. 468). Table 1 contains the equity proportions for more recent years. This shows that the cult reached its zenith in the 1990s when over three-quarters of UK pension fund assets were invested in equities[5]. The

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[4] This figure has been adjusted to include local authority pension funds.

[5] A survey of UK pension trustees by Pratten and Satchell (1998) documented the current major influences on asset allocation. These were, in order of importance: (a) favouring asset classes with high historic returns, (b) following the asset allocation of other schemes, (c) investing more in equities when the scheme is in surplus, (d) investing less in equities as the scheme matures, (e) investing more in equities if the employer is able to make good any deficit, (f) investing more in equities if the trustees are willing to tolerate risk, (g) and fund managers exercising the limited discretion permitted by their mandate. Therefore the high historic equity returns, the widespread cult of the equity, the substantial surpluses and the profitability of employers all pointed towards a high level of equity investment in the 1990s.

UK leads other major economies in the cult of the equity[6]. The rise in the equity proportion occurred in spite of the increasing maturity of UK pension schemes[7].

Year	WM[8]		CAPS[9]	Year	WM[7]		CAPS	
	WM50 %	All Funds %	%		WM50 %	All Funds %	%[8]	%[10]
1975	-	47.6	-	1989	63.3	67.8	81.4	-
1976	60.0	59.7	-	1990	71.0	74.7	76.4	-
1977	51.9	52.3	-	1991	68.5	71.9	81.4	83.3
1978	51.9	53.9	-	1992	74.7	77.7	81.9	85.5
1979	50.4	52.8	-	1993	76.3	79.0	81.7	86.6
1980	46.9	49.5	-	1994	76.4	79.5	79.0	83.2
1981	50.5	53.8	-	1995	74.1	76.7	76.9	84.4
1982	52.2	56.2	-	1996	74.6	76.0	75.7	82.6
1983	54.5	58.0	-	1997	74.3	75.2	72.9	78.6
1984	56.0	60.6	69.7	1998	71.6	72.8	70.9	76.6
1985	57.4	63.0	73.1	1999	70.6	70.8	76.4	81.8
1986	60.6	65.5	77.1	2000	72.8	74.5	73.5	79.6
1987	65.4	69.9	75.7	2001	67.6	71.6	72.4	80.2
1988	63.7	68.4	75.0	2002	68.1	70.6	68.5	78.7

Table 1: Equity Proportions for UK Pension Funds

One reason for the decline in the proportion of UK pension fund investment in equities since the turn of the millennium, is not a rejection of the cult, but simply the sharp fall in equity prices[11].

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[6] Davis (1991) used national flow-of-funds tables to construct graphs of the annual percentage of pension funds invested in equities in the UK, USA, Canada, Japan and Germany for the 1966-1988 period. These reveal that since 1975 the UK has maintained a substantially higher equity proportion than the other countries analysed. By 1988, while the UK had about 68% in equities the approximate equity proportions for the other countries were USA - 48%, Canada - 32%, Japan 28% and Germany - 18%. Davis (1995, p. 138) presents a table of the equity percentages for ten countries for 1970-1990, which also shows that the UK had the largest proportionate investment in equities.

[7] Maturity is concerned with the relationship between the likely cash inflows and outflows of the scheme, and this is largely determined by payments to pensioners and receipts from active members. An immature scheme will have substantially more active members than pensioners.

[8] The WM All Funds universe currently accounts for over 75% of all segregated UK pension fund assets. The WM 50 universe represents the 50 largest pension funds in the UK who are clients of WM.

[9] Russell/Mellon CAPS unweighted average of UK segregated pension funds for calendar year ends.

[10] Russell/Mellon CAPS balanced pooled UK pension funds for calendar year ends.

[11] While funds are free to rebalance their investments as asset prices change, there are the frictions of transactions costs and inertia.

Another reason for the drop in the proportion of equities is that since 1997 equities have become less attractive, relative to bonds. The abolition of tax relief on dividends from UK companies in 1997 affected all funded pension schemes. This reduced the attractiveness of UK equities, relative to bonds (unless the prices of bonds and UK equities adjusted to compensate for the tax change, i.e. pension schemes are the marginal investors), and foreign equities. Since it is generally accepted that highly mature schemes should not follow the cult of the equity, the increasing maturity of UK pension schemes may also have been a contributory factor to the modest drop in the equity percentage.

The cult of the equity is still supported by some advisors, e.g. "stocks are simply a better long-term investment, particularly for an ongoing pension plan with an indefinite time horizon", McCrory and Bartel (2002)[12].

2. The Case for the Cult of the Equity

The aim of a defined benefit pension fund is to provide the money from which the employer can pay out pensions, and other benefits. These payments do not start until after the end of the working life of scheme members, and so are usually many years in the future. A substantial number of pension schemes in the 1950s, when the cult of the equity developed, were immature. If a scheme is immature it has a strongly positive cash flow which will continue for some time, and will not need to liquidate its investments for many years. This gives the scheme a long investment horizon[13]. This long investment horizon is argued to have important implications for the allocation of the fund between bonds and equities. There are two complementary arguments favouring the cult of the equity for such immature schemes.

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[12] A survey of UK trustees found that investment consultants have a bigger impact on the asset allocation decision than the trustees, Kakabadse, Kakabadse and Kouzmin (2003).

[13] Bodie (1990) points out that long term investors can benefit from investing in low liquidity assets; receiving the higher returns on such assets (the liquidity premium) which compensates for the lack of liquidity.

a. Equity Risk Premium. Over long periods of time, equities have produced returns about 4% higher than those on bonds - the equity risk premium (Dimson, Marsh and Staunton, 2002). Therefore by investing in equities an employer can reduce the cost of funding the pension scheme. These higher returns are associated with only a modest increase in risk. This is because, while equities may perform badly for a few years, over the long-run equity prices revert to their long run upward trend. If a long enough horizon is used, good and bad returns tend to average out (i.e. time diversification), and risk is reduced, compared with the level of risk without such an effect. Thus the risk-return trade-off is more favourable for long-term investors than for short-term investors.

b. Liability Matching. Some people take the view that, provided the scheme is immature, it can forget about trying to match its liabilities[14], and simply concentrate on generating a large pot of money at some horizon date. This money can then be used to meet the liabilities. In which case liability matching is irrelevant. However, if liability matching is seen as a virtue, then it has been argued that the cult of the equity is also beneficial in this respect. For immature schemes, the primary determinant of the liabilities is final salaries, and so matching final salaries substantially reduces the risk of the asset-liability portfolio. The annual correlation between equity returns and proportionate changes in salaries may be low, but over the long run they are expected to move together[15]. This expectation is based on the view that over the long run the factor shares of labour and capital in national income tend to be constant (Blake, 2003a, Exley, Mehta and Smith, 1997). "The pension rights that workers in defined benefit schemes are building up are linked to wages, so you need to match them with a real claim on the economy" Chris Daykin, the UK Government Actuary (Economist, 2002). If the shares of capital and labour in national income remain constant, then equities and salaries are expected to increase at the same long run rate. Therefore, equities provide a good hedge for salaries over the long run, and so, as well as reducing the cost of

[14] Liability matching is a development of the portfolio theory of Markowitz (1952) to identify the risk-minimising combination of both assets and liabilities. If the pension scheme is viewed as a separate entity, the assets and liabilities are those of the scheme. If the pension scheme is treated as an integral part of the employer, the portfolio problem includes not only the assets and liabilities of the pension scheme, but also the assets and liabilities of the employer.

[15] In the jargon of the econometrician, they are co-integrated.

providing pensions, the cult of the equity also hedges the liability risk.

In addition to these two main benefits, there are some factors which have facilitated or supported the creation and maintenance of the cult of the equity.

c. Risk and the Endogenous Contribution Rate. While the cult of the equity could lead to a reduction in risk due to liability matching and time diversification, it is highly likely that the risk is higher than for bonds. However, an immature pension scheme can cope with this risk, and ride out periods of adverse performance. If the pension scheme becomes under-funded, the immaturity of the scheme means there is plenty of time for the employer to make higher annual contributions into the fund to remove this under-funding. Therefore any risk flowing from the cult falls on the employer; who also stands to reap the rewards of lower funding costs due to higher equity returns. In consequence, the cult should not concern the scheme members and pensioners, as it does not lead to any increase in their risk[16].

d. Individual Investment Advice. The traditional investment advice offered to individuals who are investing directly, or who are deciding the asset allocation for their own defined contribution scheme, is for the young to invest mostly in equities; and for the old to invest mostly in bonds - lifestyle investing. An empirical investigation of the financial holdings of 2,873 Americans by Schooley and Worden (1999) confirms that investors with a longer planning horizon invest a higher proportion of their financial assets in equities, while a study of 916 US academics by Bodie and Crane (1997) obtained a similar result[17]. Therefore, there appears to be a consonance between the long term investment policies for both individuals and pension funds.

e. Discount Rate. In valuing the liabilities of the pension scheme, the actuary has to select a

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[16] The risk sharing aspects of the problem are considered in Sutcliffe (2004).

[17] However, an empirical study by Ameriks and Zeldes (2001) using a large US data set found no clear evidence that individuals reduce their equity exposure as they age, while Yoo (1994) found that US workers increase their equity holdings as they age.

discount rate. Traditionally this is the expected rate of return on the assets of the fund. Where the fund has a high equity content, this can lead to a high discount rate, and a low valuation of the liabilities[18]. Therefore, a welcome side effect of the cult of the equity (coupled with the use of the expected investment return as the discount rate) is to reduce scheme liabilities, which increases the funding ratio. This can permit a reduction in the employer's contribution rate[19].

f. Asset Valuation. Until recently, actuaries valued equities, not at their current market value, but at the present value of the expected dividend stream, Dyson and Exley (1995)[20]. Since dividends are more stable than share prices (Shiller, 1981), this smoothed the valuation of equities, making them appear less risky than they really are. This was consistent with the view underlying the cult of the equity that long run investment in equities is not high risk. It also meant that equity values were subjective, depending on the actuary's dividend forecasts.

g. Management of Accounting Profits. The cult of the equity may increase the reported earnings of the employer for two reasons. First, investing in equities should increase the value of the assets in the pension fund at a higher rate than would investing in bonds. Second, if the expected return on the fund is used as the discount rate, the cult usually increases the discount rate used to value

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[18] If the dividend discount model is used to derive the expected rate of return on the assets, very high share prices, coupled with conservative assumptions about dividend growth, can result in a discount rate than is below the risk free rate, Wise, McCarthy, Neate, Pardoe and Horwitz (2004). The use of the dividend discount model makes the discount rate dependent on the assumed dividend growth rate.

[19] Wise, McCarthy, Neate, Pardoe and Horowitz (2004) argue that actuarial valuations of the assets and liabilities are not designed to produce market-consistent values. They are part of the actuarial control cycle, and their purpose is to assist in setting the contribution rate and checking the current solvency of the scheme. This involves smoothing the asset and liability valuations, and therefore the contribution rate. This justification of smoothing the valuations is rejected by Gordon (1999), who argues in favour of market valuations on the grounds that they are objective, transparent, and directly comparable with other values. In addition, smooth contribution rates can be set using market valuations of the assets and liabilities, provided the appropriate decision rule is adopted. A similar debate concerning the justification of non-economic valuations has taken place in accounting over the past forty years, and been largely resolved in favour of economic values.

[20] Actuaries continue to value scheme liabilities in a similar manner: the present value of the cash flows resulting from the liabilities.

the liabilities, so reducing their magnitude[21]. In each case the scheme funding ratio (or assets/liabilities) is improved. Gold (2000) and Asthana (1999) point out that actuaries have considerable discretion over the methods and estimates they use to compute the scheme funding ratio, and this gives employers discretion over the timing of any reductions in the employer's contribution rate. Since contributions to the scheme are a charge against profits, the cult of the equity allows the firm to manage its reported earnings, although this freedom will be reduced by FRS 17.

h. Competitive Pressures. There are two sources of competitive pressure. First, if the pension funds of a firm's competitors are following the cult of the equity, their rivals will be able to report higher accounting profits than otherwise. This may put pressure on the firm to match the reported profits of its rivals by adopting the cult. Second, UK pension funds are mainly externally managed, and this has led to fierce competition between fund managers to win mandates, and a strong focus on investment performance. This has encouraged UK fund managers to invest in equities, with their scope for out-performance of the benchmark.

3. Criticisms of the Case for the Cult of the Equity

In the previous section two main arguments were advanced for the cult. These arguments are complementary and separable, and will be considered in turn. The various factors which have encouraged the cult will then be considered.

a. Equity Risk Premium. There is a considerable amount of empirical evidence that, over the long run, and for a wide range of countries, equities have given higher returns than bonds (Dimson, Marsh and Staunton, 2002). Whether this will continue into the future has been questioned, but it seems likely that it will. The real issue is the effect on risk of investing in equities. It is generally accepted that, over the short run, equities have a higher risk than bonds. Indeed, the higher risk and return of equities is the foundation of much of finance theory. The question is whether the risk of

[21] The introduction of FRS 17 requires the use of the corporate bond rate as the discount rate for accounting purposes, increasing the value of the liabilities reported in the accounts.

investment in equities is lowered if a long period is considered[22].

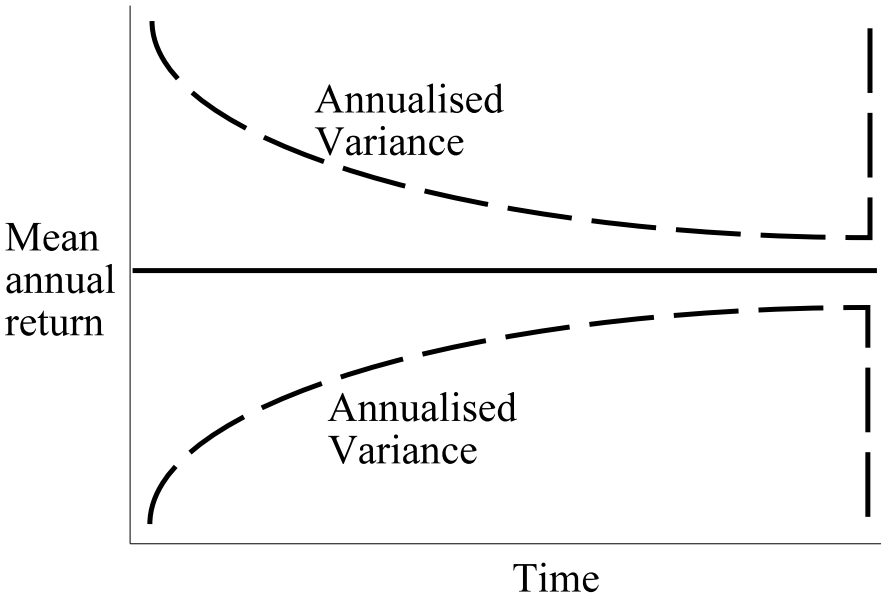

Fig 1: Variance of the Average Annual Return

The variance of returns over long periods (comprising *T* short periods) is equal to:-

$$\sigma^2_T = \sum_{i=1}^{T} \sum_{j=1}^{T} \sigma^2_i \, \sigma^2_j \, \rho_{ij} \qquad (1)$$

where ρ_{ij} is the correlation between returns in short periods *i* and *j*, and σ^2_i is the variance of returns in period *i*. If $\rho_{ij} = 0$ *(for* $i \neq j$*)*, and $\sigma^2_i = \sigma^2_j = \sigma^2$, then returns follow a random walk and $\sigma^2_T = T\sigma^2$, for both equities and bonds. In consequence risk (as measured by the variance of returns over the entire period, σ^2_T) increases in a linear manner with time. If the ρ_{ij} are predominantly positive, then $\sigma^2_T > T\sigma^2$, while if the ρ_{ij} are predominantly negative, $\sigma^2_T < T\sigma^2$. Thus negative

[22] The measurement and comparison of risk over different time periods can be done in a number of ways. If annual returns are independently and identically distributed (i.i.d), the annual variance is, by assumption, constant from year to year. Kritzman (2000) demonstrates that when annual returns are i.i.d., as the time horizon increases, both the annualised standard deviation of returns and the probability of loss on average over the horizon period decrease. Thus figure 1 shows that the average annual return tends towards the mean return as the time period considered becomes longer. However, the cumulative variance of returns increases, as does the fraction of wealth that could be lost with a probability of 1 in 1,000. Therefore, whether risk rises or falls as the investment horizon increases, depends on how risk is measured. Samuelson (1963) has shown that if returns are i.i.d. and the decision maker ignores human capital and consumption habits (as will a pension scheme), investors with constant relative risk aversion (CRRA) should make exactly the same asset allocations for short and long horizon periods. The CRRA assumption is appropriate for pension schemes as they are not consumers, and is also consistent with the evidence that the risk premium has not changed much as society has become richer.

correlation leads to a lowering of the variance of long period returns, compared to the random walk case. Indeed, very high negative autocorrelation could, in theory, result in long period equity returns having a lower risk than bonds.

Figure 2 shows the value over time of an initial investment in equities and bonds (with income reinvested) and i.i.d. returns. It also plots the variance of the value of the investment each time period. This shows that the variance of wealth increases at an increasing rate, and that equities can result in a lower wealth than investing in bonds. The supporters of the cult of the equity argue that equity returns are not a martingale or random walk. In particular, equity returns are argued to be mean reverting, with negative autocorrelation. If this is true then time diversification exists, and as the investment horizon increases, the variance of returns increases in a less than linear manner and the variance of terminal wealth is lower than otherwise.

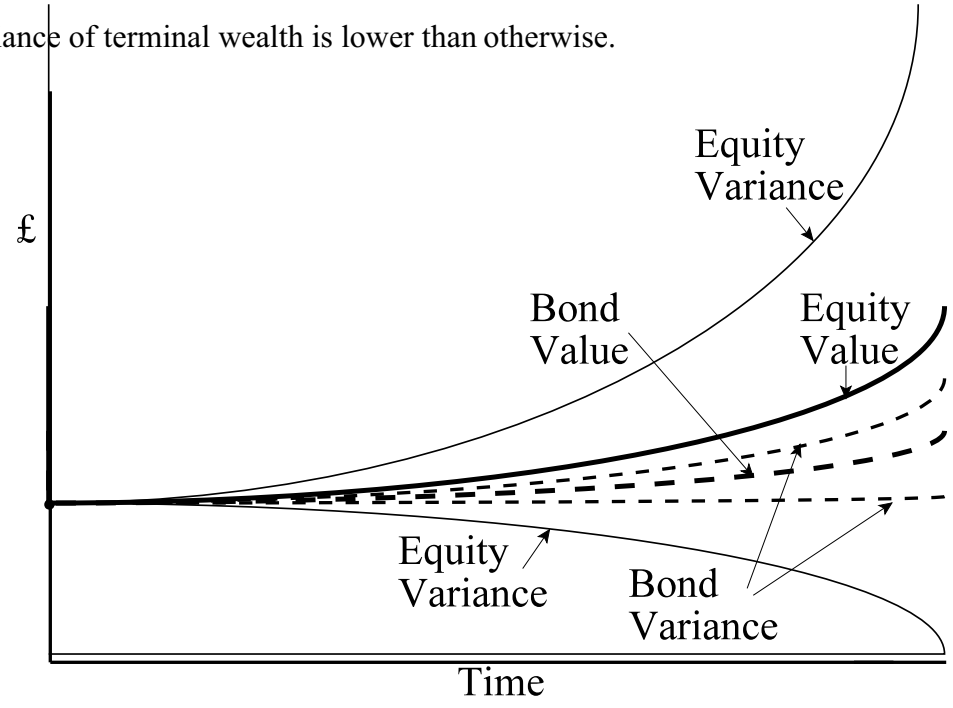

Fig 2: Value and Variance of an Investment

Ultimately, whether equity returns are independent over time or mean revert is an empirical question. There has been an enormous amount of research into the behaviour of short run returns on individual equities, but much less research on long run returns for either individual equities or the equity market as a whole. The extensive research into the short run returns on individual shares, by and large, supports independence and weak form market efficiency (Fama, 1965, 1991,

1998, Campbell, Lo and MacKinlay, 1997). Simple aggregation arguments suggest that long run returns on individual shares and on the market as a whole will also be independent. There is a large body of empirical evidence on the mean reversion of long term returns on individual shares[23]. This contains evidence both for and against mean reversion, with the support for mean reversion having ceased to exist in recent decades. There is a substantial literature on time diversification[24], but this literature is diverse and confused and has not come to a firm conclusion on the presence or absence of this phenomenon[25] [26].

The empirical resolution of the debate on mean reversion and time diversification is probably impossible due to the twin problems of sample size and stability. With reliable stock market returns available for only a 100 or so years, there are very few independent (say) 30 year periods, and not much can be concluded from 3 or 4 observations. Even if data were available for the last thousand years, while this would increase the sample size to about 33, it may still be insufficient to detect the small effects involved. In addition, it is doubtful that the behaviour of stock market returns has remained constant over this long period. Therefore, researchers are forced to rely on theoretical arguments.

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[23] See appendix 1 for a list of references on mean reversion in the UK.

[24] See appendix 2 for a list of references on time diversification.

[25] It is possible that some investors who accept time diversification are confusing two very different types of risky situation (Samuelson, 1963). The first situation is where all the money is invested for (say) one year in a risky asset. At the end of the year, the proceeds are reinvested in the risky asset for a further year, and so on. The second situation is where the money available for investment is subdivided into n equal amounts. Each of these n sums of money is then invested in a different risky asset for one year. Let all risky assets have exactly the same i.i.d. returns distribution, both over time and between assets. The second situation is one of diversification. The variance of the return on the portfolio of n risky investments is $\sigma^2_p = \sigma^2/n$, and so as n increases, the variance reduces. However, in the first situation, there is no diversification, and the variance of returns after n years is $n\sigma^2$, and as n increases, the variance increases.

[26] It has been argued that risk is a subjective matter, and if investors feel that long run risks are lower, then they are. However, a pension fund is not a person with its own preferences. It is a financial entity seeking to maximise its present value, and this depends on the market's attitude to the trade-off between risk and return.

Theoretical arguments favour an absence of time diversification and mean reversion in the very long run. For individual stocks there is an argument in favour of mean reversion, that does not apply to the stock market as a whole. As returns on a particular firm or industry increase, this induces competitors over the longer term to enter the industry, so pushing returns back down towards some long term equilibrium. However, the relationship between interest rates and stock market returns is not subject to these long run competitive forces. For example, equity risk and return depend on the gearing chosen by companies, and an increase in gearing will lead to a permanent increase in equity risk and return. A shift in investor risk-return preferences will also result in a permanent shift in equity returns, relative to bond returns.

If time diversification exists, it implies that the price of risk differs with the time horizon. Negative autocorrelation in long run stock market returns means that long term investors could engage in profitable market timing by switching between equities and bonds. For example, after a stock market crash, investment would switch into equities from other assets. Since a large amount of money is managed with a long run horizon (pension funds, insurance companies), there should be sufficient resources available to ensure that such market inefficiencies are eliminated. However, there is no evidence that long term investors earn superior returns from such market timing opportunities.

The conclusion from the empirical and theoretical evidence is that there is no clear evidence to support the view that equity risks diminish for long term institutional investors. Therefore, given the wide acceptance of a positive relationship between risk and return, the cult of the equity implies that pension funds are taking on substantially higher risk levels in order to get higher returns. The alternative is that the stock market offers “something for nothing” to long term investors.

This raises the question of whether taking on higher risks to get higher returns leads to an increase in value. Modigliani and Miller (1958) show that, in the absence of taxation and bankruptcy

effects, there is no increase in value from changing the debt-equity ratio of a company. A similar result applies in reverse to a pension fund where, rather than raising a fixed sum of money in the form of debt or equity, the fund has to decide how to split the investment of a fixed sum of money between debt and equity. Modigliani and Miller's first proposition means that the way the money is split between bonds and equities has no effect on the value of the fund (Ralfe, Speed and Palin, 2003). Actuaries have recently accepted that the present value of a pension fund does not change as the asset allocation between equities and bonds is altered. For example, assets whose market price is £10 million are worth £10 million, irrespective of the way this money is split between bonds and equities. In consequence, actuaries must also accept that the cult of the equity does not benefit the fund by increasing its present value. This is consistent with the conclusion that, as Sharpe (1964) has shown in his capital asset pricing model, the equity risk premium is the market-determined reward for accepting risk, and not a free lunch. In consequence, there is no reason based on risk-return arguments to adopt the cult, and the equity-bond allocation is a matter for risk-return preferences[27].

There is, however, an additional argument which points towards the risk-minimising choice for the asset-liability portfolio. This will be clarified by considering a strategy that replicates a pension fund following the cult of the equity. A fully funded pension scheme following the cult can be replicated by (a) investing the pension fund in the liability-matching portfolio, and (b) borrowing the same sum of money to create an investment vehicle largely invested in equities. The first

[27] It has been argued (e.g. Mehra, 2003) that in the past the equity risk premium in a number of countries, including the UK, was an order of magnitude higher than can be rationalised by financial economics. This has been termed the "equity premium puzzle". If pension funds expect that in future they will be over-compensated for bearing the risks of equity investment, this creates a motive for the cult of the equity. However, the equity premium puzzle may be solved by some rationalisation of the high historic risk premiums, or the puzzle may vanish because the risk premium drops to a level that can be explained by existing models. In either case, the equity premium puzzle does not offer a motive for the cult. An example of a possible explanation for the high risk premium is survivorship bias. Of the 36 stock exchanges in 1901, 22 suffered major suspensions of trading during the twentieth century. Brown, Goetzmann and Ross (1995) argue that such disruptions mean that studies of long term equity returns suffer from survivorship bias leading to the overstatement of long term equity returns, and the understatement of long term equity risks.

portfolio consists of the scheme liabilities and investments chosen to minimise the risk of this asset-liability portfolio[28]. The second portfolio consists of a short position in the liability-matching portfolio, and a long position of equal value invested largely in equities.

This strategy highlights why the cult of the equity is questionable. It shows that the pension scheme is deliberately speculating with what is usually a large sum of money on the spread between returns on the liability-matching portfolio and the stock market. In effect, the pension fund has become a profit centre. There are a number of reasons why this is not sensible. First, suppose that in the long run equities outperform bonds, and the higher risk is insufficient to offset the higher equity returns, given the prevailing market price of risk. In these circumstance most long term investors will engage in large scale borrowing, and use the funds raised for stock market speculation. At the same time, it will be very hard to get investors to buy long term bonds (e.g. lend to such companies), because equities offer a superior investment. Therefore, such a situation is not sustainable. Second, suppose that some investment skill is required for equity investments to outperform bonds on a risk-adjusted basis. The employer will be engaged in a particular sector of the economy, and it is unlikely this gives their pension fund special knowledge and skills in speculating on the stock market. If the employer wishes to back their judgement, there are probably other speculative risks on which they are better informed, or have some other comparative advantage. Therefore the fund is usually speculating on the judgement of their fund managers, who are hired in a competitive market. If a fund manager can "lay golden eggs" by out-performing, they have an incentive to increase their management fees to capture the benefits of such skills, rather than pass them on to their customers. Therefore, such a situation is not sustainable.

The view that the cult of the equity produces higher returns in the long run has been argued not to be a free lunch. Higher expected returns bring with them commensurately higher risks. This risk-return trade-off is at the rate set by the market, and so taking on higher risks offers no increase (or decrease) in value. Abstracting from taxation, risk sharing and default insurance, perhaps many

[28] The liability matching portfolio probably consists of index-linked gilts and bonds, together with modest amounts of equities and property.

trustees, employers and investment advisors have been attracted by the apparent something-for-nothing promise of the cult[29]. It was shown that the cult is equivalent to speculating with the pension fund on the spread between the stock market and the liabilities, and it is not obvious that this is a sensible activity for companies involved in industrial sectors that give them no special expertise in this area.

b. Liability Matching. The size of the pension that will be received by active members depends on their final salaries, so exposing the scheme to salary risk[30]. Pensions in payment are linked to the retail price index (RPI), and the pensions of deferred pensioners are usually based on their final salary, indexed for subsequent increases in the RPI. This exposes the scheme to inflation risk. In addition, since these liabilities are in the future, there is also discount rate risk for the liabilities to both pensioners and active members. Liabilities are also subject to a variety of actuarial risks, e.g. longevity risk, death in service risk, ill health risk, etc. There are no instruments available for hedging these actuarial risks, although mortality bonds have been proposed to hedge longevity risk (Blake and Burrows, 2001)[31]. Therefore, the focus is on hedging the inflation, salary and discount rate risks. Empirical evidence on the performance of a variety of hedging instruments for each of these risks will be considered; followed by the evidence on hedging liabilities. Taking an integrated view, the hedging problem encompasses not only the pension scheme itself, but also the assets and liabilities of the employer (to the extent that the employer bears the risks of the scheme). However, the adoption of an integrated view when hedging pension liabilities is uncommon.

Inflation risk. The Pensions Act 1995 requires limited price indexation for service after 6th April 1997 for pensions in payment, and this exposes schemes to inflation risk. The Fisher hypothesis

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[29] Similar arguments concerning the inevitable long run out-performance of equities were used in persuading home owners to take out endowment mortgages.

[30] If the scheme is closed to new members and has no active members, salary risk is irrelevant. It is also irrelevant if the scheme is about to be wound up.

[31] If the scheme wishes to remove all liability risk they could buy deferred annuities from insurance companies. However, this is likely to be very expensive, and the market is not deep enough to accommodate large schemes.

states that expected nominal equity returns change one-for-one with changes in the expected inflation rate, Fisher (1930). However, a considerable amount of empirical evidence supports a negative relationship between both *ex post* and *ex ante* equity returns and inflation, leading to the stock return-inflation puzzle, Gallagher and Taylor (2002)[32]. This empirical research is based on short time periods, while pension funds are interested in the long run. Therefore, Boudoukh and Richardson (1993) looked at the relationship for the USA for 5 year periods between 1802 and 1990, and found a positive correlation of +0.52 for *ex post* returns. Testing the *ex ante* relationship is more problematic because expectations data is unavailable, but the correlation appears to be even higher than for *ex post* data. They obtained similar results for the UK for 1820 to 1988. Fahmy and Kandil (2003) also found evidence that the Fisher effect is only valid in the US over the long run. These findings support the Fisher hypothesis in the long-run, although they leave substantial scope for other instruments (e.g. index-linked gilts), to be a better hedge for inflation than equities[33].

Salary risk. There is very little empirical evidence to support the view that equities are a good hedge for salaries. For example, Gordon (1999) and Gordon and Jarvis (2003) state that "the evidence that equities match liabilities that depend on compensation consists principally of hand-waving arguments that productivity increases are shared in constant proportion between labour and capital and dubious arguments based on graphs of the relevant data."

Dyson and Exley (1995) and Exley, Mehta and Smith (1997) present a graph showing that the proportions of gross domestic product going to labour and capital in the UK have been reasonably stable since 1948. But even though factor proportions are constant in the long run, it does not necessarily mean that equity returns provide a good hedge for proportionate changes in salaries.

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[32] Gallagher and Taylor (2002) argue that this puzzle is caused by not controlling for supply innovations.

[33] Some schemes have limited price indexation, and this complicates the inflation-liability relationship.

The share of a factor in national income[34] is the quantity of the factor *(Q)*, multiplied by its average reward *(P)*, i.e. $Q \times P$. Using the subscripts *L* and *C* for labour and capital respectively, it is claimed that in the long run $Q_L P_L / Q_C P_C = k$, where k is the fixed long run factor shares ratio. This expression can be rearranged as $P_L / P_C = kQ_C / Q_L$. Provided the capital-labour ratio (Q_C / Q_L) is also constant over time, P_L and P_C will move together, as required. However, the capital-labour ratio varies over time (Foley and Marquetti, 1999), and so even though factor shares are constant, there is no necessity for P_L and P_C to have a strong positive correlation. Furthermore, even if P_L and P_C have a strong positive correlation, the correlation between P_C (national salary levels) and the salaries of the employees in the scheme concerned may be weak.

Smith (1998) conducted an empirical investigation of the risk-minimising portfolio for UK national average earnings for the period 1922-1997. He concluded that equities play a very slight role, while gilts and index-linked gilts have a very important role. Cardinale (2003) studied monthly and quarterly UK data for 1963-2002, and annual data for 1850-2001. He found that salaries were co-integrated with both bonds and equities, and concluded that the long-run link between equities and salaries is stronger than the short-term link. A similar conclusion was reached by the Institute & Faculty of Actuaries (1998), who found a one year correlation of 0.05, and a 5 year correlation of 0.24.

Boldrin, Dolado, Jimeno and Peracchi (1999) used annual data from 1961 to 1996 to compute the correlation between earnings and equity returns for six countries. The resulting correlations were UK −0.37, France −0.30, Germany −0.37, Italy −0.16, Japan −0.08 and USA −0.35. These results do not provide any support for the view that a long position in equities is a hedge for salaries. Amir and Benartzi (1999) computed the correlations between the annual percentage changes in US salaries and the US stock market, and between the annual percentage changes in US salaries and US bonds for the 1977-1996 period. The correlation with equities was −0.12, while the correlation

[34] This should presumably be gross domestic product, rather than gross national product, as the UK is not a closed economy, and some people in the UK work for foreign firms, while UK companies earn some of their profits overseas.

with bonds was −0.32, indicating that neither equities nor bonds provide a good hedge for salaries. Bottazzi, Pesenti, and Van Wincoop (1996) used quarterly data for the period 1973-1992 for ten OECD countries and found that the correlation between domestic equity returns and salaries was −0.47 for the UK, and −0.39 for the ten countries. Using US monthly data from 1953 to 1972, Fama and Schwert (1977) concluded that the correlation between incomes and returns on both government bonds and NYSE shares is effectively zero.

It has been argued by actuaries that there is a strong positive correlation between inflation and salaries, and so salary risk can be hedged in the same way as inflation risk. There is some evidence in favour of a positive link between salaries and inflation at the national level for long time periods. For example, the simulations by Wilkie (1995) give a correlation between wages and inflation over 50 years of +0.96; while the Government Actuary (2001) presented data showing that over the 50 years from 1948 the average earnings of UK full time adult male employees grew at an annual compound rate that was 1.76% higher than the growth in retail prices. This difference in the growth rates of salaries and inflation was reasonably stable for the five 10 year sub-periods. This suggests that index linked gilts may be a suitable hedge for salary risk. Exley, Mehta and Smith (1997) present graphs of the relationships over time between earnings and inflation, and between earnings and dividends for the UK, France and Germany. For all three countries there is a strong positive relationship between earnings and inflation, but a much weaker relationship between earnings and dividends. Exley, Mehta and Smith conclude that index-linked bonds provide a substantially better match for salaries than do equities. The limited available evidence suggests that, while there is a positive correlation between inflation and salaries, neither is well hedged by equities.

Discount rate risk. Since the liabilities arise at various dates in the future, they must be discounted back to the present. If the expected rate of interest on bonds is used as the discount rate, then bonds will do an excellent job of hedging discount rate risk. If the rate of return on the investments is used, and if the fund is following the cult of the equity, then equities will do a good job in hedging

discount rate risk. However, as argued in section 3e below, the investment return is not the correct discount rate.

Liability risk. There are also some empirical studies that have considered the salary, inflation, discount rate and other risks together by looking at total liabilities. Van Bezooyen and Mehta (1998) computed the minimum risk portfolios for pensioner liabilities and active members for the UK and the Netherlands[35]. Their results are shown in table 2, and reveal that the main hedging instrument is fixed interest securities, not equities. Index-linked gilts were excluded from this analysis, as their inclusion would have led to the matching portfolios being almost entirely composed of index-linked gilts.

	Netherlands		UK	
	Pensioners	Active Members	Pensioners	Active Members
Equities	7%	21%	13%	33%
Fixed Interest	93%	79%	87%	67%

Table 2: Risk-Minimising Investment in Equities and Fixed Interest for Dutch and UK Pension Funds

Randall and Satchell (1998, 1999) studied the relationship between annual pension payments and returns on various asset classes, and concluded that the matching portfolio is over 50% index-linked gilts, with the remainder of the portfolio divided roughly equally between gilts and equities.

A small number of asset-liability models have been constructed of funded defined benefit pension schemes and they support the conclusion that equities are not a good hedge for the liabilities. Only three studies state the asset proportions of the risk-minimising portfolio. Boender (1997) used data for a Dutch pension scheme and found that a 10% equity allocation minimised risk. Mulvey and Thorlacius (1998) and Board and Sutcliffe (2004) used hypothetical data and found the risk-minimising portfolio had 18.7% equities and 8% equities respectively. Another three studies used data on a Dutch pension scheme to find an optimal asset allocation. Such portfolios will very

[35] If it accepted that the asset allocation of a pension fund should match the liabilities, the derivation of the entire efficiency frontier is unnecessary. Only the risk-minimising portfolio is of interest.

probably contain a higher equity proportion than the risk-minimising portfolio. Bogentoft, Romeijn and Uryasev (2001) allocated 16% to equities, Gondzio and Kouwenberg (2001) allocated between 19% and 38% to equities, and Kouwenberg (2001) allocated 33% to equities. These studies do not support the view that equities are a good hedge for pension liabilities, although they do suggest that a small equity holding is beneficial in matching liabilities[36]. These asset-liability models highlight the extra risks borne by funds which follow the cult of the equity, i.e. a Texas hedge[37].

The overall conclusions are that equities can hedge part of the inflation risk over the long run, although index-linked gilts offer a far superior instrument for hedging inflation risk. Equities do not offer a hedge for salary risks. Equities can hedge discount rate risk; but only when the investment return is incorrectly used as the discount rate. If the bond rate is used as the discount rate, then bonds offer a far superior hedge for discount rate risk. Finally, the evidence on hedging total liability risk indicates that the risk-minimising portfolio contains only a small proportion of equities. Therefore, liability matching is not a valid argument in support of the cult of the equity.

In addition to questioning the two main arguments for the cult of the equity, the various factors which have facilitated or supported this cult have also been challenged.

c. Risk and the Endogenous Contribution Rate. The circumstances when the contribution rate must be increased may be the same as those where the employer finds it hardest to make additional contributions. For example, there may be an economic recession with low equity prices and low interest rates. This will worsen any scheme deficit by lowering asset values and raising liability values. Therefore, at the same time as the employer is dealing with an economic recession, there

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[36] Since index-linked gilts and bonds provide an excellent match for the liabilities to pensioners and deferred pensioners, a small equity investment is probably due to the final salary risk for active members. Cardinale (2003) also concludes that the matching portfolio for salary-linked liabilities is a composite hedge of bonds, index linked gilts, domestic and foreign equities and property.

[37] A Texas hedge involves hedging a long (short) position in an asset with a long (short) position in a hedging instrument which is positively correlated with the asset. This leads to an *increase* in risk

is a need to increase the contribution rate. The consequences of this double hit on the employer may be negative for the employees[38]. This scenario is similar to the situation that occurred in the UK in 2002 and 2003. Therefore, while the employer usually has a long time to restore any deficit, this does not mean that the employees and pensioners bear none of the risk. In this case, the cult of the equity results in higher risks for the employees and pensioners[39].

The increasing maturity of pension schemes means that the magnitude of pension liabilities has increased at a faster rate than the value of many employers. If the scheme is large relative to the employer, the risk of employer default is higher than otherwise, and the ability of employers to guarantee the solvency of the scheme is diminished. For example, in 2002 the pension schemes of both British Airways and Corus had liabilities more than seven times larger than the market capitalization of the employer. In such cases, the cult of the equity results in a higher risk of default for employees and pensioners.

In the last 20 years constraints have been placed on big swings in the funding ratio. The Finance Act 1986, Schedule 13, Part 2, introduced an upper limit on the extent to which a pension scheme can be over-funded and still remain tax exempt; while the Pensions Act 1995 introduced the minimum funding requirement (MFR) which sets lower limits on the funding ratio. Breaches of these limits must be removed within a specified period, and removing an under-funding may place a strain on the employer, possibly leading to liquidation. These bounds on the funding ratio make equities a less attractive investment because their value is are more volatile than other asset classes. Using annual observations on several hundred large US pension schemes, Amir and Benartzi (1999) found evidence in support of this view; with the relationship between the percentage of the fund invested in equities and the funding ratio following an inverted *U* shape.

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[38] For example, a deficit can lead to the scheme being closed to new members or to additional contributions. Benefits, other than those already accrued, can be reduced, the retirement age can be increased, the accrual rate reduced and the employee contribution rate increased. In addition, wages may be frozen, or increased at a lower rate for those in the pension scheme (as did the Financial Services Authority in April 2003).

[39] The issue of risk sharing is considered in Sutcliffe (2004).

d. Individual Investment Advice. Samuelson (1989) summarises four theoretical explanations for the young investing a higher proportion of their wealth in equities, than the old[40]:-

- Equity returns are mean reverting and investors have constant relative risk aversion (CRRA).
- If the risk-taking of a young person results in a poor outcome, they can plan to work harder to recoup their lost wealth, Bodie, Merton and Samuelson (1992).
- For most people, as their expected future working life shortens with age, the present value of their human capital also declines over time, while the value of their savings in the form of financial assets is likely to increase. Therefore, if equities form a constant fraction of total wealth (which includes human capital); the proportion of financial wealth invested in equities declines with age, Jagannathan and Kocherlakota (1996).
- People save so as to assure themselves of a minimum (subsistence) level of wealth at retirement.

In addition to Samuelson's four explanations, Arrow (1970) argues on theoretical grounds that relative risk aversion tends to increase with wealth. Therefore, if age is positively correlated with financial wealth, as people get older they will invest a smaller proportion of their financial wealth in equities. Viceira (2001) considers diversification between the risks of labour income and the stock market, and shows that when there is zero correlation between the stock market and labour income, workers invest a higher proportion of their financial wealth in equities than do pensioners[41].

Only the first of these six explanations applies to pension schemes, and this explanation was

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[40] Samuelson (1989) also offers an explanation for the young investing a smaller proportion of their wealth in equities than the old. People aim to make sure that their consumption does not fall below some minimum (subsistence) level. Therefore, while young they build up their wealth in safe assets. As they age, there are fewer periods of life left, and so they can take more risks with their wealth.

[41] However, if this correlation is positive, workers may invest a smaller proportion of their financial wealth in equities than do pensioners.

considered in detail in section 3a[42]. Therefore, while people display the cult of the equity when they are young (immature), this does not mean that similar behaviour should be displayed by immature pension schemes. This rejection of the analogy with individual investors, appears not to be accepted by some actuaries: "How can it be the received wisdom for individuals to invest in one way, and yet for the company to invest in another?", Dyson (2002).

e. Discount Rate. The correct discount rate to use when computing the present value of the liabilities is the rate of return on a matching asset, rather than the expected rate of return on the investments. Arrow (1964) and Debreu (1959) have shown that the present value of any sequence of risky cash flows is given by the price of the time-state claims which replicate this sequence. In other words, the discount rate to use in computing the present value of a sequence of cash flows is the return on a matching asset[43].

Since the liabilities are generally accepted to be low risk, the appropriate discount rate is probably that for low risk assets, e.g. AA grade corporate bonds (as proposed by Financial Reporting Standard FRS 17, Accounting Standards Board, 2000) or 30 year Treasury bonds (as used in the USA). The small amount of empirical evidence mentioned above in section 3b, suggests that the matching portfolio consists mostly of gilts and index-linked gilts. If the actuary is using the rate of return on low risk assets, rather than the higher rate of return expected on the assets, reducing the size of the liabilities and the contribution rate ceases to be a benefit from adopting the cult of the equity.

f. Asset Valuation. If the actuary values equities at their current market value, rather than using the

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[42] The second explanation can only apply to pension schemes if "work harder" equates with increasing the employer's contribution rate. However, if the pension scheme is viewed as being integrated with the employer, this analogy does not apply.

[43] Petersen (1996) argues that if the fund invests in risky assets the probability of default increases, and this increases the risk associated with the liability payments. Therefore, the cult of the equity increases the discount rate. However, the size of the pensions liability is not reduced by the probability of default.

dividend discount model, the riskiness of the cult of the equity is revealed with asset values used in the actuarial valuation fluctuating with the market. This also removes the scope for the actuary to choose the asset value.

g. Management of Accounting Profits. The introduction of FRS 17 means that the published accounts of UK companies will show the market value of the assets, and the value of the liabilities computed using the AA grade corporate bond rate. This reduces the scope for earnings management via pension contributions, so reducing this benefit from the cult of the equity.

h. Competitive Pressures. The valuation of assets at market prices, and the use of a low discount rate reduces the pressure on companies to follow the cult of the equity to match the reported profits of their rivals. The pressure on fund managers to invest in equities in the hope of out-performing their benchmark still remains; although adoption of the suggestion by Myners (2001) that the asset allocation should be decided by the trustees on the basis of an asset-liability model would reduce this pressure.

4. Conclusions

It has been argued that there is no firm evidence supporting time diversification; while the extra risks of investing in equities, rather than bonds, are reflected in the equity risk premium when there is a well functioning capital market. Under these conditions pursuit of the cult of the equity does not lead to an increase in the surplus of the pension scheme. The available evidence is that equities are a poor match for pension liabilities, and the cult of the equity has no hedging merit. Thus, the two main arguments used in support of this cult are rejected.

The argument that the employees and pensioners bear none of the risks associated with the cult is not correct; see Sutcliffe (2004). The analogy drawn between immature investors and immature pension schemes is not valid, and so is not an argument in favour of the cult. The use of a bond discount rate, rather than the expected return on the assets, means that the cult no longer has the

benefit of reducing both liabilities and the employer's contribution rate. The move to valuing assets at current market prices in actuarial valuations has the consequence that the riskiness inherent in the cult is no longer hidden. The scope which the cult gives for manipulating corporate earnings via pension contributions has been reduced by FRS 17. Finally, the competitive pressures to follow the cult have been reduced.

The overall conclusion is that, amongst the factors considered, there is no powerful reason for adopting the cult of the equity. Equally, there is no strong reason to reject this cult. In the absence of taxation, risk sharing and default insurance, the asset allocation decision of the fund is indeterminate, and the choice depends on the risk-return objectives of the scheme. The impact of tax arbitrage, risk sharing and default insurance on the selection of the asset allocation can be analysed on the merits of these factors alone, without including an underlying equity tilt based on the arguments considered in this paper.

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