

Informational Efficiency, Bubbles and the 1987 Crash

Dan Ryan

Discovery proceeds from the awareness of anomaly; i.e., with the recognition that nature has somehow violated the paradigm-induced expectations that govern natural science
Thomas Kuhn

The debate about informational efficiency reveals a remarkable polarity in the viewpoints held by those who study the market and those who actually participate in it. Academic consensus in favour of market efficiency flies in the face of the views of most market participants. Since the cataclysmic upheavals of October 1987, there has, however, been a re-examination within the economics profession of the Efficient Markets Hypothesis (EMH). The apparent bubble in the equity markets in 1987, and the absence of any clear rational explanation for the collapse in prices, warrants such a reappraisal.

This essay will first consider the concept of efficiency at the semi-strong level (the most relevant level in the context of the possible occurrence of bubbles). Sections two and three then examine the role of rational behaviour and information. In section four, an alternative to the efficient markets hypothesis known as noise trading is presented. Finally, in section five, the events of October 1987 are analyzed in the light of the discussion.

Semi-strong efficiency

There are three elements in the value of a financial asset. These are, respectively, the estimated returns over time, the expected

terminal value, and the discount rate to be applied. It is crucial to efficiency that market participants should form reasonably accurate and unbiased estimates of these parameters. Underlying the two former elements are company earnings, and analysts can only value stocks correctly if they have a reasonable idea of what future earnings are likely to be.

Little (Granger, 1972) found no observable correlation between the change in earnings for firms over successive periods. This phenomenon is alarming, because it suggests that the predictability of earnings has been severely circumscribed, and by implication, that informational efficiency is of less help in pricing securities than one might expect. Cragg and Malkiel (Granger, 1972), concurred, presenting evidence indicating that, even with the vast array of information available to them, professional securities analysts have great difficulty in predicting earnings:

"...evidence has recently accumulated that earnings growth in past periods is not a useful predictor of future earnings growth...the careful estimates of the security analysts...the bases of which are not limited to public information, perform little better."

The weaknesses of fundamental analysis notwithstanding, the utility of a share is inseparable from its current and prospective market values. To whatever extent it is possible to estimate the

parameters underlying the valuation of a share, the exercise will produce results which are at least better than a shot in the dark. An investor who invests in a security, the market price of which is less than its value, will enjoy superior returns on the average. Asset prices must tend towards their intrinsic value in the long run, but the deficiencies of fundamental analysis suggest that significant short-term deviations may occur.

Rationality

Two main concepts of rational behaviour in the economic sphere exist. The first is a simple mathematical idea of consistency. The second is the Smithian idea of reasoned behaviour of self-interest and profit maximization. The EMH, based as it is on an economic structure composed of profit-maximizing agents, requires that both concepts of rationality are fulfilled.

Sen (1987) suggests possible flaws in these ideas of rationality. Acceptance of his alternative formulations would be extremely destructive to the EMH. Mere internal consistency cannot be adequate for economic rationality, nor can self interest maximization be seen as uniquely rational in a way that pursuing other kinds of objectives (such as altruism, public spirit, class consciousness, group solidarity) must fail to be.

He raises two other difficulties. Certain objectives may compromise the rationality of the person pursuing them. Not only must agents behave rationally in pursuit of their goals, but those goals must themselves be assessed rationally. Furthermore, even when the goals are clear, translation of these into actual behaviour is affected by the pattern of social interdependence, which is a feature of group behaviour when members have slightly or wholly divergent goals. Even when a strictly dominant strategy appears to exist, problems may arise in individual decision making. The

prisoners dilemma is one instance where atomistic non-cooperative behaviour produces inefficiencies. Though each agent pursues his own dominant strategy, the result is distinctly inferior for everybody in the group.

Even greater difficulties arise in a world of uncertainty. As Sen points out "in the presence of uncertainty, rational behaviour requires an appreciation of possible variations in the outcome of any chosen action, and such behaviour must, therefore, be based on systematic reading of uncertainties regarding the outcome and ways of dealing with them" (1987:68). This is an extremely rigorous requirement and in practice, behaviour is likely to be characterized not by perfect rationality, but at best by some form of bounded rationality.

Bounded rationality describes a scenario where human behaviour is not to be seen in terms of any grand maximizing behaviour, but rather as a series of individual decisions, taken on the basis of only partial information and based on limited opportunities for reflection. Neither are these decisions fully integrated, so, as Herbert Simon (1983) points out, decisions may not even be consistent, and choices may depend on the order in which alternatives are presented. Boundedly rational economic agents will fail to maximize profits, even if rationality is defined in a Smithian fashion. Such a deviation, indeed any deviation, from the pure Smithian idea of rational profit maximization raises crucial difficulties with the concept of efficiency and especially with the stronger forms of efficiency.

Information

The information which is available to the financial markets is unlikely to be comprehensive, and may be of limited value in constructing estimates of equity values. But our analysis of the role of information must include not only difficulties with the quality and usefulness

of publicly available information, but also anomalies in the manner in which economic agents utilize information. As Kindleberger states:

“the theoretical literature uses the assumption of the market having one mind and one purpose, whereas it is observed historically that market participants are often moved by different purposes, operate with different wealth and information, and calculate within different time horizons” (1987:281).

Arrow (1987) highlights the economic role of informational differences. Market models which are based on informationally homogeneous individuals imply zero trade. All changes in information are reflected in price changes which will simply induce each trader to continue holding the same portfolio of assets. We can deduce from this that one likely cause of trading is difference of information.

If an individual trader learns something of which another trader is unaware, it is likely that he will have an opportunity to capitalize on that information by buying or selling in the market place. However, if all parties are rational and if this rationality is common knowledge, this cannot happen. A sale of existing securities may be considered as a complicated bet; a zero-sum transaction between individuals who are identical in all things but information. If both are risk averters, they will never trade securities between themselves if they have the same information. If, however, they have different information, then each will consider that the other has some information that he or she does not have. An offer to buy or sell will itself convey information. By making an offer, the offerer is in effect saying that he expects some advantage to himself or herself, and therefore a loss to

accrue to the other party, at least as calculated on the offerer's information. It is easy to see that in such a scenario, no trade will take place. Prices will, however, adjust to reflect the transfer of information arising from the offer and rejection.

This, of course, does not tally with historical experience. A considerable volume of trade does take place on all markets. This can be explained either by viewing investors as irrational, or by considering a scenario where investors have relatively little information to hand, and are acutely aware that other investors are in a similar position. In such a situation, trading may represent a fair bet. This leads us to consider why investors may not have all information to hand - the costs of information. In an efficient market, costly information presents us with a paradox. If prices at all times fully and unequivocally reflected publicly available information, there would be little incentive for market traders to incur the costs of gathering and processing information. Yet, if they abandoned their activities, the efficiency of the market would presumably break down.

Grossman and Stiglitz (1980) suggest that traders who seek out information about economic fundamentals will be rewarded by the market for their efforts through the earning of superior returns. There is in any market an equilibrium amount of inefficiency, which leaves information traders with just enough extra profit to justify their activities so that they make normal profits. In this, Grossman and Stiglitz distanced themselves from earlier writers, who had suggested that the presence of a few informed traders would lead to the whole market being efficient. Thus Grossman and Stiglitz state:

“efficient markets theorists seem to be aware that costless information is a *sufficient* [italics

in original] condition for prices to fully reflect all information; they are not aware that it is a *necessary* condition. But this is a *reductio ad absurdum*, since price systems and competitive markets are important only when information is costly" (1980:404).

Noise trading

An alternative to the EMH, incorporating these principles, is based on the idea of noise trading. This approach rests on two assumptions. Firstly, some investors are not fully rational and these investors demand risky assets on the basis, in part, of beliefs which are not fully justified by economic fundamentals. Secondly, arbitrage (trading by fully rational investors who are not subject to such sentiments) is risky and therefore limited. Arbitrage is risky in two ways. Fundamental risk exists in that price changes occasioned by noise trading may be justified by subsequently disclosed information. Secondly, even where an observable anomaly exists, the market may not correct itself in time to allow the arbitrageur to make a profit. Market prices will not be based solely on fundamental factors, but will be affected by market psychology. Noise traders may be subject to systematic biases in expectations formation.

Advocates of the EMH argue that noise traders cannot survive for long in the market for this very reason. Traders who are not fully rational will make more mistakes than those who are and will therefore be eliminated from the market place by a Darwinite process. Schleifer and Summers (1990) on the other hand question this judgment. Noise traders are likely to be more aggressive than arbitrageurs, and ready to bear more risk. If risk is rewarded in the market, then noise traders may earn higher expected returns, despite buying high and selling low. With higher expected

returns, noise traders will not disappear from the market as quickly as the EMH supposes and may not disappear at all. On some occasions, it may even be advantageous to arbitrageurs to jump on the bandwagon, where they believe that in so doing they will push prices still higher, enticing many more naive noise traders into the marketplace, pushing prices up still further and allowing the arbitrageurs to sell into the rising market at a profit.

Neither are noise traders likely to learn from and imitate arbitrageurs. Rather, the very high returns enjoyed by some noise traders may encourage others to imitate those noise traders, ignoring the fact that they may just have got lucky. In any case, new investors enter the market all the time with the same judgment biases. Investors are likely to follow very inflexible trading strategies such as trend-chasing. Such changes in demand are unwarranted by, though not necessarily unrelated to, changes in fundamentals. Demand shifts of this type only matter if correlated across noise traders. Yet many trading strategies are highly correlated and the impact of noise traders of this type on the market is likely to be pronounced.

Bubbles and the 1987 crash

In this final section, the 1987 crash is discussed in the light of the above. Kindleberger suggests that:

"a bubble may be defined loosely as a sharp rise in price of an asset or a range of assets in a continuous process, with the initial rise generating expectations of further rises and attracting new buyers - generally speculators interested in profits from trading in the asset rather than its earning capacity. The rise is usually followed by a reversal of expectations and a sharp decline in prices often resulting in

financial crisis" (1987:281).

An investor's demand for equity is based on the expected return on the equity over the period for which the equity is held. Therefore the current price which an investor will pay is a function of the expected price at the end of the holding period. Imperfectly informed investors will form expectations about the price at the end of the period at least partly on the basis of the current price. Such a set of functions cannot determine the market price (the problem lacks a unique solution), only the sequence of prices. Only one sequence is the market fundamental price path. All others are bubbles. In such circumstances, economic models would require further restrictions in order to make firm predictions of the current market price. Jean Tirole (Flood and Hodrick, 1987) has demonstrated that real asset prices will be unique and will depend only on market fundamentals in an economy with a finite number of rational, infinitely-lived traders, but his results are very sensitive to the assumption of traders being infinitely lived.

The events of October 1987 represented to many observers the demise of perhaps the greatest bubble of recent times. Stockmarkets had registered record gains in the months leading up to the crash. The Dow Jones Industrial Average (DJIA) increased from 1738 in January 1987 to 2722, before it went into rapid decline after October 6. On a single day, October 19, the DJIA fell 508 points or 22%. Record volumes and unprecedented volatility were recorded. Can we agree with the characterization of 1987 as a bubble and what can we say about the circumstances of the crash?

The official investigation into the crash chaired by Nicholas Brady wrote that:

"the precipitous market decline of mid-October was 'triggered' by

specific events....This initial decline ignited mechanical price insensitive selling by a number of institutions employing portfolio insurance strategies and a small number of mutual fund groups reacting to redemptions. The selling by these investors, and the prospect of further selling by them, encouraged a number of aggressive trading oriented institutions to sell in anticipation of further market declines....This selling, in turn, stimulated further reactive selling by portfolio insurers and mutual funds" (Shiller, 1988:287).

Shiller (1990) investigated the crash by examining the viewpoints of market participants. He found that most investors considered that stocks were overpriced and two-thirds categorized their viewpoint into a "theory of investor psychology" rather than a "theory about fundamentals such as profits or interest". The bulk of respondents quoted the price drops of the week preceding the crash as the main trigger for the far greater falls of October 19.

A more sophisticated explanation for the 1987 crash is presented by Black (1988). During 1987, investors' estimates of mean reversion (a change in expected return that moves in the opposite direction from a change in the market level after that change occurs) grew much more slowly than actual mean reversion, so that bias in their estimates grew. The crash was triggered when investors realized that actual mean reversion was far higher than they had thought. The turmoil in the markets, as this correction took its course, caused investors to demand higher returns, pulling down the market equilibrium still further. Such price movements were aided by investors' use of dynamic strategies (any investment policy which changes exposure to the market after changes in the market level). Portfolio

insurance is one of the better known such strategies, but many investors follow simpler forms of such strategies. Black's model is entirely consistent with the idea of noise trading. Noise can be considered as the bias in estimated mean reversion.

In French's (1988) view, the bubble hypothesis is based on the idea that investors know that prices are too high and that they expect to be able to sell into the market before it falls too far. This is not historically the case. There is no evidence of such a consensus ever having existed. French agrees that prices were too high, but denies that investors were aware of this. Individual investors do not have all information pertaining to a security, but may however have information which is not available to other market participants, or which may only be available to a few participants. Therefore, in forming estimates of asset values, investors will aggregate their own private information with the information conveyed in market prices. The relative weights which they will attach to their private information and to price information will not necessarily be consistent with the relative value of their information and investors may put too much weight on market signals and not enough on their own information.

To illustrate, suppose that in 1987, the typical investor's information was more pessimistic than that implied by the prices. Because investors put too much weight on the market information, she mistakenly believed that she was atypical and that other investors were more optimistic. Consequently, she was prepared to deal at irrationally high prices. A number of items of bad news corroborated the pessimistic private views of investors, leading to very significant downward revision in investors' estimations of asset values. The large price revision which ensued led investors to believe that others had even more pessimistic information causing further

downward revisions in asset value estimation and further selling. On this view, the major factor in the crash of October 19, 1987, on this view, was the large fall in share prices of the previous week.

Conclusion

This essay has examined the topic of informational efficiency in financial markets. Section one commented briefly on the semi-strong form of the efficient markets hypothesis. Sections two and three considered rationality and information. The fourth section looked at one possible alternative to the EMH, that of noise trading. Finally, section five analyzed the 1987 crash.

To conclude, it can be inferred from the above discussion that it is quite plausible that price indeterminacies other than bubbles may exist in markets. This does not imply permanent biases in securities prices, but securities prices may deviate substantially from the efficient level for significant and perhaps prolonged periods. In this light, it is probable that semi-strong efficiency exists only very imperfectly in real life markets.

References

- Arrow, K. J. (1987) "Economic Theory and the Hypothesis of Rationality," in *The New Pallgrave*(1). London: Macmillan.
- Black, F. (1988) "An Equilibrium Model of the Crash". National Bureau of Economic Research Macroeconomics Annual.
- Flood, R. P. and Hodrick, R. J. (1990) "On Testing For Speculative Bubbles," *Journal of Economic Perspectives*, 4(2), 85-102.
- French, K. R. (1988) "Crash-testing the Efficient Markets Hypothesis," National Bureau of Economic Research Macroeconomics Annual.
- Granger, C. W. (1972) "Empirical Studies of Capital Markets: A Survey," in Szego, G. P. and Shell, K. (eds.) *Mathematical Methods in Investment and Finance*. London: North Holland.

- Grossman, S. J. and Stiglitz, J. E. (1980) "On the Impossibility of Informationally Efficient Markets," *American Economic Review*, 70, 13-18.
- Kindleberger, C. P. (1987) "Bubbles," in *The New Palgrave(1)*. London: Macmillan.
- Sen, A. (1987) "Rational Behaviour," in *The New Palgrave (4)*. London: Macmillan.
- Shiller, R. J. (1988) "Portfolio Insurance and Other Investor Fashions as Factors in the 1987 Stockmarket Crash." National Bureau of Economic Research *Macroeconomics Annual*.
- _____. (1990) "Speculative Prices and Popular Models," *Journal of Economic Perspectives*, 4(2), 55-66.
- Shleifer, A. and Summers, L. H. (1990) "The Noise Trader Approach to Finance," *Journal of Economic Perspectives*, 4(2), 19-34.
- Simon, H. (1983) *Reason in Human Behaviour*. London: Basil Blackwell.