

Stock Markets and Central Bankers

The economic consequences of
Alan Greenspan

Andrew Smithers & Stephen Wright

Introduction

The current troubles of the US economy, and the prolonged problems in Japan, have both followed sharp falls in their stock markets. Whether central bankers should respond to fluctuations in share prices has thus become an important issue of economic policy. The question is whether the Bank of Japan, during the 1980s, and the Federal Reserve, in the 1990s, should have tightened monetary policy in an effort to stem their stock market booms.

On 5 December 1996, Fed Chairman Alan Greenspan remarked that the level of the US stock market suggested that investors had become imbued with “irrational exuberance”. The phrase became famous and was subsequently used by Robert Shiller (Shiller, 2000) as the title of his best-selling book on the overvaluation of the US market. Alan Greenspan’s concerns, however, did not appear to linger long in his mind. Indeed, as the market continued to rise well beyond the levels at which he had expressed his initial concerns, Greenspan appeared to move from critic to cheerleader.

As we write, the US stock market has fallen by around one-third from its peak level. It is widely believed that the US economy is already in recession and there are widespread concerns that this will deepen. The economy has yet to respond to the dramatic falls in interest rates that have

Andrew Smithers is chairman of Smithers and Co. Stephen Wright is a Lecturer in Economics at Birkbeck College London.

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been made by the Fed and there are thus fears that the US could follow Japan into a liquidity trap. It is therefore reasonable to ask whether these problems could have been avoided had Alan Greenspan acted on his initial concerns. This, in turn, raises the broader question of whether central banks should in general respond to stock market movements.

Our answer is strongly positive, on both counts,¹ though we doubt whether this view would yet receive support from the majority of economists.

We attribute the lack of support, at least so far, to the influence of two key ideas. The first of these is the Efficient Markets Hypothesis ('EMH'), which asserts that markets provide the best available estimate of the value of any asset, including corporate equities. The second is the general consensus that monetary policy should be about controlling inflation, and nothing else. For the purposes of compactness and symmetry we shall refer to this second idea as the Efficient Central Banker Hypothesis ('ECBH').²

Both these ideas have common features. They are both powerful analytical devices, and their power lies in their simplicity, which is a feature rightly beloved by economists. Both arose in response to previous incoherent, and intellectually inferior analysis. But equally they have become so widely accepted in the profession, that their very power has become an obstacle to critical thinking.³

Because they are such powerful and influential ideas, both the EMH and the ECBH deserve serious consideration. While we hold strongly to the view that central banks should pay more attention to stock markets and, in particular, that Alan Greenspan should have paid more attention to his own initial concerns, we do not claim that all aspects of our analysis are obvious and straightforward. Before addressing the central issue directly,

¹ We would stress that we do not give these answers solely with the benefit of hindsight (though we would suggest that hindsight does appear to be on our side); we made our view clear not only in a book published at the height of the boom (Smithers & Wright, 2000a), which was written well before then, but in other contexts we had also expressed similar views on a consistent basis, from the mid-1990s onwards.

² The word 'efficient' has of course very different connotations in the two contexts. The EMH is predicated on the assumption that markets must automatically be rendered efficient by the actions of market participants; the ECBH, on the other hand, assumes that central bankers, while previously prone to make mistakes, have learned the errors of their ways. Note also that, despite its acronymic resemblance, the ECBH should not be interpreted as having anything to do with the European Central Bank.

³ It is likely that the dominance of these ideas has been supported by the apparent success of the US economy in the last two decades of the twentieth century. Similar complacency regarding economic policy was prevalent in the tail end of the long boom of the 1950s and 1960s. Textbooks written towards the end of the 1960s usually presented a picture in which all major economic policy issues had been resolved.

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we therefore need to answer a sequence of questions:

- Do markets always value companies correctly and efficiently?
- Are there one or more valid measures of stock market value other than price? *i.e.*, is it possible to say when a market is over- or under-valued?
- If so, can the high levels of recent stock market value be reconciled with the EMH?
- Are there adverse consequences for the economy if stock markets become heavily overvalued?
- Could central bankers prevent or mitigate these consequences?

We shall first look more closely at the two key ideas, the EMH and the ECBH, that underlie most analysis of the issues. We shall then deal with each of the above questions in turn. A final section presents our conclusions.

The Efficient Markets Hypothesis

There is a long tradition of regarding financial markets as irrational. Investors are assumed first to follow fads and then to panic. They are prone to let asset prices develop ‘bubbles’ with no basis in fundamentals. In part, the Efficient Markets Hypothesis arose as the economist’s reaction to this traditional view.

As its title implies, the EMH assumes that financial markets work with an efficiency unmatched by the rest of the economy. It thus presents a stark contrast to the view that investors are irrational. In its extreme form, it assumes that market prices adjust to new information instantaneously and perfectly. If correct, it has many implications. For market practitioners in particular it has the uncomfortable corollary that their activities must be useless. If prices were always correct, there could be no point in either value or technical analysis, since no study of economic, company or past share price data could provide information that was not already ‘in the price’.

It is worth stressing that few, if any, economists would contend that this extreme definition of efficiency is a realistic description of the world. Indeed, it was established more than 20 years ago that the perfectly efficient market is a logical impossibility. If trading and seeking information about value were pointless, no rational person would do either. It would

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thus be impossible for prices to reflect all information.⁴ This conclusion has never been contested.

The issue that economists do debate is not whether markets actually are efficient, but whether they can be treated as if they were; in effect, whether the degree of necessary *inefficiency*, which is needed to reward those who seek out information, is small enough to be viewed as negligible.

This practical version of the EMH may work well in many contexts and, in particular, those in which the arbitrage activities that underpin an efficient market are straightforward, and low risk. We shall, however, assert that it does not work at all well in others, and, specifically, that it is a poor description of the way in which the stock market works, viewed as a whole.

If, as we shall seek to show, markets do not always price stock markets efficiently, then it must logically be possible for stock markets to become over- or under-valued. We shall also assert that central bankers should respond to such situations. On this second issue, however, we come up against another key idea, which is that central bankers are, in effect, already fully occupied with other things, and that they therefore should pay no attention to stock markets—whether efficient or not.

The Efficient Central Banker Hypothesis

The Efficient Central Banker Hypothesis (ECBH) does not have such a clear-cut or explicit form as the EMH, but it is implicit in much of the recent academic literature on monetary policy. It is also all too often apparent in the self-congratulatory tone employed by central bankers in describing their activities.⁵

The essence of the ECBH is that central bankers' actions should be designed to control inflation, without the distraction of any competing aims. Its supporters usually maintain that this is what central bankers have in fact been doing in recent years.

⁴ Grossman & Stiglitz (1980); Smithers (1978) also pointed out the paradox.

⁵ For a comprehensive survey of recent academic work, see Clarida, Gali & Gertler (1999). For a recent assertion that central bankers should focus solely on the narrow aim of targeting inflation, see Bernanke & Gertler (2000). For an example of a former central banker's self-congratulation, see Brian Snowdon's interview with Alan Blinder (2001) in this journal.

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The ECBH evolved in the reaction to the failure of central bankers, in most developed countries, to control the upsurge of inflation in the 1960s and 1970s. The ECBH is often credited, at least implicitly, with the subsequent stability of both inflation and, until recently, the economy as a whole. Prosperity and low inflation have thus added to the credibility of both the ECBH and central bankers.

The ECBH is reinforced, of course, by the EMH. If stock markets are doing their jobs properly, then there is even less reason for central bankers to be diverted from doing theirs.

According to the ECBH, central bankers should only respond to fluctuations in the stock market if they provide reliable indications of future inflationary or deflationary pressure. If Alan Greenspan had tightened policy in the mid-1990s, when he expressed concern about irrational exuberance, this would have been opposed by proponents of the ECBH. They would have seen it as compromising central bankers' new-found devotion to the sole aim of inflation stabilisation, since there was, at the time, little sign that prices were accelerating. Subsequent events have, thus far at least, supported such a judgement. Unemployment fell to historically low levels in the late 1990s without the increase in inflation predicted by past experience. A tightening of monetary policy in the mid-1990s would thus have induced a slowdown in the economy that the ECBH would imply was needless.

At first sight, this argument appears fairly convincing and indeed many people have been convinced. We shall, however, argue that while the ECBH has been an improvement on the incoherence, and at times sheer irresponsibility, of monetary policy in the 1970s, it is too simplistic. It ignores a number of important complications relating to the stock market:

- While the lack of inflation in recent years provides evidence in favour of the ECBH, it would be premature to conclude that central bankers can pay little or no attention to stock markets. An overvalued stock market destabilises the economy, and may jeopardise the ability of central bankers to stabilise inflation over the long term, except at great cost in terms of output. The main problem is that while central bankers can control real short-term interest rates, they run great risks if they ignore the cost of equity capital.

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- The fundamental rationale for the ECBH is also shaky.⁶ In recent years, the rigid focus on inflation has been an understandable reaction to post-war experience. But all such responses to history risk becoming rigid and being applied in an inappropriate way to changing conditions. We shall suggest that a more fundamental, and less response-based, rationale for monetary policy requires a greater response to major stock market fluctuations.
- Finally, we argue that proponents of the ECBH are disingenuous, since central bankers *do* respond to stock markets, and regularly and openly maintain that they should—but only when they fall, not when they rise.

To substantiate these assertions, we now address the sequence of questions listed in the introduction.

Do markets always value companies correctly and efficiently?

As we have already noted, the crucial issue regarding the EMH is not whether it is descriptively precisely accurate, which in logic it cannot be, but whether deviations from the predictions of the EMH are of any quantitative significance.

While casting doubt on the efficiency of markets in the valuation of the US corporate sector as a whole, we accept that the EMH may be a useful way of looking at a wide range of financial markets. The opportunity for effective arbitrage is a necessary and generally sufficient condition for efficiency. Where arbitrage is possible at low risk, markets should approach perfect efficiency, and there is plenty of evidence to suggest that they do, when these conditions hold.⁷ But, as we have argued elsewhere,⁸ these conditions do not apply to the US stock market as a whole. Despite the powerful evidence for mis-valuation of the stock market, it would be extremely risky to try to exploit it for profit. The failure of market participants to exploit mis-valuations for profit is not therefore evidence of irrationality. It follows that we cannot therefore expect arbitrage to achieve complete efficiency in valuing the US stock market as a whole.

⁶ As academic proponents of the ECBH (*e.g.*, Clarida *et al.*, 1999) are typically more willing to admit than central bankers.

⁷ Thus, for example, markets for forward contracts on foreign exchange transactions, or on highly liquid government bonds, are likely to be highly efficient.

⁸ See Smithers & Wright (2000a), Chapter 28.

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An appeal to empirical evidence might appear to be the obvious way to assess the quantitative importance of mis-pricing of the stock market. The practical difficulty of doing this has, however, been shown by repeated efforts to test the EMH over the past two or three decades.⁹ Early and simple versions of the EMH, that equated efficiency with a lack of predictability, have been convincingly rejected by the data. This led to the introduction of more sophisticated, but not unreasonable versions. While these have not been rejected, this is not because they have proved robust under examination, but because of the difficulty of setting up satisfactory tests. As a result, it has become increasingly accepted that the EMH, in its revised form, is essentially untestable. This view is summarised in the following quotation from a bestselling graduate textbook,

“...any test of efficiency must assume an equilibrium model that defines normal security returns. If efficiency is rejected, this could be because the market is truly inefficient or because an incorrect equilibrium model has been assumed. This *joint hypothesis* problem means that market efficiency as such can never be rejected.”

(Campbell, Lo and MacKinlay, 1997)

It is worth noting that the lack of clear statistical evidence against the EMH means that there is an equal lack of statistical evidence in its favour—a point acknowledged by its academic defenders.¹⁰

On this basis, the EMH should be rejected, not because it has been falsified by the evidence, but simply because (at least according to its proponents) it never can be falsified.¹¹ This point can be illustrated by a comparison with ‘creationism’—i.e. the belief that the world was created in accordance with biblical descriptions. This view conflicts with the evidence of fossils, which indicates that the world was created rather earlier than 4004 BC, the date derived from the Bible by Archbishop Ussher. To surmount this difficulty, it has been claimed that the contrary evidence has been put on earth by God to confuse the wicked and test the faith of the godly. Clearly no evidence can be produced which can overturn this theory. The reason for rejecting creationism, and by implication also to

⁹ The literature is so massive that we shall not attempt even a summary listing of key papers. Campbell, Lo and MacKinlay (1997) provide an excellent review.

¹⁰ For example, Hall (2000)—a paper we discuss further below.

¹¹ “I do not demand that every scientific statement *must in fact have been tested* before it is accepted. I only demand that every such statement must be *capable* of being tested.” (Popper, 1959, page 41; italics in original)

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reject the consensus version of the EMH, is not that it can be disproved, but that it simply cannot be tested.

Despite the difficulties in testing the EMH, there is, however, as noted above, clear evidence of predictability, which is a phenomenon indissolubly linked with the concept of value.

Stock market predictability and value

While the EMH is the subject of dispute, a wide range of both believers and sceptics accept, from the statistical evidence, that there is a degree of predictability in stock market returns. The stock market is not a random walk.¹² The dominant feature of this evidence is that stock prices exhibit the property of ‘mean reversion’ over relatively long investment horizons.

This property can be represented in two different, but equivalent ways. The first is that stock returns are negatively correlated over the longer term, so that periods of high stock returns are typically followed by periods of low returns. The second is that there are valid measures of fundamental value, from which stock prices cannot systematically deviate. If the stock market is high, relative to its fundamental, this will reliably predict low future returns. The ratio of price to some fundamental measure, therefore provides an indication of stock market ‘value’.

In Smithers & Wright (*op cit*) we surveyed a wide range of potential measures of stock market value, and suggested a number of criteria by which their relative merits should be assessed. Our strong conclusion was that the best available measure was the aggregate ‘ q ’ ratio, that compares the stock market valuation of the corporate sector to the value of their underlying assets, measured at replacement value rather than book cost. Figure 1 shows two alternative measures of q over the course of the twentieth century.¹³

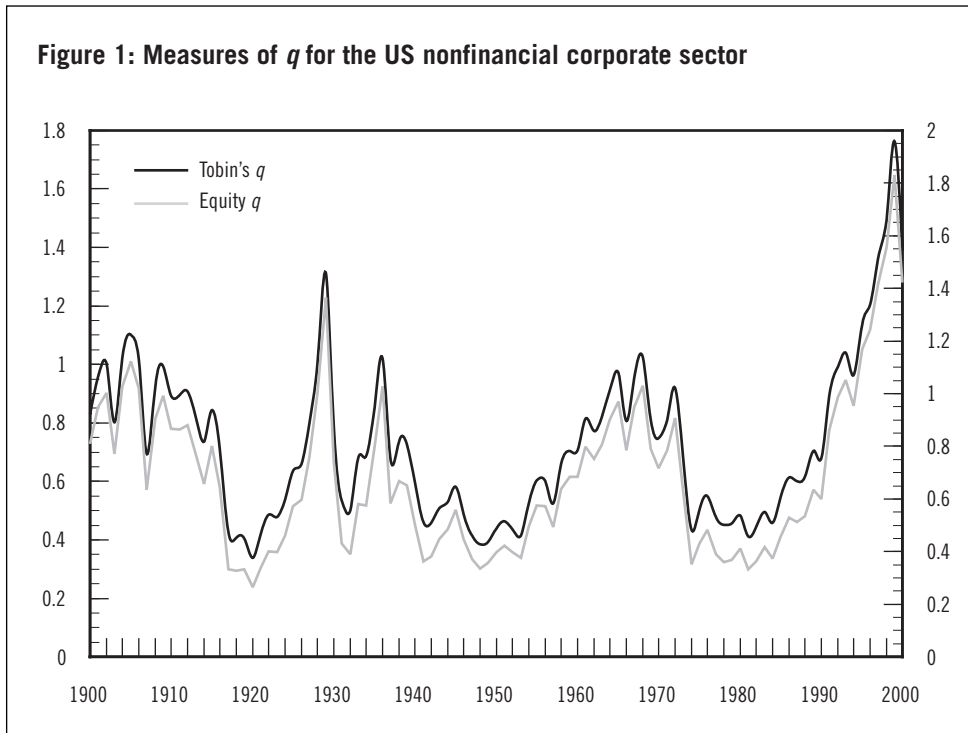
One crucial feature, evident in the chart, is that q itself appears to show the property of mean reversion.¹⁴ This is a necessary, but not sufficient

¹² More precisely, stock market returns are not random.

¹³ The data in Figure 1 are from Wright (2001), which provides full documentation and precise definitions. This paper updates the data used in Smithers & Wright (2000a). The academic literature has typically focussed on ‘Tobin’s q ’: the ratio of the market value of total corporate liabilities (equities plus debt) to the capital stock. We have focussed our analysis largely on the equity equivalent: the ratio of stock market value to corporate net worth (capital less net debt). As might be expected, Figure 1 shows that both ratios have extremely similar properties.

¹⁴ This is borne out by statistical testing: see Robertson and Wright (2001).

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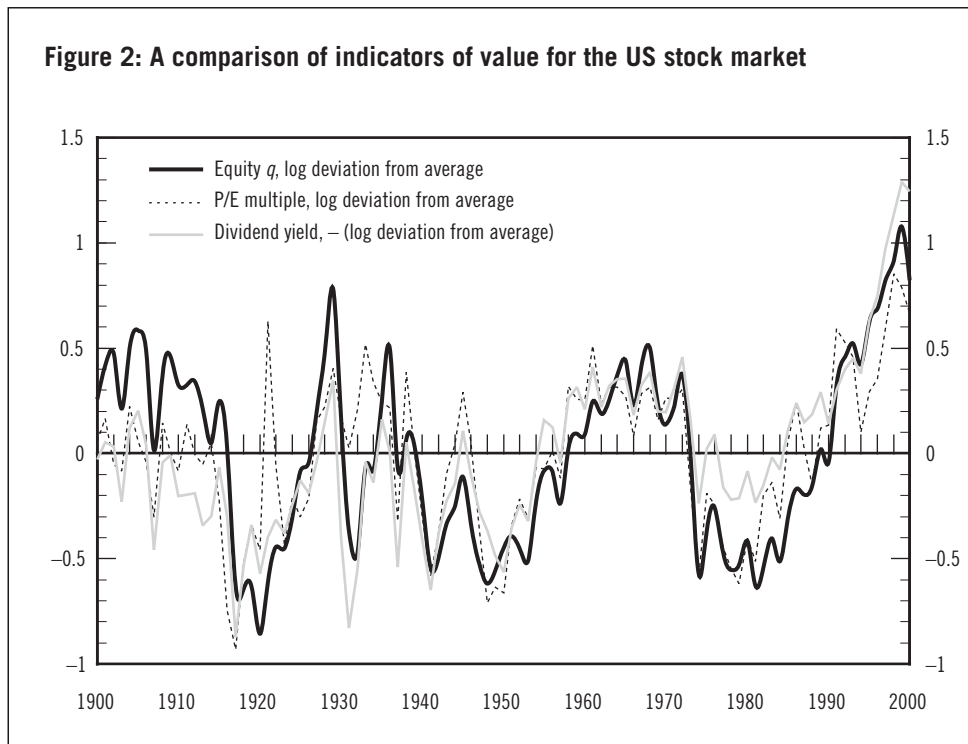
Figure 1: Measures of q for the US nonfinancial corporate sector

condition, for q to be a valid measure of value. In principle, high values of q might predict changes in the denominator, rather than the numerator of the ratio. Indeed, this was the expectation when the concept of q was first formulated by James Tobin. However, statistical testing shows clearly that the adjustment process when q is at high or low values comes predominantly through stock prices, and that, by implication, high, or low, values of q predict low, or high, returns.¹⁵

It should be stressed that this predictive power is generally weak, at least in terms of point forecasts. For this reason we have characterised q as primarily acting as an indication of the nature of stock market risk. High values of q indicate that the balance of probabilities is that stock returns will be poor, or, at extreme values, negative. They do not indicate any

¹⁵ Robertson and Wright (1998) provide evidence that (equity) q 'Granger-causes' (i.e. is a leading indicator of) changes in stock prices, within a cointegrating vector autoregressive framework. Robertson and Wright (2001) generalise this result to incorporate Tobin's q , and prediction of returns, rather than stock price changes. Less formally, Smithers & Wright (2000a) show that q has historically been strongly correlated with 'Hindsight Value', a weighted average of future returns at typical investor horizons, thus demonstrating the link between the two interpretations of mean reversion given above.

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precise path for stock prices, nor do they indicate the precise timing of price changes. If this were not the case, it would be impossible to reconcile predictability with even the weakest version of efficiency. A higher degree of predictability would indicate the possibility of arbitrage gains being made without excessive risk and would thus indicate that markets behaved as if their participants were indeed irrational.

There are of course other possible measures of value. Some, such as those which come under the general heading of 'bond yield ratios' are simply nonsensical. Others have some of the desirable properties possessed by q , though none have all. We have thus argued that q is the best available measure, both on statistical grounds, and, crucially, on grounds of underlying economic theory.¹⁶ For the purposes of this paper, however, it is sufficient that there exist reasonably reliable measures of stock market value. Figure 2 shows that, in recent years, the signals given by q have also

¹⁶ These issues are examined in detail in Smithers & Wright (2000a) Chapters 21 to 27.

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been very similar to those given by two other commonly used measures of value, the dividend yield, and the price-earnings multiple.¹⁷ At the height of the boom, q suggested that the market was around three times overvalued.¹⁸

The similar nature of the signals provided by a range of indicators of value in the recent past had, by the turn of the millennium, led a wide range of academic economists, whether or not defenders of the EMH, to the conclusion that a period of historically low returns was in prospect.¹⁹ Where opinions differed was in the interpretation of these high valuations. There were two areas of difference. The first was whether such high valuations could be consistent with the EMH. The second was whether they merely indicated the likelihood of a period of weak—but still positive—returns, or of significant market losses, as we and some others, most notably Shiller (2000), had predicted.

Can recent high levels of stock market value be reconciled with the EMH?

We have thus far defined a useful measure of value solely in terms of its ability to predict, if only weakly, future stock market returns. As we have noted, this feature was once seen as evidence against market efficiency, but that new versions of the EMH were developed which, at least in principle, could accommodate this evidence. These assume that when high measures of stock market value predict low returns for the future, it is because investors both expect and *desire* low returns.

According to this approach, the historic evidence for predictability can be explained by assuming that fluctuations in predicted returns arise from similar fluctuations in the returns desired by investors. Such changes alter

¹⁷ The academic predictability literature has largely focussed on the dividend yield; this however suffers from the severe limitation that it does not appear to have a stable mean (nor would theory predict that it should). The price-earnings multiple appears to have a more stable mean, but earnings need to be cyclically adjusted (as in Shiller, 2000) in order for it to have sensible properties as an indicator of value. We argue that this inevitably allows an undesirable element of subjectivity into the construction of the cyclically adjusted P/E multiple. It also has the disadvantage that it depends on the P/E having a stable mean, which, while empirically reasonable lacks strong theoretical support.

¹⁸ Comparing q with its historic mean value of around 0.7, rather than its theoretical equilibrium value of unity. In Smithers and Wright (2000a) we ascribe this systematic (and statistically significant) difference of mean q from unity to systematic overestimation of capital, for which there is also some indirect supporting evidence in the data (see also Wright, 2001).

¹⁹ For a survey of recent academic analysis, see Pickford, Smithers & Wright (2001a).

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the rate at which future income from equity investment should be discounted. This leads, via the 'Dividend Discount Model', to fluctuations in stock prices, which represent the discounted value of future dividend flows. Crucially, for this explanation to be valid, the discount rate must not only vary, but do so in a way that itself incorporates some element of predictability. The standard assumption is that the discount rate varies around a stable mean. One problem with this explanation is that the extreme levels of q , and other indicators of value, seen at the height of the boom were, as Figures 1 and 2 show, well beyond anything seen earlier in the century. In Smithers and Wright (*op cit*) we estimated that at the end of 1998, when q was 'only' around twice its mean, the adjustment process required to bring both q and stock returns back to their historic means would have taken around sixty years. Fifteen months later, at the height of the stock market boom, the time needed for such an adjustment had stretched to a century. Thus the assumption that such values can be explained by temporary falls in the typical investor's discount rate stretches the meaning of temporary well beyond its normal usage.

A possible way out of the difficulty thus presented, is to assume that the required fall in the discount rate at the end of the twentieth century was different from previous falls, in that it was not temporary, but permanent. This approach has the attraction of some apparent justification, in terms of academic research, from the 'Equity Premium Puzzle', first identified by Mehra and Prescott (1985). A superficial interpretation of this puzzle is to conclude that the historic equity premium has been 'too high', and therefore that a fall in the equity return is actually to be expected.

There are, however, two key reasons for holding that this argument cannot be sustained. First, Mehra and Prescott's original work simply pointed out that the observed equity premium appeared inconsistent with an assumed model of behaviour. In making such a claim, they were certainly not asserting that markets have been priced as if people have behaved in an irrational way for the past two hundred years.²⁰ A demonstration that a model is inconsistent with the evidence means that either the model or people's behaviour must be adjusted. It is more normal and, we think, more sensible to seek to improve the model; and subsequent research has shown that reasonable models can indeed be derived that are consistent

²⁰ Which would cast serious doubt on one of the most central assumptions of economic analysis, that markets behave as if prices are determined by people behaving rationally.

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with the evidence.²¹ Second, there is no supporting evidence to show that the equity premium has fallen.²²

But even if both these points are ignored and it is assumed that the equity risk premium has entirely disappeared, the argument still fails to provide a rational explanation for the extreme market valuations of recent years. This is because, for the corporate sector as a whole, it ignores the mutual dependence of the return on capital and the cost of capital.

This second point is both so crucial, and so frequently misunderstood, that it is worth analysing in more depth. One of the major problems of communication, when discussing the valuation of the stock market as a whole, is the need to approach valuation in a completely different way from that used to value shares. It is natural and sensible to assume that if a lower discount rate is applied to a given stream of expected future profits from an individual company, then its stock market value should rise. Although it is perhaps equally natural, it is incorrect to assume that the same must hold for the market as a whole. This is possibly the most widely misunderstood point in investment analysis. Like many other such misunderstandings it derives from a 'fallacy of composition'.

Individual companies are too small to have any noticeable impact on the economy in general. The rate at which a company's profits are expected to grow can thus in principle be discounted to estimate its value, since the growth rate of an individual company has no impact on required returns. This approach is known as the dividend discount model. While it can, at least in theory, be used to value individual companies it cannot be used for companies in aggregate. For the corporate sector as a whole, the cost of capital depends on the return on capital, and vice versa.

The interdependence of cost and return can be illustrated by looking at the past. The real cost of equity capital is the rate at which earnings are capitalised. Historically the average P/E multiple has been around 14, which is the same as an earnings yield of 7%. The average return on equity to investors has also averaged about 7% in real terms. This is not an accident. If the return had been 10%, the earnings yield would have been 10% and the P/E 10.

²¹ See Smithers & Wright (2000b) for a brief survey.

²² Indeed there is some evidence to the contrary. Wadhvani (1999) presents survey evidence that expected returns at the end of the nineties were well above historic norms. For further discussion see also Smithers & Wright (2000b).

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This identity between the return to investors and the earnings yield makes nonsense of claims that any possible changes in the 'equity risk premium' would dramatically change the value of the stock market. Such claims usually result from a failure to allow for the above identity. Even if a change in the equity risk premium brought about a long-term change in the return on equity to investors, it would not necessarily result in a significant change in the value of existing shares. The identity between the discount rate and the earnings yield would mean that, in equilibrium, a higher P/E would be balanced by an exactly offsetting fall in the return on the average company's equity.

An example may help to clarify this. Suppose a fall in the equilibrium stock return, from 7% to 5%, implying a rise in the equilibrium P/E from around 14 to 20.²³ If the rate of underlying profits were strictly exogenous to this change (as it might be reasonable to assume in the case of a single firm), and hence remained unchanged at 7%, then the value of shares in existing companies would rise by around 40%. But profits are not exogenous for companies in general; in equilibrium a fall in the cost of capital must be matched by a fall in the return on capital. Thus, in the long run, the return on existing shares (and on the underlying assets these firms own) must also fall to 5% with unchanged price, as new firms install new capital to compete with existing firms, given the incentive provided by the gap between the return on capital and its cost.²⁴

We conclude therefore that extreme stock market valuations cannot be rendered consistent with the EMH by making assumptions on investor discount rates.

If this approach is ruled out, the only remaining course open is the extremely radical one of discarding the data. The most celebrated exponent of this approach has been Robert Hall (Hall, 2000).²⁵ He proceeds on the assumption that markets *must* be efficiently priced, and therefore that measured q must miss out on large amounts of unmeasured intangible

²³ Our earlier discussion should have made it clear that we would regard any such fall as strictly hypothetical.

²⁴ To the extent that there are adjustment costs of installing new capital (which in turn should be the sole determinant of q in a rational stock market), the price of existing shares might be expected to rise in the transition, but Kiley (2000), shows that any such rise would be very much less than would be implied by treating profits as exogenous, and would of course be strictly temporary. In the absence of adjustment costs, q would not rise at all. Kiley's paper provides a powerful demonstration that crude applications of the Dividend Discount Model come to grief once general equilibrium considerations are taken into account. See also Smithers & Wright (2000a, Ch. 29; 2000b) for more detailed discussions of this issue.

²⁵ McGrattan and Prescott (2001) and Nakamura (2001) also make similar claims in quantitative terms, but do not follow through the implications with the same degree of rigour and thoroughness as Hall.

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capital, which he names 'e-capital'. Apart from its intangible, and hence rather ill-defined nature, Hall's unrecorded e-capital is just like the conventional type and thus it can only be produced by saving and investment. Both must, by implication therefore, have been massively under-recorded in recent years:

According to the e-capital view, the US economy did a huge amount of saving in the 1990s, which would be revealed in a new set of national income and product accounts that included the production of e-capital, and the income earned from that production.

The implications of such a rewriting of recent history are indeed radical. Hall's estimated value of e-capital rises from zero in 1990, to be roughly equal to the value of tangible assets in 1999, thus markedly lowering the figure for q . A further implication is that US GDP was, by this point, being understated by at least 13%, with all of this difference being attributable to under-recording of corporate profits. This requires that the figure for corporate profits, shown in the national accounts, should be more than doubled.²⁶

Hall himself acknowledges that these are fairly startling assertions. His calculations are simply the logical implications of the assumption of efficiency. While we would not wish to dispute the importance of new technologies, nor that some intangible assets may have stock market value, we contend that most claims about their value involve gross overstatement of their importance.²⁷ The extreme nature of Hall's assumptions indicates the fragile basis for such claims. The collapse in the dotcom market since Hall's work was written makes them even less convincing.

Such attempts to justify recent US stock market valuations on the assumption of perfectly efficient markets seem to us to strain credibility beyond breaking point. We suspect strongly that the recent slide in Wall Street will markedly increase the number of doubters amongst economists. The inability of the revised version of the EMH to be tested may still be disputed by some, but the recent levels of Wall Street have provided very clear and practical evidence against the claims that the stock market is, in aggregate, a perfectly efficient market. But arguments and

²⁶ Hall only manages to limit the impact on GDP to this amount by assuming that e-capital depreciates extremely slowly—with an assumed average life of around 17 years.

²⁷ For more detailed discussion, see Pickford, Smithers and Wright (2001b).

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statistics, however sound, are seldom sufficient to produce major changes in professional opinion. Events are normally needed as well. Our expectation is that these will be provided by a significant deepening of the bear market that began in 2000.²⁸

What are the consequences of periods of stock market over-valuation?

If the recent extremes of the US stock market are hard to explain by the assumption of market efficiency, the alternative lesson that we would draw is that stock markets are sometimes woefully mis-priced.²⁹ If our view is correct, US shares will yield very poor returns over the next few years. Indeed, history indicates a high probability that future stock returns will be well below those from less risky assets.³⁰ If this prediction proves correct, as the recent behaviour of markets suggests it will, then the case against the EMH will be overwhelming.

There is a strong case therefore for considering what share prices tell us, on the assumption that markets are not efficient. In extreme circumstances, such as those in Japan in the late 1980s or America in the late 1990s, they clearly tell us that investors face a high risk of significant losses. But there is also strong historic evidence that the impact of these losses will cause major problems to the economy. Extreme stock market over-valuations have always been followed either by major recessions, which has been the US experience, or by periods of stagnation, which has been Japan's recent misfortune.

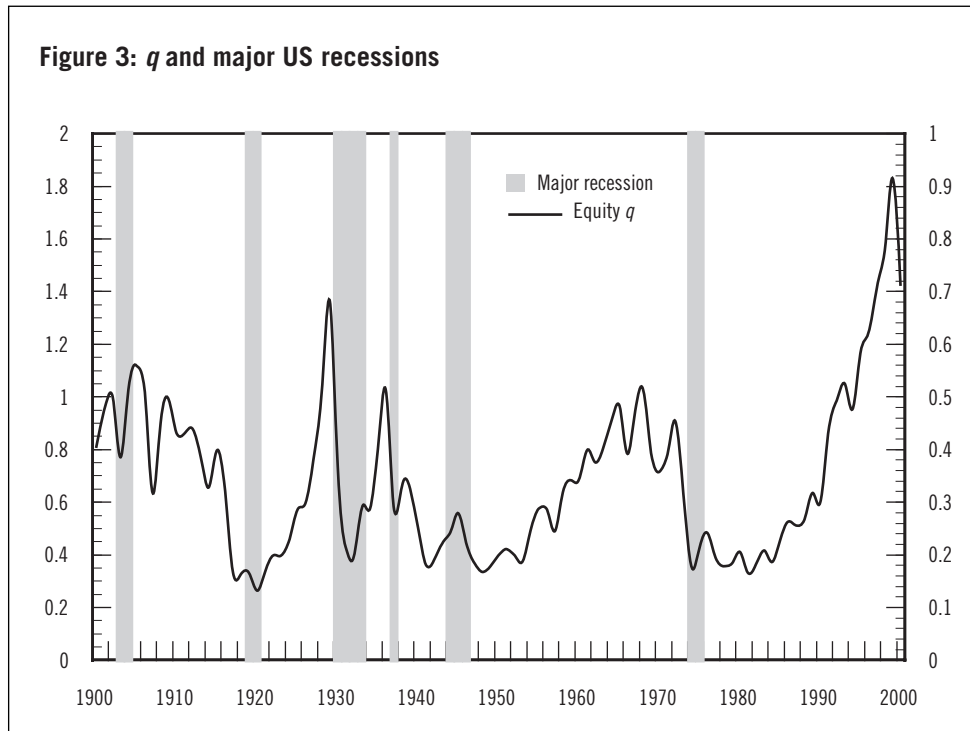
Figure 3 illustrates the connection between US stock market overvaluation and major recessions. Before the recent peak, there have been four clear peaks in US share prices, measured in terms of q : in 1906, 1929, 1937

²⁸ Defenders of efficient markets have acknowledged the power of events as a test of the theory. Hall (2000) notes, in his concluding paragraph: "This paper has developed a view consistent with the facts. I stress that the view is consistent and is not yet compelled by the facts. We may learn in coming years (for example by a stock market crash) that the high stock market was a mistake..."

²⁹ We should stress that this view does *not* imply that participants in financial markets are necessarily 'irrational', on average: a conclusion that would be anathema both to ourselves and to most professional economists, however abundant the evidence may be of individual irrationality. In Smithers & Wright (2000a) Chapters 19 & 28 we argue that the potential for arbitrage that this mis-pricing would appear to imply is severely limited. We give the example of a fund manager who might view the market as seriously over-valued, and likely to fall, but who would nonetheless rationally continually to invest clients' funds in the market, given the severe professional risks of doing otherwise. In this respect, market mis-valuation is quite consistent with what Rubinstein (2000) terms 'weak rationality' of financial markets.

³⁰ See Robertson & Wright (1998; 2001).

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and 1968. In every case these peaks were followed by severe falls in the stock market, which took share prices down to very cheap levels and these falls coincided with major recessions.³¹

It is not hard to understand why the impact of stock price fluctuations on the economy should be so severe. A rise in stock prices that is not justified by any corresponding rise in fundamental value must ultimately be followed by a subsequent decline, in real terms. When the relationship between asset prices and income gets out of line, either asset prices must fall in nominal terms or incomes must rise. Neither of these alternatives is painless. Major falls in nominal asset prices, such as occurred in the USA in the Great Depression and more recently in Japan, tend to result in debt deflation and be followed by major recessions.³² The only logical alternative, by which asset prices can be brought back into line with incomes, is

³¹ Defined as calendar years in which real GDP was at least 1% below the level of the previous year. Calendar years were used because quarterly data on GDP are not available before 1945.

³² It is notable that two key proponents of the ECBH (Bernanke & Gertler, 1999) have themselves done ground-breaking research on the underlying mechanisms whereby movements in asset prices accentuate the business cycle.

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to have a rapid rate of inflation, with massively disruptive effects. In part, this occurred during the bear market of the 1970s, but even during this inflationary period, a significant part of the adjustment still came from falls in nominal stock prices. Any such adjustment via inflation would of course be wildly at variance with the aims of central bankers.

It is worth emphasising that periods of stock market overvaluation increase the risk of both inflation and recession. There is naturally a sharp reaction in the real economy to marked changes in asset prices. When they are high, capital is cheap and investment is stimulated. At the same time private sector saving will be depressed, as the appearance of greater wealth will seem to make the pain of saving less necessary. In a closed economy, this would normally set off inflation. In an open economy, as in the recent US experience, this need not necessarily occur. The savings deficit in the private sector has been covered by a sharp rise in both the flow of foreign capital and public sector saving. When share prices reverse there is likely to be a dramatic change in both investment and private sector savings. If this is not offset by equal changes in the public and overseas sectors, then there will be a sharp fall in total demand and the severe danger of recession. Furthermore, in these circumstances the economy will not usually respond in its normal manner to falls in interest rates. To revive the economy is likely to take a much greater infusion of liquidity than usual, particularly if falling prices make it impossible for the central bank to create negative real interest rates. Not only did this occur both in the USA in the Great Depression, and more recently in Japan, but it is clearly a risk in America today.

In time large injections of liquidity, helped perhaps by fiscal stimulus, should lead to economic recovery. It will then, however, be very difficult for the central bank to remove the excess liquidity that it has created in order to achieve recovery, without a sharp rise in nominal interest rates. Such a rise will cause bankruptcies, as the excess debt created in the previous bubble will still be a burden on company and individual balance sheets. In order to prevent a rise in debt defaults pushing the economy back into recession, the central bank will probably have to allow a faster rate of inflation than it would otherwise wish to countenance. This inflation will, of course, contribute over time to a reduction of the debt burden.

If the central bank is not unusually accommodating in the early stages of the recovery, there is a high risk that the economy will fall back into

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recession. If it is accommodating, however, a recession will ultimately be necessary in any case, to bring the subsequent inflation under control.

The management of economies, once asset bubbles have been allowed to develop, is so difficult that if asset bubbles can be avoided, it is very difficult to believe that they should not be.

Should central bankers respond to overvalued stock markets?

It is clearly too late to alter policy to prevent the stock market overvaluation of the recent past. For the future, however, it is important to consider three issues. The first is whether stock market bubbles of this type should, if possible, be prevented, the second is whether this is possible without excessive cost, and the third whether there should be contingency plans to deal with their aftermath.

As we noted at the start of this paper, the Efficient Central Banker Hypothesis (ECBH) maintains that central bankers should not concern themselves with stock markets, since they are already fully occupied with the control of inflation.

Even on this restricted job description for central bankers the arguments of the previous section would suggest that, on a longer-term view, the ECBH has too narrow a perspective. Overvaluation of the stock market implies that the cost of capital gets out of line with the return on it. This must of course be a temporary phenomenon. In the long run the return and the cost must be the same. An overvalued stock market is, therefore, no different from the rate of interest chosen by the central bank being set too low.³³ Equity is not the only form of capital; clearly bonds and bank lending are also important. Equity is, however, the most fundamental. Companies can finance themselves entirely with equity, but they cannot finance themselves wholly with debt.

The evidence, presented in Figure 3, suggests that allowing the cost of capital to fall so far below its return has always resulted in the imposition of severe costs on the economy. In the process, there have been two occasions in the twentieth century—the USA in the 1930s and in Japan in the 1990s—when central banks have lost the control over inflation that the

³³ We should stress that we are by no means the first economists to make this point. In particular, it was used, albeit with reversed sign, by James Tobin during the 1970s, when he argued that the then very low levels of q implied a far higher cost of capital than might have appeared from looking solely at real short-term interest rates.

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ECBH considers so crucial. That this lack of control has been in a downward direction makes the risk all the more serious, since deflation is likely to lead to liquidity traps, in which the power of monetary policy is severely constrained.

As the USA now faces this risk, it is reasonable to question whether Alan Greenspan's apparent success at stabilising inflation during the 1990s will turn out to have been bought at the cost of significant *destabilisation* of inflation in the early years of the new millennium.

Furthermore, this is unlikely to be the only cost. If deflation does recur, it is likely to arise as a result of a severe recession, that imposes considerably greater costs than those directly resulting from either inflation, or deflation. The ECBH's self-denying ordinance, that central bankers should be solely concerned with inflation, is an understandable reaction to the inflation of the 1970s. But, as we have noted, academic economists have yet to derive a deeper rationale to justify such a rigid focus.³⁴ In its absence, most academic economists have been content to assume that the benefits of stable inflation are not significantly offset by costs arising from variations in output. However, as we have argued, medium-term success in stabilising inflation, in terms of the prices of goods and services, may prevent proper action being taken to avoid stock market excesses, with their high subsequent costs in terms of either output or inflation. If this is correct, then there is clearly a strong case that central bankers should pay more attention to stock markets.

One argument against using interest rates to prevent bubbles is that to do so would create more frequent and unnecessary recessions. The case that recessions would be more frequent is probably correct, but the assumption that they are unnecessary is probably not. It is likely that recessions are a necessary feature of a vibrant and growing economy. We would argue that sound economic management should not be seen as the absence of recessions, but the avoidance of the trauma that results from major ones.

³⁴ That is, one that arises from a focus on utility costs of inflation variability, compared to those associated with variations in other economic variables. The most widely cited attempt to do so is probably that of Rotemberg and Woodford (1997). But their highly stylised model, in which inflation imposes utility costs, effectively via changes in relative prices, given price stickiness assumes away a wide range of other possible market rigidities that might work in the opposite direction—for example, liquidity constraints, and long-term debt contracts that are fixed in nominal terms (for a utility-based model of which, see Wright, 2000).

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The argument that central banks should not change interest rates because of conditions in financial markets is in any case disingenuous. They do, but only in one direction, which is when markets fall. The Fed's policy, in late 1998, and again in the autumn of 2001, was clearly driven by a concern that the stock market was in danger of collapsing, just as it was in the aftermath of the October 1987 crash. The result has been an asymmetric approach to the stock market. The Fed has made it clear that it will act to try to stop it collapsing, but not to stop it rising. This of course results in Fed policy making the stock market appear a one-way bet: the so-called 'Greenspan Put'.

This revealed asymmetry in the Fed's behaviour, which of course conflicts with the Efficient Central Banker Hypothesis, is particularly paradoxical, given that there is some reason to expect that it may be easier to use monetary policy to prick a stock market bubble, than to re-inflate it once it has burst.

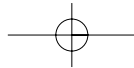
Even if this asymmetry is accepted, however, there is a final argument against intervening to prevent asset bubbles, which is that official action can, in the modern world of expert economic management, rapidly act to offset the onset of any recession. It follows that the fear of recession should not influence policy. Indeed, Alan Blinder, former vice-chairman of the Federal Reserve, was not shy to put such faith on record, claiming, at the height of the boom, that:

For the US economy to go into a significant recession, never mind a depression, important policy makers would have to take leave of their senses.

Time will tell whether Professor Blinder's confidence proves to be admirable or foolhardy. But we have shown that historical evidence suggests that this faith has been unfounded even, as Japan has shown, in the recent past. Furthermore, developments in the US today suggest the need for greater humility on the part of economists about their ability to foresee and control events.

Conclusions

The general view among economists is that central bankers should focus their attention on the control of inflation, and should not pay attention to movements in stock markets. This near-consensus view is reinforced by



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the continuing influence of the Efficient Markets Hypothesis (EMH), that maintains that financial markets correctly price firms at all times.

We believe that this general view is incorrect:

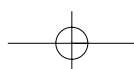
- There are strong reasons, both in principle and in practice, to doubt the applicability of the EMH to the valuation of the stock market as a whole.
- Indicators of stock market value, such as q , show the market to have been severely overvalued at the end of the twentieth century.
- Previous episodes of overvaluation have been succeeded, both in the USA and Japan, by severe recessions.
- Such recessions raise the risk of central banks losing control of inflation, due to liquidity traps.
- They also impose costs, in terms of output and inflation, that central bankers should take into account.
- Central bankers already do in any case take these into account, but asymmetrically: only when markets fall, not when they rise.

A key test of our view will be provided by the aftermath of the recent US stock market boom. There will be two points to watch. The first relates to the behaviour of share prices and the second to that of the economy.

The first is that if, as we believe, q is a satisfactory measure of stock market value, then US share prices are still too high. At the time of writing, with the S&P 500 index around 1,100, q implied that the market was around 1½ times overvalued. If we are wrong, and share prices do not fall further in real terms from their current level, or rise again on a sustained basis, there will therefore be reasonable cause for doubt about the existence, or at least the measurability, of overvaluation.³⁵

Second, if share prices do fall in the way that we expect, but there are no major economic side-effects, then economists will be able to argue that the Efficient Central Banker Hypothesis cannot be rejected, since there is no practical need to respond to overvalued stock markets. Without severe adverse consequences, there can be no reason to discard the benefits of having less frequent recessions.

³⁵ It should be noted that this would in turn leave a number of other important issues unresolved: most notably, why historic stock returns have had such low variability over long horizons (Robertson & Wright, 1998; Smithers & Wright, 2000a, Ch. 17).



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But these are both big ‘ifs’. We have sought to show that there is already substantial evidence that central banks should pay more attention to stock markets when formulating monetary policy, and that to ignore this evidence would be irresponsible. When economies are strong and at little risk of being easily pushed into recession, but the q ratio is uncomfortably high, then it should be accepted that the case for seeking to restrain the economy is greater than currently recognised.

Events in the next few years will either reinforce or weaken this evidence. Our strong expectation, however, is that Alan Greenspan’s inaction, in response to his own initial concerns about the level of the US stock market, will ultimately have severe adverse economic consequences; and that these in turn will cause radical rethinking of central bank policy.

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