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## EDITORIAL COMMENTARY

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### Trust, Complexity and the 1990s Market Bubble

The hypothesis of this paper is that misplaced personal trust, coupled with positive feedback, can be a contributing factor to stock market bubbles. In addition it presents evidence suggesting that trust and feedback conditions were especially favorable in the 1990s such that they may have contributed to one of the largest stock market bubbles in U.S. history. The genesis of this hypothesis lay in the observation that “trust is a necessary condition for the existence of Present Value.”

If personal trust can play an important role in stock market dynamics why do we hear so little about it from Financial Economists? I suggest that it is because the concept of trust does not fit into current financial theory. In particular, current financial theory is grounded in a deterministic world devoid of the irreducible uncertainty that makes trust necessary. Instead, trust has been replaced by the concept of probabilistic risk wherein distributions of possible future outcomes can in principle be known with certainty. In current financial theory, the future is implicitly treated as if it already exists and that we only need to wait to see what happens. However in the real world the future is evolving and so what might happen cannot be predicted with precision. In this uncertain environment, if investors are to be induced to part with their money, they must have faith that the party they entrust it to will attempt to use it in a manner that is consistent with their best interests, whatever the future may bring. This is consistent with my research suggesting that investors’ perceptions of financial risk are multi attribute and involve feelings and thoughts of trust. While financial theory treats risk as primarily a function of the technical features and probable outcomes associated with financial hazards, most decision makers see risk to be influenced not only by the nature of the hazard and the risk managers technical competence but also by his/her attention to their particular situation. Thus it is not uncommon to find people unwilling to accept the risk of radiation due to nuclear power or genetic damage due to chemical pollution but yet quite willing to accept the risk of radiation exposure from X rays and chemicals when the situation involves a trusted physician. Trust should be seen as an attribute that can magnify or ameliorate per-

ceived personal risk. In this regard my research, involving many hundreds of novice and sophisticated investors, indicates that the trust is seen to be far more important from a risk perspective when selecting a financial advisor than technical competence.

Before getting into more detail about how trust influences perceived risk and market dynamics, it is important to understand the nature of trust and how it appears to have evolutionary roots related to the survival benefits of social cooperation and mutually beneficial trade.

#### The Nature of Trust

Research in Evolutionary Biology, Game Theory, Experimental Economics, Neuroscience and Decision Science over the last 30 years suggests that trust is a social mechanism with biological roots. In particular, it may serve to improve the chance of successful gene transmission from generation to generation while also having the desirable ancillary benefit of sometimes improving the perceived personal well-being of the trusting and the trusted. This recent research also indicates that the current economic probabilistic view of “trust as risk” is too limited to explain very many types of economic and social transactions. The term “strategic trust” is sometimes used by Philosophers to describe the economic “trust as risk” type of thinking.

In a condition of strategic trust the decision maker aims to achieve an optimal outcome in a deterministic world. In a formal rational manner the decision maker sizes up the risky situation and makes a choice that is consistent with the axioms of utility maximization. As a rule, the word trust is seldom used to describe the emotional state of the decision maker during this process. Usually the word “confidence” is used since it more accurately describes the passive contemplative state of the decision maker and avoids the conceptual complications that arise with the active state associated with a personal trust based reciprocal transaction. Because strategic trust implicitly ignores the human emotional dimension of a trust relationship, strategic trust is assumed to be able to exist between decision makers and inanimate objects, such as corporations.

Recent research tends to suggest that the Philosophers’ concept of “authentic trust” is a more appropri-

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ate and generally useful conceptualization of trust than strategic trust. Authentic trust, like strategic trust, involves a conscious analysis of a potential trust relationship but it also allows the incorporation of an emotional overlay wherein trust involves feelings of mutual commitment, dependency and shared values. Again, like strategic trust, personal advantage is still a key element of the trust relationship, but it is seen to arise from the trust relationship and not be the sole selfish calculated reason for the relationship. Authentic trust appears to be the type of relationship that Adam Smith had in mind when he advocated the division of labor and expounded upon the mutually beneficial “trade” that could arise because of it.

A renewed interest in the concept of authentic trust has been brought about by recent research in Evolutionary Biology, Neuroscience, Decision Science and Game Theory. Biological evidence indicates that humans may actually have a greater natural proclivity to cooperate than compete and that they seem to have evolved trust supporting genetic hardware to enhance the chance of survival through “reciprocal altruism.” For example humans seem to have an inborn tendency to be able to detect social cheaters and free riders through observations of facial features, body posture and speech patterns. There is also extensive evidence that naturally occurring emotions such as anger, fear, love, outrage, etc. serve an important role in encouraging social behaviors and norms which support trust based relationships and non zero sum reciprocity. Social enforcement mechanisms such as shunning, ostracism and the disdain for hoarders are but a few examples of these social behaviors.

Game theorists are also able to point to evidence that cooperation seems to be as naturally present as competition. For example, experimental results from “prisoner dilemma” type games indicate that in more natural settings, cooperation, rather than defection, seems to be the norm. Even more relevant, in games that contain some irreducible uncertainty, similar to that in real world environments, game outcomes with cooperation can be evolutionarily stable. That is, personally selfish behavior and free riding do not force cooperation to extinction.

Recent research from Neuroscience and Decision Science also suggest opportunities and mechanisms for the influence of trust on decisions, especially where the decision task is complex and time constraints are severe. First, the human brain seems to be somewhat modular in construction and adapted to focus on more routine problems related to survival rather than being a general problem solver, like a computer. Second the “emotion circuits” of the brain are interconnected with the “logic circuits” such that the two can and need to support each other if good decisions are to be made. Third, emotion or affect (a positive or negative feeling based orientation) often

appears to serve as an orienting device to direct the more formal logical decision process. Fourth, humans, like most other sentient beings, appear to have a very strong innate tendency to be socially influenced and in particular to imitate others’ decisions. In this regard “herding” and a form of “swarm logic” appears to take hold especially when decision complexity and time constraints become severe. Fifth, decision makers appear to trade off accuracy against effort. Specifically, as a decision situation becomes more complex and difficult, decision makers seem to rely more heavily on less mentally burdensome rules of thumb and give greater weight to qualitative, as opposed to quantitative, information. They lean more heavily on decision processes that “feel right” as opposed to those that “look right.” Sixth, there is little doubt that decision makers are loss averse as opposed to risk averse. That is, potential loss is usually weighted more heavily than potential gains or variability of return as a decision attribute. More relevant to this paper however, perceived risk is multi attribute in nature and lack of trust greatly magnifies the perceptions of risk.

In summary, my personal experience with hundreds of novice and professional investors suggests that all of the previously mentioned behaviors and tendencies are much in evidence in their investment behavior. Most relevant to this paper is the tendency of these investors to be more affectively influenced as investment decisions become more complex and difficult to unravel. In this regard, there is a strong tendency to reduce the weight of ones own formal analysis and to look toward consensus positions or the opinions of those deemed to be more knowledgeable. Trust in the implicit and explicit opinions of others takes on increased weight as financial decision complexity increases.

### **Complexity and Market Dynamics**

From the foregoing it appears that shifts in trust, especially through its relationship with perceived risk, could influence individual stock prices and market dynamics. However, bubbles typically involve large movements in many stock prices and it seems unlikely that such large and volatile swings in trust could occur. The resolution of this paradox requires a reassessment of the nature of stock market dynamics. More specifically it requires the discarding of the Newtonian Efficient Markets Hypothesis (EMH) for an alternative dynamic model based on Complexity Theory. The remainder of this section investigates the profound difference between the EMH and a Complexity based market model. In particular it describes how small changes in trust, coupled with multiple channels of positive feedback, could be responsible for wide swings in the market. The final section of this paper

will suggest how market trust conditions of the 1990s, coupled with this complexity based model, might account for the 1990s bubble.

The EMH was never meant to be a descriptive theory. Its assumptions were partially accepted for their mathematical tractability while the theory was primarily designed to be predictive, with normative overtones. It is now recognized that the model has a very poor predictive record while its failings have been terminologically marginalized by referring to them as "anomalies." In point of fact the EMH cannot explain the bubble anomaly because its assumptions formally prohibits their existence. In particular the EMH assumes homogeneous or near homogeneous expectations and maximizing behavior by investors who are formally logical and have access to identical information. Because stock prices reflect all that is currently knowable, major price fluctuations arise only because of the arrival of new exogenous information. In addition, even if instances of "irrational pricing" were to arise due to noise trading, prices would be driven back to within narrow reflecting barriers by the profit seeking behavior of the more rational traders. Clearly the EMH is based upon a set of incorrect assumptions about human decision behavior and a linear Newtonian worldview wherein equilibrium is assured because of negative feedback and where outcomes must be proportional to their cause. Perhaps its greatest disservice is that it supports the fiction that there is an intrinsic stock value that needs only to be discovered. It fails to recognize that the pricing process itself is dynamic and "emergent" and that the pricing process results in shifts in the types of information and pricing algorithms that are seen as appropriate. At the very least, the concept of reflecting price barriers should be amended to view the barriers as elastic rather than rigid, thus incorporating bubble behavior. Within the elastic barriers, value might be seen as formally fuzzy.

The wholesale discovery of EMH anomalies such as overreaction, price momentum, home bias, etc. as well as the evidence of inconsistent and generally mediocre performance of experienced investment managers suggest that the market is not the logic driven system so understandable through reductive methodologies as it was thought to be. More importantly, recent experimental market studies and large computer simulations strongly suggest that the stock market exhibits dynamics like those of a Complex Nonlinear system.

Complex nonlinear systems have a number of interesting properties not the least of which is the impossibility of precise prediction. These systems have a global overall structure but exhibit short-term randomness. One may be able to predict the general direction of the system, within limits, but that is about all. However, the more important feature of complex systems for this paper is that they tend to be powerfully influ-

enced by positive feedback. As such they are capable of generating extreme outcomes that seem to appear from nowhere. In complexity theory terminology, they "exhibit extreme sensitivity to initial conditions." Small, almost imperceptible and often endogenous changes can lead to major shifts in the state of the system. Often these new emergent states are unlike any property of their constituent parts. Common natural examples of emergence include water turning into ice and, more dramatically, life itself, which arises from a batch of chemicals and an energy source. It turns out that there are a number of possible channels through which changes in trust might introduce positive feedback into the stock pricing process, thereby creating the emergent states called bubbles and crashes. A few of these more important feedback channels are discussed in the following paragraphs.

### Positive Feedback Channels

The first channel is related to the proposition that stock price changes should be perceived to be an important piece of decision information. In this regard it is important to note that it is the change in price, rather than the level of the price, that is likely to be the datum of greater importance. This is partly because the interpretation of the level of the stock price is ambiguous, given the considerable uncertainty about how to estimate the value of a stock to begin with. More significantly it is due to the fact that people tend to see change as more salient and respond to it more quickly. The direction and magnitude of the price change is also important because recent research indicates investors, and other decision makers, associate positive outcomes with lower levels of risk. That is, they see perceived risk as varying inversely with return. This inverse micro relationship is just the opposite of the positive macro relationship that exists across financial asset types. Positive price related feedback might begin when an increase in trust leads to a perceived reduction in risk, an overall increase in the demand, and a consequent rise in the price of a stock. The rise in the price is perceived as an indication of lower risk and so the process cycles forward. Another behavior likely to enhance this positive feedback process is that in Western cultures, as opposed to Asian cultures, people tend to extrapolate past trends into the future. Thus, future price increases are expected to follow past price increases while future price reductions are expected to follow past price reductions. This may happen because in Western cultures linearity is believed to dominate natural processes while in Asian cultures the acceptance of a belief in cycles is more widespread.

A second channel of positive feedback is related to the ways in which decision makers tend to notice asymmetrically and respond to new information. First,

people tend to seek out and give greater weight to confirming rather than disconfirming evidence. For example, if stock prices rise, investors are more likely to notice other positive features associated with the firm and give them greater weight. This behavior has been noted in studies reporting that investors tend to associate good companies with good investments. A related behavior is that of seeking out personal contacts and further experiences that are consistent with the affective valence of the recent event. A financial example of this behavior might be the tendency of investors to commit disproportionately large amounts of funds to recently profitable investments at the expense of adequate diversification. This behavior may also be related to the phenomenon of "price chasing." Second, affect tends to have a more pronounced influence in the case of positive information. Thus greater reliance on qualitative information and the use of more affective holistic decision strategies are likely to be seen after recent good news. This behavior may be related to the tendency of investors to express greater overall confidence in the future after recent stock price increases. Increased confidence in the future then seems to be followed by successive rounds of investment. When it comes to negative information, decision makers tend to see negative information as especially credible and respond to it more vigorously. They also appear to rely more heavily on formal logical decision procedures when faced with bad news, provided there is no tight time constraint. The asymmetry between the effects of positive and negative information may be related to the psychological attribute of loss aversion and result from a primitive urge to avoid situations that threaten one's survival. In any event, the quicker and more dramatic response to bad news is consistent with the tendency for bubbles to collapse more quickly than they inflate.

It was previously noted that one of the strongest natural tendencies among humans and other animals is to be socially influenced. Thus a third, socially induced, positive feedback channel might be expected as decision makers consult with and imitate others. More importantly, socially influenced investment decisions are likely to be especially prevalent with equity investment because of the innate complexity of the task. In particular, it is well known that decision makers tend to give much greater weight to less rigorous and formal analytical techniques and more weight to more affectively influenced qualitative information in complex judgment situations. Thus explicit trust in one's personal financial advisor or more implicit trust in the public decisions of a respected portfolio manager should be expected to carry great weight, especially among less self assured investors. While "herd" behavior is naturally adaptive because there is greater physical safety in numbers, herding or imitating in the investment world may also provide benefit where others might have access to superior information and skills. Also, in

the short run such behavior may provide a safe haven for investment advisors and institutions that do not have superior abilities and face the loss of funds if their ineptitude were to be exposed. Extensive research indicates that herding and imitating is widespread among individual investors and across institutional investors. There is much evidence that the herding is driven by perceptions of superior skills and better information. However there is also interesting evidence suggesting that more qualitative issues, such as those typically associated with cultural factors, may have some influence, even among institutions. In particular, it has been noted that apart from regulatory and economic issues, banks prefer to herd on banks, mutual funds other mutual funds, etc. Also investors seem to have a net preference for investing in their place of employment and country of citizenship even though it is not accompanied by informational or cost advantages.

A fourth positive feedback channel is through the "wealth effect." While there is considerable discussion about the strength and consistency of this effect, it is the one that Economists usually mention. The wealth effect creates positive feedback as a result of investors becoming more (less) willing to commit more (less) funds to the market as their wealth rises (declines) with market. The precise psychological mechanism underlying this effect is usually left vague and noted only as a "propensity." Conceptually it appears to be a composite of many causes and behaviors, many of which I probably have already mentioned.

### **Complexity, Trust and the Market Bubble**

To this point I have discussed the nature and importance of trust in the investment process. I have also described positive feedback channels that could lead to the creation and destruction of a stock market bubble. In the following paragraphs I argue that reliance on "expert trust" by investors was of such a magnitude that increasing trust, followed by distrust, contributed to one of the largest bubbles and crashes in stock market history.

If there ever was a period of time in which trust was likely to play a significant role in investors' behavior the 1990s was it. The economy was just coming out of a recession, the first Gulf War seemed to have ended well, many stocks appeared to be selling at bargain basement prices and the fabulous amounts of the money which could be made in the stock market was in the public consciousness as a result of the takeover and merger activity of the previous decades. If the expression "regression toward the mean" has any validity, it surely would suggest that investors expected much better times ahead and that the investing mood was turning positive. However three other factors were more important for strengthening the influence of trust based investing.

First, a large continuous flow of new money was beginning to enter the market as a result of changes in retirement funding arrangements. In particular, the shift from defined benefit retirement plans to defined contribution plans was placing large amounts of money in the hands of an unsophisticated investing public. Now individuals were supposed to decide and take responsibility for the investment of their own retirement money. Since most new investors were unprepared to assume this task, they naturally relied very heavily on the advice of financial advisors, colleagues, friends and media "talking heads." Given the bewildering array of investment opportunities that were multiplying daily and the very unfamiliar world of finance, complete with its own jargon and culture, these novice investors had little choice other than to trust in someone's advice if they wanted to get into the stock investment game. Even for those who did not wish to take speculative risks, stock investment appeared to be the thing to do since the word was widespread that "you can't go wrong with stock if you invest for the long run."

The second factor leading to a more pronounced emphasis on trust in equity investment was the increasing complexity and ambiguity associated with analysis and forecasting. Specifically, new technologies were developing rapidly and new firms were sprouting like weeds after a spring rain. IPOs were everywhere. In this environment even professional investors were at a disadvantage since the usual techniques for stock analysis did not translate well to situations of almost complete uncertainty and where a crystal ball, or at least inside information, seemed to be more appropriate. In many respects the appearance of these new biotech, info tech, etc. firms and technologies was reminiscent of the turn of the century and the rise of the auto, chemical and electrical industries. In this situation even expert investors had to trust that the corporate executives had a sound business plan and could handle any unforeseeable contingencies that might arise. To make matters more uncertain, many of the former staid and predictable firms, such as General Electric, also began programs to remake themselves. These restructurings further increased the difficulty and uncertainty of equity investing.

The third factor bringing trust to the forefront in the 1990s was the steady drumbeat of the message that corporate executives and fund managers could be expected to be focused on the stockholders' best interests since they were now being partially compensated through stock options. That is, they could be trusted to do the right thing, because if they did, their options would also increase in value. Stockholder value was said to be king! In addition, less noticeable, but implicitly very important, was the overall public belief that free markets could do no wrong. In particular, the stock market had been found to be efficient by knowledgeable economists and stock prices could be assumed to represent real economic value.

At this point it is useful to mention some of the primary sources of distrust that were to materialize later and contribute to the unwinding of the bubble. First and foremost, the stability of the market was being undermined by conflicts of interest in the accounting and financial analysis professions. Specifically, auditors were conflicted by their firms' desires to sell consulting services and financial analysts were conflicted by their firms' desire to underwrite and sell securities. Second, many stock option plans allowed managers to cash in their options after very short holding periods (less than a year) and the managers realized that it was possible to "manage earnings" and stock prices to their short term advantage. In addition, some managers' behavior, while not overtly illegal or unethical, resembled gamblers playing with the "house money." That is, since they had not paid for their options, they behaved as if they had little to lose but a lot to gain by taking bigger risks with the firm's funds. Finally, trust in the official regulatory process was undermined by revelations of budget reductions among regulatory agencies and widespread public exposure of a cavalier and "public be damned" attitude on the part of many corporate executives and professional money managers.

### **The Role of Network Structure**

Before concluding this essay, a few comments are in order about the role played by network structure in transmitting information and more importantly influence among stock market investors. Recent research into the behavior of networks reveals a lot about how the configuration of a network and the number and strength of the connections between the network nodes influences its behavior, independent of the purpose of the network. What is most relevant to this essay is that given a need for trust; especially trust in a person of perceived technical competence, the influence network among investors was probably what is called an "aristocratic network." In this type of network there are a small number of hubs that serve as "information leaders" (financial experts, corporate executives) and these hubs have many connections to other nodes (investors) who are not well connected to other nodes or alternative information leaders. In this type of network, trends develop quickly as influence is readily transmitted to different parts of the network. However, when a few of the hubs are destroyed, the network collapses very fast and the nodes are left relatively isolated and the system becomes unstable but without any strong direction. This type of network also usually exhibits a type of behavior called "preferential attachment." With preferential attachment there is a tendency for influence and resources to accrue to fewer and fewer nodes and hubs as time goes by. The effect is sometimes called the "rich get richer and the poor get poorer phenomenon." The

rapid collapse of the 1990s bubble, accompanied by the revelation of the misdeeds of a few trusted individuals, is very consistent with this type of network collapse. Also, this type of network exhibits statistical event distributions consistent with a power law. In particular, power law functional relationships are associated with the creation of a few more extreme outcome events and many more very small outcome events. That is they statistically exhibit what are called “fat tails.” It has been well known for years that stock return distributions also have a “fat tails” pattern instead of that of a normal distribution. If stock price behavior is the result of an aristocratic market network, a fat tailed distribution of stock returns is just what should be found.

In summary, it appears possible that a trust driven bubble might have arisen in the 1990s because of the improving economy, the greater importance of trust in the equity investment process and the presence of positive feedback channels that could amplify security price movements. In addition, recent empirical research suggests that the conventional dividend discount model used to value stocks appears to have broken down by the middle of the decade. In particular, stock values no longer seemed to follow dividends as indicators of economic value. Also, other commonly accepted indicators of value, such as P/E ratios, skyrocketed past the upper limits of reason. A reasonable post bubble question is “why didn’t anybody notice that something seemed to be wrong?” The answer probably lies somewhere in the observation that nobody likes a “party pooper” and that there was no need for worry because, after all, the market was efficient and just reflecting the “new economic order.” Clearly there was a strong symbiotic relationship between trusted experts and investors as the bubble inflated. Both were getting very rich. However, when this formally complex system underwent a “phase transition” from trust to distrust (the bubble burst), only a few were able to don golden parachutes. Most investors lost money and most academics should have lost their faith in market efficiency.

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