
**THE IDENTIFICATION
AND
MEASUREMENT
OF
SPECULATIVE RISK**

by

Richard Fitzherbert

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Abstract

Recent falls in stock markets have once again exposed investors in superannuation and managed funds to negative rates of return. A common, and possibly self-interested, response from the managed funds industry is that such declines can only be anticipated in hindsight.

While acknowledging that this is sometimes the case, stock market levels such as those reached in Australia in 1987, the UK in 1999 and the USA in 2000 can be shown to have involved a high degree of speculative risk - the chance that purchases at such levels were extremely unlikely to provide a reasonable return for long-term investors. Poor long-term performance from such levels could have been anticipated, even though the timing of any sharp decline could not.

The thesis of this paper is that speculation can be identified using two quite different approaches to analysis. Given a definition that is relevant to investors with long-term objectives, speculative risk can then be measured.

If speculation can be identified and speculative risk can be measured, then it can be avoided in investment decisions and taken into account when valuing actuarial liabilities. This is particularly relevant for defined benefit funds as demonstrated recently in UK pension schemes.

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1 Introduction

- 1.1 The famous US stock market crash of 1929 has been described in numerous books and articles including Galbraith (1975). It might have been supposed that mere knowledge of the history of this event, and its aftermath, should have been sufficient to prevent stock markets from engaging in similar levels of speculative activity. Indeed, this one of Galbraith's objectives in writing *The Great Crash 1929*:

"There is merit in keeping alive the memory of those days. For it is neither public regulation nor the improving moral tone of the financial markets which prevents these recurrent outbreaks and their aftermath. It is the recollection of how, on some past occasion, illusion replaced reality and people got rimmed."

Regrettably, Galbraith's hopes do not seem to have been met and there have been recent examples of speculation on a similar scale.

In terms of underlying value, Shiller (2000) argues that in 2000 the US stock market reached a peak in terms of underlying company profits that was 50% higher than the 1929 peak. As discussed in section 3 the Australian stock market, using a similar method of calculation, reached approximately the same level in 1987 as the US market in 1929. In 1989, the Japanese stock market, as measured by the Nikkei 225 index reached a peak just under 40,000 points - roughly five times its current (2003) level. The subsequent decline is now recognised in Japan as *'The Collapse of the Bubble'*.

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- 1.2 It is frequently argued that such speculative episodes, and their subsequent demise, can only be recognised in hindsight. The opposite view is argued here.

If such excessive levels can be identified, it is nevertheless recognised that the ultimate peak and the timing of the subsequent decline cannot be forecast with any accuracy. An important question that needs to be considered is therefore the practical problem confronted by professional investors at such times. They may recognise that prices have reached unsustainable levels, but they are unwilling to take any action lest they sell too early - risking short-term underperformance, loss of mandates and jeopardising their own livelihood.

- 1.3 There are two quite different methods of identifying and measuring speculative bubbles. One method is qualitative and based on economic history as documented by Kindleberger (2000). The second method is quantitative and based on old-fashioned fundamental security analysis adapting the ideas of Graham et al (1962). In Australia in 1987 and the US in 2000, these two approaches both came to the same conclusion.

The subsequent likelihood of poor long-term returns, or speculative risk for long-term investors, could therefore be identified and measured. If this is so, then the argument that speculation and speculative risk can only be recognised in hindsight is untenable.

- 1.4 This paper begins with a description of two different methods of identifying speculative bubbles - one qualitative, the other quantitative. To be able to measure speculative risk a formal definition is proposed and its calculation is then illustrated.
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Identification of speculation and measurement of speculative risk then becomes the starting point for two more substantial challenges: -

- (a) how to use this information in traditional actuarial valuations, and
- (b) how it might be incorporated into asset allocation advice.

It is often argued that assets and liabilities should be valued on a consistent basis. With market values more or less compulsory for asset valuations, the starting point for choosing a discount rate for valuing liabilities should therefore be the corresponding return that is implicit in a market valuation of assets. This idea is explored.

Finally, the paper grapples with the practical issue for professional investors and investment consultants who identify speculative risk, but who believe they cannot bear the *business risk* of taking, or advising, an underweight position in asset sectors that carry significant speculative risk.

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2 Identification of speculative bubbles.

- 2.1 According to Kindleberger (2000), speculative bubbles in the past have followed a standard structural pattern, even though the details vary from one episode to another.

"For historians each event is unique. Economics, however maintains that forces in society and nature behave in repetitive ways.

...

The basic pattern of displacement, overtrading, monetary expansion, revulsion and discredit, generalized in modern times by the use of the Minsky model, describes the nature of the capitalist economies well enough to direct our attention to crucial problems of economic policy.

....

Details proliferate. Structure abides."

Although Kindleberger was mainly interested in the Minsky model in the context of economic policy, the model describes the structure of a speculative bubble. Understanding this structure is no less relevant for investors seeking to recognise the symptoms of speculative bubbles.

- 2.2 Kindleberger provides a detailed description of the Minsky model. It has a number of distinct stages: -
- (i) first there is a '*displacement*' or shock to the economic or financial system which significantly alters the business or financial prospects of a significant sector, or more than one sector of the economy. For example, the strike at the largest nickel producer in the world may well have sparked the '*Poseidon*' boom of 1969/70. The speculation which culminated in the 2000 collapse of the '*dot.coms*' was probably initiated by a number of important developments in telecommunications and technology, including the Internet.
 - (ii) to accommodate speculation, monetary and/or credit expansion is required. This can take numerous forms including budget deficits, expansion of bank credit, margin lending and, increasingly since the mid 1980s, the use of derivatives.
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Both Kindleberger and Galbraith argue that monetary expansion may not be sufficient without a '*pervasive sense of optimism*'. As Galbraith notes:

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"Speculation on a large scale requires a pervasive sense of confidence and optimism and conviction that ordinary people were meant to be rich."

- (iii) the third stage, which can be identified qualitatively and quantitatively is the boom stage when *over-trading* takes place. This is where demand for goods and financial assets pushes up their prices, creating more demand and a feed-back loop develops between the financial sector and the general economy. The financial sector can include residential property.
- (iv) at some point something happens, often unexpectedly and quite suddenly, which changes the psychology of market participants. For example in Australia in 1987 it was a dramatic overnight fall in the US stock market. The trigger could be an earthquake (eg Kobe) or it could be a major fraud or corporate collapse (eg Enron and Mineral Securities).

As well as sudden triggers the change could be gradual if enough people decide to realise their profits and sell, balancing the buying pressure from newcomers.

- (v) the final stage, sometimes referred to as revulsion or discredit, is where liquidation occurs. This may be orderly, or it may degenerate into a panic. This is perhaps one phase of the speculative cycle where central bankers have learned from 1929. However, supplying the financial sector with liquidity may merely avoid a disorderly panic, move the problem elsewhere or just delay the eventual liquidation. In Australia in 1987, for example, the subsequent liquidity helped fuel a speculative property and property lending bubble which, when it finally ended, nearly caused insolvency in at least one of the major banks. Further afield, the Japanese government has been struggling with the bad debts
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caused by the speculation in stocks and real estate for more than a decade.

This suggests that central bankers have learned to prevent liquidation from becoming disorderly. The only way to prevent such liquidation altogether may be to prevent the preceding overtrading from reaching excessive levels.

- 2.3 Galbraith (1975 p 187) had a similar view to Kindleberger's assessment of the relevance of the Minsky model.

"As has been so often emphasized, the collapse of the [US] stock market in 1929 was implicit in the speculation that went before. The only question concerning that speculation was how long it would last. Sometime, sooner or later, confidence in the short-run reality of increasing common stock values would weaken. When this happened, some people would sell, and that would destroy the reality of increasing values. Holding for an increase would now become meaningless; the new reality would be falling prices. There would be a rush, pell-mell, to unload. This was the way past speculative orgies had ended. It was the way the end came in 1929. It is the way speculation will end in the future."

The first edition of Galbraith's account of the crash of 1929 appeared in 1954; so perhaps his final sentence failed to anticipate the increased willingness of central bankers to ease disorderly liquidation. A more recent example of this is the role of the US Federal Reserve in containing the potential damage which might have followed a disorderly collapse of Long Term Capital Management Ltd in 1998. (Lowenstein, 2001)

- 2.4 An understanding of the structure of speculative bubbles enables the alert observer to notice symptoms which become apparent when speculation is in progress, or to use Kindleberger's terminology, during the over-trading phase. Such qualitative observations require an element of detachment. Alternatively, as philosophers of science would argue (see for example, Chalmers, 1999), these observations may need to be made by trained observers. However such
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training does not require specialised financial or economic knowledge. The symptoms of speculation include: -

- (a) apparent investment 'success' by non-professional investors,
- (b) outrageously optimistic forecasts and advertisements,
- (c) widespread criticism of traditional valuation yardsticks ("this time it is different"), and
- (d) the emergence of financial cult figures.

2.5 These symptoms would be difficult to investigate in a rigorous statistical manner and diagnostic use of these symptoms relies on the recorded observations of experienced investment practitioners such as Band (1989), Lynch (1989) and Neilson (1997). Also, as Neilson notes, these indicators give neither indication of the eventual peak nor the timing of the demise: -

"When one reads the history of manias, the recurrent pattern is very clear. The markers include an abundance of credit, a new exciting world of change, the emergence of financial cult figures, and so forth. ... History is a valuable guide but, sadly, only provides a crude street map without any indication of scale."

The problems in applying history are made more difficult because there is no well-known statistical analysis which attempts to correlate the level of optimism shown in financial advertisements with subsequent stock market performance. However, as Kindleberger notes, *'anecdotes are evidence'* and we cannot pretend an advertisement such as the following did not happen.

At the time of the bubble preceding the Australian stock market crash of 1987, a full page advertisement for AMP Equity Trust appeared in the *Australian Financial Review* on 27th August, 1987 noting that the trust had achieved a return of 100.6% in its first 10 months,

"How many investors are kicking themselves for not getting in on the ground floor when the AMP Equity Trust was launched last year? ...

But the good news is you can still invest in this trust and, in addition, AMP has launched two new Equity Trusts."

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The statement that the AMP Equity Trust had achieved 100.6% in its first 10 months was subject to the disclosure (in somewhat smaller print) that

"The future performance of AMP Equity Trust may be different from this rate."

In some cases newspapers and radio transcripts provide a permanent record of some of the more outrageous views expressed at the time. For example: -

- (a) Close to the peak of the Japanese stock market in 1989, a full page advertisement from Nomura Securities Co Ltd appeared in *The Australian* on January 31st, 1989 challenging the views of observers who thought Japanese price/earnings ratios (then around 80) were too high.

"[Such people] point to sky-high PE-ratios and claim that Tokyo is much too expensive and that the market is unstable ... instead of deepening their knowledge and enlightening themselves .."

- (b) In 1999, the year before the peak in the US stock market, James Glassman and Kevin Hassett published *Dow 36,000: The New Strategy for profiting from the coming rise in the stock market*. The crux of their argument amounted to a view that a fair price/earnings ratio for US stocks was 100 (p18). In a discussion of the merits of price/earnings ratios they wrote (p33):

"A profound change has occurred in the attractiveness of stocks since the 1980s as investors have become more rational. The old 'limits' of yields and P/Es do not apply any more - if they ever did."

- (c) On ABC Radio on October 9th, 1999, there was a discussion concerning the likely price of Telstra instalment receipts and the corresponding future price of the ordinary shares. This occurred during a regular (and popular) Saturday morning personal finance
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program. On this particular occasion the regular commentator was replaced by a special guest who was a senior newspaper journalist: -

Host: *"What's your guesstimate for the price that people will pay for the second installment of Telstra shares?"*

Guest: *"It's hard to tell, but I've had a few calls on this at the newspaper, and very hard to assess a number, but what I'm trying to say to them is that don't even worry about it. I'm trying to say that by the time the shares are \$100 in (say) 2008 it won't matter."*

Host: *"And you think that will happen?"*

Guest: *"Easily."*

Host: *"\$100 per share?"*

Guest: *"Easily."*

At the time of writing (February 2003) the price of Telstra shares was just over \$4 per share.

2.6 With the benefit of hindsight, these advertisements, arguments and comments look rather foolish. It is worth noting, however, that they were the pronouncements or publications of respected people and prestigious organisations; they cannot be dismissed as the irresponsible chatter of unimportant lunatics.

As well as the quality and substance of the origins of this material, we need to recognise two features of its timing. First, there is no reason to suspect that the authors were not genuine; they firmly believed in what they were saying and/or suggesting at the time. Second, someone was prepared to meet the costs of publication which would have been unlikely if readers would have dismissed the advertisements (or the book) as so silly that they were not worth reading.

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In other words, the occurrence of these excessively optimistic views tells us something about the mood of the investing (or share buying?) public at the time. They were receptive to these ideas and unlikely, at the time, to dismiss them as ridiculous. This may be partly due to what Hugh Mackay (1994) refers to as the second law of human communication:

"Listeners generally interpret messages in ways which make them feel comfortable and secure."

Consequently, in boom times, market participants will readily accept arguments that dividend yields of 1% are irrelevant to investment decision making, that price/earnings ratios of 40 (or more!) are not too high or that the concept of intrinsic value is decades out of date. Views which contradict the prevailing optimism tend to be ignored. For example the dust cover of Glassman and Hassett (1999) claims their book explains "Why the financial establishment is wrong" - suggesting that there was no shortage of views querying the level of US stock prices in 1999.

- 2.7 If the phenomena mentioned in para 2.4 are recognised as indicators of a prevailing sense of optimism and/or the overtrading stage of a speculative bubble, a second reason why such examples are not recognised as symptoms at the time is that in common with scientific observations, their interpretation depends on the dominant paradigm. (See for example Chalmers, 1999).

If market participants believe that speculative bubbles can only be recognised in hindsight, then these phenomena will tend to be ignored. However if observers have studied the history of speculative bubbles (or experienced them!) and have been shown examples of these phenomena in this context, then they will be more inclined to notice the evidence.

- 2.8 An alternative approach to the diagnosis of speculative bubbles, and one that may appear to be more objective than interpreting degrees of excess optimism in newspapers etc, is to estimate the 'normal' or 'sustainable' level of corporate earnings that corresponds with a particular stock market index. The index is then divided by this estimate of 'normal' earnings to provide an adjusted price/earnings ratio which can then be compared with the historical record -
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particularly at the peaks of previous speculative bubbles. Even if past speculative bubbles can only be recognised in hindsight, perhaps this calculation will provide a warning signal about speculation in the future.

This is an adaptation of methods traditionally used by security analysts to assess, and compare, the investment merits of individual companies. However, in these cases, analysts normally use estimates of prospective earnings (after-tax profits) per share.

- 2.9 With access to databases of analysts' estimates of prospective earnings for every company in a stock market index, an aggregate prospective earnings estimate for an index can be obtained. While this may appear to be a sensible way of estimating sustainable earnings: -
- (a) even in normal trading conditions, such a bottom-up approach will tend to be optimistic as analysts' earnings estimates for individual companies tend, in general, to be optimistic. This estimate will need to be tempered by a top-down estimate based on economists' forecasts of Gross Domestic Product and its components, one of which will be company profits.
 - (b) during the over-trading phase of a speculative bubble, return on equity will either be unusually high, or expected to be so. This sense of optimism will affect all forecasters, including security analysts. This optimism will tend to lead to an overestimate of sustainable earnings and, in the case of individual stocks, price/earnings ratios that analysts consider appropriate.
- 2.10 Estimating current sustainable earnings, defined as *after-tax profits excluding non-recurring items and assuming neither depressed nor favourable trading conditions*, is not a simple task. Analysts may exclude non-recurring items, but will normally estimate prospective earnings based on expected trading conditions which may well be favourable.

It might seem reasonable to suppose that current sustainable earnings can be estimated by taking a historical average which will include favourable and

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unfavourable periods. However this does not allow for the corporate growth that has occurred since previous years' results were recorded. Before past data can be used to provide an estimate of current sustainable earnings, historical figures need to be adjusted for corporate growth. There are two straightforward methods of making such an adjustment - adjusting for inflation or inflating past years' figures using a constant rate of compound growth of (say) 5% per annum. Having made these adjustments, an average of 10 years' (or similar) figures is then taken to estimate current sustainable earnings. These methods of adjustment have some underlying assumptions, as discussed below.

- 2.11 If, other things being unchanged, the level of profits underlying a stock market moves with inflation, then past profits can be made comparable with current profits by reference to an inflation index such as the Gross Domestic Profit Implicit Price Deflator. A 10 year average is then taken to iron out year to year fluctuations. This was the approach adopted by Shiller (2000) although he did not discuss his reasons beyond referring to Graham and Dodd (1934). A graph showing the adjusted price/earnings ratio of the Standard and Poor's 500 index, and its predecessors, appears as Figure 1.2 in Shiller (2000 p8).

There were four notable peaks in the 20th century (including 2000). The adjusted price/earnings ratios at these peaks were: -

1901	25.2
1929	32.6
1966	24.1
2000	44.3

On the same basis, the latest trough was roughly seven times adjusted earnings in 1982. At the market level ruling at the end of 2002, the US stock market was still trading at approximately 24 times adjusted earnings, roughly the same level as that of the peak of the so-called 'go-go era' in 1966.

Over the last 20 years, US stock prices in relation to adjusted earnings have therefore increased by a factor of 3.5 - adding 6.5% per annum compound to the investment return achieved from dividends and capital growth due to

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increased earnings. This is the story that underlies investment performance figures over the same period.

On the basis of adjusted price/earnings ratios Shiller demonstrated that, in 2000, US stock prices had reached levels in relation to underlying sustainable earnings which were unprecedented. Notwithstanding the passage of time and the subsequent decline, the level of the US stock market in early 2003 in relation to sustainable earnings looks more like the level of past speculative peaks than subsequent troughs.

- 2.12 The second method of adjusting prior year earnings is to argue that growth in the underlying earnings of a stock index depends on changes in return on equity and retained profits. Return on equity, and consequently retained profits, fluctuate. Retained profits, as a percentage of shareholders' funds, have exhibited a long term average of the order of 5% per annum. Adjustment of prior year profits for corporate growth can therefore be achieved by a straightforward increase of 5% per annum compound.

This argument always seems to create problems because it is commonly believed that, in general terms, company turnover, earnings and dividends should grow, broadly speaking, with Gross Domestic Profit. While company profits should grow this way, this growth cannot be sustained unless their capital base grows at the same rate. Under historical cost accounting, shareholders funds can only grow from retained profits or by raising additional equity which increases the number of shares on issue. Growth due to raising new equity capital must be excluded in calculating investment returns (as is the case in calculating stock market indices). Consequently the source of growth of the shareholders' capital underlying a stock market index is retained profits. Inflation has little, if anything, to do with corporate growth, as experienced by investors after adjusting for raising additional capital.

A further assumption, implicit in this method of adjustment, is that return on equity is a weakly stationary process - in other words it fluctuates randomly about some long term equilibrium level. This is discussed in more detail in Fitzherbert (2002).

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To apply this method of adjustment to Australian data, we first need an estimate of the underlying earnings of the Australian All Ordinaries Index which, unlike its US counterpart, is not directly available. Most Australian companies balance on June 30th and report their profits on a half-yearly basis and this information is used to update various databases. By 30th September each year the profits for the year ended June 30th will therefore be known. The index on this date divided by the market weighted price/earnings ratio therefore gives an estimate of the underlying earnings attributable to the index constituents as of September 30th for the previous financial year.

After adjusting these figures as described, using 5% per annum compound, the figure below shows the adjusted price/earnings ratio for the Australian All Ordinaries Index since 1979.

Figure 2.1
Australian All Ordinaries Price/Adjusted Average Earnings



2.13 A number of features of this figure are worthy of note: -

- (a) the index peaked at around 27 times adjusted average earnings in 1987,
 - (b) the lowest trough was 8 times in 1982,
-

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- (c) in 2000, when the US market was trading at 44 times average adjusted earnings, the Australian market was trading at approximately 20 times, and
 - (d) despite the fluctuations, there has been a noticeable increase in this ratio over the last 20 years which has added to the recorded performance of ordinary shares over this period. For this to be repeated, the index would need to reach, and be sustained at, approximately 30-40 times over the next 20 years. It seems more likely that the price/adjusted earnings ratio will either be sustained at recent levels or decline to 1980s levels. The arguments of Barker (2002) suggesting lower medium-term returns in the future than in the recent past seem well founded.
- 2.14 Alternative methods of overall assessment of stock market levels are a comparison with the estimated replacement cost of assets, and a comparison of aggregate market capitalisation with Gross Domestic Product. While these measures have merit, they are not considered further here.
- 2.15 The four peaks of the US stock market in the 20th Century, together with the Australian peak of 1987 and the UK peak in 1999 (see para 4.5) have all corresponded with adjusted average price/earnings ratios in excess of 20 times. On the basis of history, this seems to indicate levels which have been subsequently viewed as speculative bubbles. In the recent cases we see that evidence of over-trading may also appear in the media, although recognition of these symptoms may require a trained observer.
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3 Speculative Risk: definition and measurement

3.1 The Australian Pocket Oxford dictionary defines speculation as:-

(a) *the purchase or sale of stocks or goods in the hope of profiting by changes in their market values,*

(b) *deal[ing] in financial assets of a risky kind.*

This is only partly helpful because long term capital appreciation is often, but not always, a reasonable expectation from share investment. Also, we do not know what *assets of a risky kind* are until we know what the dictionary means by risk. Its definition of risk is *chance of bad consequence*.

While the dictionary idea of risk is helpful, the dictionary definition of speculation is hard to apply because it is hard to distinguish between the expectation and hope of capital appreciation.

There are other reasons why the dictionary definition of speculation is unhelpful, including the argument as to whether speculation and/or risk should be considered in relation to a portfolio as a whole or to individual assets. For example, is it speculative to own a fully hedged equity portfolio involving the ownership of an index weighted portfolio and an opposite position in futures? In this case (at least) one side of the position involves dealing in futures which, by itself, would normally be regarded as *'dealing in financial assets of a risky kind'*, however the net position is essentially that of a short term fixed interest security. (For the purposes of this discussion the issue of counterparty risk and the risk of clearing system failure has been ignored.)

3.2 Given the difficulties of adapting the dictionary definition of speculation, it might be more helpful to consider the ideas of Graham et al (1962) combined with the basic actuarial principle that liabilities determine suitable investments. Also the term *'speculative risk'* intentionally indicates an extreme element of risk. It is intended to apply to all participants in the stock market, including long term investors who would normally own ordinary shares.

The suggested definition of speculative risk is:-

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the chance that, at current prices, share purchases are unlikely to provide a reasonable compound return by way of income and capital appreciation over a long-term but finite holding period.

The phrase '*at current prices*' acknowledges that speculative risk is not constant; it varies with time. An appropriate holding period will vary from investor to investor. The age at which private individuals tend to accumulate funds for retirement, weighted by amount, would be towards the end of their careers - say age 55. These funds are then spent, on average over a 25 year period starting at age 60 (say) with a duration of around 10 years. An appropriate weighted average holding period would therefore be of the order of 15 years for private individuals saving directly, and indirectly, for retirement. Such a period is also towards the end of what might be regarded as the foreseeable future. For illustration purposes and also for general use, 15 years is therefore suggested as suitable in this context. Given this holding period, investors in ordinary shares should have reasonable grounds to expect a 'reasonable compound return' which is at least equal to the gross redemption yield currently on offer from government bonds with a similar duration.

In some cases, this definition of speculative risk could be stated in terms of the probability that the total return on an indexed stock portfolio over the next 15 years will exceed the return from a portfolio of government bonds with the same duration.

- 3.3 Despite the apparent precision of this latter definition, practical measurement is not a simple matter. Two suggested approaches are:-
- (a) estimate the rate of return to be achieved over the suggested 15 year holding period and compare this with government bonds to assess the likelihood of achieving a return in excess of that of a portfolio of bonds, and
 - (b) estimate the price/earnings ratio that would need to apply in 15 years' time such that the return from the share portfolio was equal to that currently available from a portfolio of bonds. A comparison of this price/earnings ratio with the historical record will give an indication
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as to the probability that an investment in shares will fare better than a portfolio of bonds.

- 3.4 The steps required in this calculation are shown below. These calculations assume a single sale at a median price/earnings ratio in fifteen years' time which seems a little unrealistic. However, the sale of an equity portfolio, or an implicit sale where a portfolio is passed from one generation of policyholders or beneficiaries to another, will normally be a gradual affair over a number of years. The proceeds would take place at a variety of prices and times which would tend to lead to an 'average' result. Even though the concept of a single sale might appear unrealistic, an assumed sale at a median price/earnings ratio would have a similar financial result to what is more likely in practice. The reason for the choice of a median price/earnings ratio is that this is the value which provides an equal probability of a result which is better or worse than the calculations.

We now proceed as follows:-

- (a) estimate the current level of sustainable earnings that corresponds with the stock market index portfolio using the methods described in paras 2.11 (USA) or 2.12 (Australia) and
- (b) project these earnings forward for 15 years assuming a growth of 5% per annum, estimating dividends in the process at 50% of earnings.

To find out whether the chances of shares outperforming bonds are better than 50% we assume a sale in 15 years' time at the median price/earnings ratio and then either:-

- (i) discount dividends and the eventual sale at the long term bond rate. Comparing the resulting net present value with the current index will tell us two things - whether the chances of outperforming bonds are greater than 50% and secondly, the index value that makes shares and bonds equally attractive on the basis of estimated median return.
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- (ii) calculate the internal rate of return. This will provided a median estimate of the rate of return that a long term share investor will achieve which may, or may not, exceed the gross redemption yield on bonds.

If we wish to estimate the probability that equities will out perform bonds, we then perform an empirical comparison of this implied price/earnings ratio with the historical record.

- 3.5 These calculations, in relation to the 1987 peak of the Australian All Ordinaries Index and the 2000 peak of the Standard and Poors' 500 index are shown below.

Table 3.1
Speculative Risk assessment at recent stock market peaks

Year	Australian All Ords 1987	US S&P500 2000
Index Peak	2300	1500
Adjusted average earnings	87	36
15 year bond yield (%pa)	13%	6.5%
Median P/E	12x	13x
Net Present Value	770	650
Internal rate of return	2.6%	-0.5%
Required P/E in 15 yrs	50x	44x

- (a) In both cases, the net present value of 15 years' dividends plus the assumed sale proceeds was less than 50% of the index. This suggests that these stock markets would have needed to have been less than 50% of their level at the time to give share investors an even money chance of faring better over the next 15 years in shares compared to
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bonds. Another way of looking at this same point is to note that the median estimates of internal rate of return on share portfolios was substantially less than the yields available on long term bonds.

- (b) To provide investors in shares with an even chance of faring as well as investors in bonds, the price/earnings ratios 15 years after these peaks would need to be 45-50 times sustainable earnings. On the basis of the historical record, the chances of shares performing as well as bonds over 15 years from these peaks was very remote.

It is sometimes argued that speculative excess can only be recognised in hindsight. The opposing argument is that these assessments could have been made at the time using publicly available information and methods of analysis available since 1934. Also it might be noted that the forecast median equity premium over the following years was substantially negative in the case of both the Australian peak in 1987 and the US peak in 2000.

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- 3.6 An assessment of the speculative risk inherent in stock market levels in mid-2002 is shown below.

Table 3.2
Speculative Risk assessment mid-2002

	Australian All Ords	US S&P500
Index level	3100	900
Adjusted average earnings	170	37
15 year bond yield (%pa)	5.5%	4.5%
Median P/E	12x	13x
Net Present Value	3200	825
Internal rate of return	6.0%	3.8%
Required P/E in 15 yrs	11x	13x

In general, this table shows that the median estimated return from shares and bonds in both countries was approximately the same. Given that bonds and equities were an 'even money bet' (speculative risk was approximately 50%) it seems hard to understand why the typical the typical Australian superannuation fund held more than 70% in equities, world-wide, at the time.

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4 Valuation discount rates (and the UK pension problem)

- 4.1 With the trend towards defined contribution funds, the valuation problems of defined benefit funds are becoming less of an issue for Australian actuaries. However some of the funds that remain are substantial even if the comments which follow may be more relevant in other countries. This is particularly important in the UK where there has been a substantial change from the discounted cash flow approach (applied to both assets and liabilities) and the use of market values for assets and a discount rate based long terms bonds adjusted (usually positively) for a 'risk' premium. (See for example Head *et al*, 2001.)

Assume, for the purposes of this discussion, that the assets of a defined benefits fund can be notionally regarded as cover for accrued benefits and that future contributions are intended to meet the cost of benefits which will accrue in future. Given this notional segregation, the valuation of a defined benefit fund can be conceptually divided into two components:-

- (a) the present value of accrued benefits and the value of assets, and
- (b) the present value of benefits to be accrued in the future less the present value of contributions at the recommended contribution rate.

- 4.2 If the cash flow of accrued benefit payments is accurately matched by cash flow, by way of interest, dividends, redemptions and (if necessary) sales of assets, then there is no surplus or deficiency on this component of the valuation and the valuation rate of interest (or investment earnings) should not matter.

If assets are valued at (net) market value, then the present value of accrued benefits should be valued at the rate of return that is implicit in the use of market values in valuing assets. Provided this is done, fluctuations in market values will have no bearing on a nil difference between the value of assets and liabilities.

Problems will arise if assets are valued at net market value and the assumed earning rate exceeds that which can be expected to be achieved from investments purchased at levels ruling on valuation date. Suppose for example

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an Australian fund had been 100% invested in equities in September 1987. If accrued benefits had been valued at 4.5% then the subsequent sudden decline would not have affected the ability of the fund to meet these benefits from dividends and sales at more normal price levels. However it would have been quite unsound to value accrued benefits at (say) the long term bond rate of 13% plus an assumed 'equity risk premium' of say 2% per annum. To justify this basis of valuing liabilities, assets would need to have been valued at approximately 25% of market value.

- 4.3 At a time of high speculative risk, the idea of using an investment earning assumption that is substantially less than the long term bond rate may appear to be an unsurmountable problem in communication. However the alternative of widespread insecurity in defined benefits schemes is a risk that should be unacceptable.

It may sometimes be argued after a substantial decline in market values that this decline was the cause of insolvency. If, however, equities are valued at market values at times of high speculative risk, then the median long-term return will be significantly less than bond rates. If this speculative market value is approximately equal to the 'fair value' of benefits discounted at the long term bond rate plus an equity premium then assets have, in effect, been valued at a significantly lower discount rate than liabilities. The insolvency existed at the time of the valuation, but this was disguised when market values exceeded the value of benefits because the method of valuation was quite unsound. There are significant dangers in the 'fair valuation of liabilities' approach unless actuaries learn to assess the likely return from various market levels and ignore the doctrine of 'risk free rate' *plus* the 'equity risk premium' that emerges from financial economics.

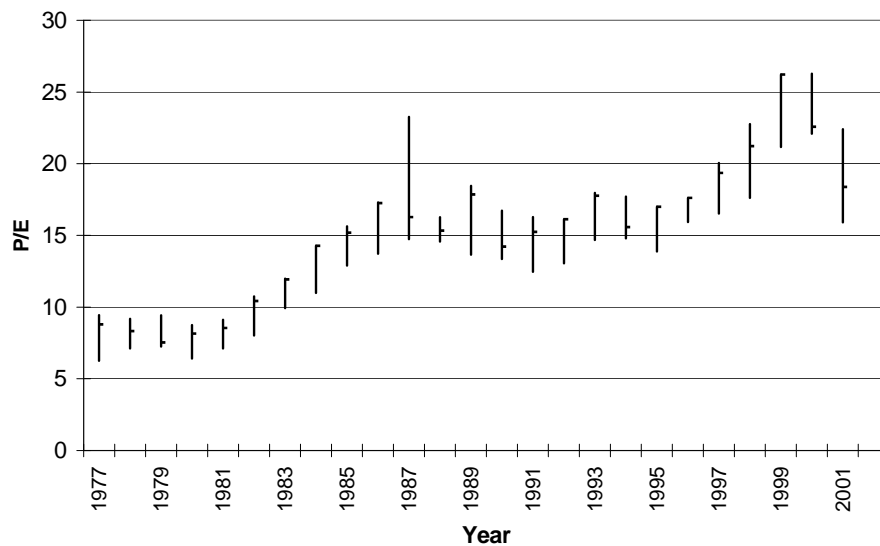
- 4.4 As far as future benefits, funded by future contributions, are concerned the problem of valuing existing assets does not arise. However, the cost of providing defined benefits should decline if investment earnings rates rise. Provided the value of accrued benefits and assets are properly matched, it follows that contribution rates should fall if stock markets fall, and not the other way around!
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- 4.5 The figure below shows the range of price/earnings ratios in relation to the FTSE Non-Financial index over the last 25 years. The earnings figures were the 10 year adjusted averages using annual earnings figures derived from year end index values and price/earnings ratio estimates published annually by Brumwell (1978 *et seq*). The adjusted 10 year averages used the second method of adjustment at 5% per annum set out in para 2.12. Note that the full 10 years' data was only available in 1986, thus the 1981 figure is a five year average.

Figure 4.1

UK FTSE Non-Financials Price/Average adjusted earnings 1997-2001



Ross and Goford (2003) comment:-

"The most alarming development in UK pension funds has undoubtedly been the emergence of significant deficits.

The explanation lies in how pension funds have been invested, and at root the need for trustees to better understand how their pension liabilities behave."

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The arguments presented in this paper present a different explanation. At the end of 1999, when the FTSE Non-Financials index stood at 3372, it was trading on a dividend yield of just under 2% per annum and 26 times adjusted average (or estimated sustainable earnings) of 129 points. Using the assumptions of para 3.4, the median 15 year internal rate of return was only 2.8% per annum at a time when long-term gilts were offering just under 5% per annum. It seems most unlikely that any pension valuations used such a low nominal valuation rate of interest, but this was the median rate of return that was implicit in a market valuation of equities at the time - when equities probably accounted for approximately 80% of the typical fund's assets.

By the end of 2002, the internal rate of return offered by UK equities had increased to 9% per annum on the same assumptions. What had therefore happened is that the valuation rate of interest implicit in a market valuation of assets had increased from 2.8% per annum to 9% per annum over three years. If the liabilities had been valued at something like the rate of interest that was implicit in the market valuation of assets three years' ago then this fool's paradise would have been exposed at a time when trustees might have been able to do something about it.

Ross and Goford (2003) continue:-

"Finance theory teaches us that the market value of a pension fund's liabilities is unaffected by how the assets are invested."

The analysis of this paper suggests otherwise. To begin with, there is no such thing as the market value of pension liabilities as the term *market value* would be normally understood. While there may be a potential '*market*' in members repurchasing their pension entitlements under commutation arrangements, there is only an estimated expected present value. If market prices are to be used for "*valuing*" assets, then the rate of return that is implicit in this approach, and an institution's investment strategy, must be taken into account in determining the valuation rate of interest.

Secondly, there has been a marked reluctance to sell equities when, on the basis of the methods similar to those suggested here, bonds offer a superior

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long-term return. As markets fluctuate, the rate of return implied by market valuations of assets also fluctuates and, to be consistent, so must the valuation rate of interest.

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5 Asset allocation

- 5.1 Private individuals and trustees of superannuation funds investing directly in shares will normally take each issue on its merits - even if the reason for purchasing a share is its index weight. However many of them will consider dividend yields, prospective price/earnings ratios, growth prospects etc or will act on recommendations which take these factors into account.

The process for selecting indirect investments is quite different whether this involves the direct or indirect delegation of stock selection to professionals. While factors affecting the fund management organisation are taken into account, it is usually the past performance of the portfolio that is taken into account rather than its underlying fundamentals such as aggregate dividend yield or prospective price/earnings ratio.

Members of superannuation funds, for example, very rarely (if ever) see a discussion of market levels in terms of underlying dividends or earnings. Yet past performance usually features prominently in reports to members. The outlook for future performance only tends to be discussed to reassure members when past performance has been negative.

- 5.2 The change from direct to professionally managed investment has therefore corresponded with a change in perspective from one that looks forward (prospective price/earnings ratios etc) to one that looks backwards. Furthermore it is generally known that past relative performance has little if any predictive power; the reverse is true for information about dividends and earnings that is available to direct investors.

In other words, the change from direct share ownership to professionally managed investment has been accompanied by a change in the information provided to investors. Forward looking information that is useful for achieving superior returns (and assessing market levels) has been replaced with backward looking information that seems to be relatively useless for achieving superior results and says nothing about market levels in relation to underlying fundamentals. At the very least there is a need for a discussion of underlying dividends and earnings in trustees' reports.

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- 5.3 When confronted with high levels of speculative risk, professional investors are usually unprepared to take advantage of the selling opportunity that this represents. If an overpriced market advances further in the short term their clients will be displeased. In other words, short term business risk over-rules long term investment risk in the professional investment market, even when there is plenty of evidence of speculation and long term investment risk reaches extreme levels.

Two senior journalists, Dunstan (2003) and Kohler (2001) have commented on this question. Dunstan quotes the case where professional fund managers, when confronted with a 70% chance of a stock market decline, will hold all of their own funds in cash. But they will continue to hold all of their clients' funds in shares because *'they cannot afford the 30% risk of being wrong.'*

Kohler observed:-

".. despite their long-term mandate, trustees and asset consultants benchmark fund managers against monthly and quarterly movements in share price indices and specify a maximum 'tracking error' from short-term movements in the index. It's true that most investment contracts provide for major three-yearly performance reviews, with smaller annual reviews, but there is no guarantee a fund manager will not be sacked after a bad quarterly performance, so most behave as if they might be."

- 5.4 To some extent the inability of the professional investment community, (comprising asset consultants as well as fund managers) to deal with speculative risk could be a self inflicted problem caused by their own emphasis on past performance. This is a serious problem which, among other things, may create a momentum effect which exacerbates speculation. Emphasis and detailed discussion of underlying fundamentals in trustees reports might help, particularly if this discussion of underlying fundamentals were accompanied by less emphasis (or even omission) of past performance data.

Astute investors will recognise that delegation of stock selection to financial institutions does not make full use of professional investors' expertise.

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Through the mechanism of the professionals' business risk, indirect investment subjects unsophisticated members of the public to the backward looking short-term judgement time-span of their fellow investors.

There may be no solution to the problems created by the emphasis on past performance data but, with unrestricted member choice, private self-managed funds offer a way of avoiding the problem. The rapid rise in self-managed superannuation funds may be evidence of a trend which has disturbing long term implications for the investment community. Recent publicity relating to fees and payouts to senior executives may be additional factors influencing the popularity of self-managed funds as well as the recent manifestation of the speculative risk identified in this paper. According to Costa (2003),

"Poorly performing offshore investments have given super members that sinking feeling. That's why many are leaving the pool.

...

[The Taxpayer's Australia education and marketing director says] by the end of the September quarter 2000 there were just 215,000 DIY funds with assets of \$71 billion. Two years later, the number of funds had grown to 247,000 covering assets of \$99 billion. People are becoming more and more cynical about these managed funds ... "

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6 Conclusion

- 6.1 Speculation in stocks conforms to a well known cyclical pattern that exhibits sociological symptoms that can be recognised by interested observers who lack detailed financial or economic training although they may need to learn to recognise the evidence through experience or a study of history.

On the assumption that aggregate profit levels fluctuate in real terms, or that return on equity is a stationary process, historical earnings data can be used to relate stock market levels to underlying sustainable earnings. History has demonstrated that adjusted price/earnings ratios much in excess of 20 are unsustainable.

These two methods can be used to provide a consistent diagnosis of the existence of widespread speculation.

- 6.2 Speculative risk can be measured by projecting the cash flow from dividends forward for a number of years and assuming the portfolio is sold, or passed to a following cohort. The sale proceeds are based on a median price/earnings ratio and estimated sustainable earnings projected forward to the point that the duration of the equity portfolio matches that of the liabilities. For a general measure, 15 years is suggested as an appropriate time horizon. It would be more accurate to use the duration of the liabilities where this is known.
- 6.3 When market prices are used to value assets, there is an implicit rate of return at which market prices will be equal to the discounted value of income, redemptions of bonds and the eventual sale of equities many years' hence (or their notional transfer to the next generation). In speculative booms, the likely long-term return that is implicit in the market price of equities is very low and can be negative. The use of market prices to value assets is therefore inconsistent with a discounted valuation of liabilities where valuation rates of interest are based on bond rates plus an *assumed* equity risk premium.
- 6.4 That professional investors' and financial institutions' business risks over-rule the investment risk to which clients, beneficiaries and policyholders are
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exposed is a serious problem for the professional investment community. Astute private individuals may recognise that this form of agency risk can be avoided by managing their own affairs. But the majority of the community does not have the knowledge or time to deal with such matters and some workable solution needs to be found.

To some extent the influence of business risk on investment decision making seems to be due to the prominence of backward looking performance data in promotional material and reports to investors. Perhaps there is a need for more emphasis, *and discussion*, of market levels in relation to underlying fundamentals in such documents.

However, unless there is a wider recognition of the need to be patient with consultants and fund managers who recommend caution or who reduce market exposure "too early" at times of speculative excess, there will be recurrent examples of the recent fallout from being heavily invested at times of high speculative risk.

- 6.5 I would like to acknowledge the assistance of Mike Barker who read more than one draft of this paper and provided helpful comments. Sos Green helped with UK bond data and pointed out some omissions and areas that needed clarification. Martin Hickling assisted with the background Australian earnings data used in Figure 2.1 and Tables 3.1 and 3.2. These figures were based on data from the *IRESS* database. However responsibility for the opinions expressed and for the calculations remains with me.
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