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# EFFICIENT MARKETS, HUBRIS, CHAOS, LEGAL SCHOLARSHIP AND TAKEOVERS

NICHOLAS WOLFSON\*

## INTRODUCTION

Professor Richard Posner has recently written about the demise of legal scholarship as an autonomous subject<sup>1</sup> due to developments in the social sciences, such as economics.<sup>2</sup> It is no longer possible for legal scholars to deal with the law as an independent body of cases and statutes subject only to the particular linguistic felicity of lawyers and law professors. Legal scholars must inevitably deal with other disciplines, such as economics and psychology,<sup>3</sup> when attempting to advance knowledge in a particular legal field. It is, and perhaps always was, futile to attempt to advance learning by merely analyzing cases and statutes with the familiar legal tools of analogy and linguistic acumen.

One of the fields that has been most affected by this development is that of corporate law. This subject has been vastly modified by modern developments in finance theory, such as the efficient market hypothesis and the capital asset pricing model.<sup>4</sup>

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<sup>1</sup> See Posner, *The Decline of Law as an Autonomous Discipline: 1962-1987*, 100 HARV. L. REV. 761, 761 (1987). "The idea that law is an autonomous discipline, . . . a subject properly entrusted to persons trained in law and in nothing else, was originally a political idea." *Id.* at 762. The autonomy of law was challenged as far back as 1897 by Justice Oliver Wendell Holmes. See Holmes, *The Path of the Law*, 10 HARV. L. REV. 457, 469 (1897). Holmes had predicted that economists and statisticians would play a much larger role in the future. See *id.* It was not until a half century later that Holmes' prediction began to come true. See Posner, *supra*, at 766-67. Other factors that have changed legal scholarship include developments in the field of philosophy, particularly in areas related to law such as abortion, obscenity, capital punishment and women's rights, and the collapse of society's confidence that lawyers will correct the major problems of the legal system. *Id.* at 767-69.

<sup>2</sup> Posner, *supra* note 1, at 767-69.

<sup>3</sup> RATIONAL CHOICE, THE CONTRAST BETWEEN ECONOMICS AND PSYCHOLOGY (R. Hogarth & M. Reder eds. 1987) [hereinafter CONRAST].

<sup>4</sup> See E. FAMA, FOUNDATIONS OF FINANCE (1976); Easterbrook, *Managers' Discretion and Investors' Welfare: Theories and Evidence*, 9 DEL. J. CORP. L. 540 *passim* (1984).

Perhaps the most significant area of discussion and research in the realm of corporate law has been that of corporate takeovers.<sup>5</sup> Takeovers have been viewed as the cause of the bull market of the 1980's,<sup>6</sup> and a proposed tax increase on takeovers has been blamed

<sup>5</sup> See Jensen, *The Takeover Controversy: Analysis and Evidence*, 4 MIDLAND CORP. FIN. J. 6, 6 (1986). Professor Jensen observed:

The market for corporate control is fundamentally changing the corporate landscape. Transactions in this market in 1985 were at a record level of \$180 billion, 47 percent above the \$122 billion in 1984. The purchase price in 36 of the 3,000 deals exceeded a billion dollars in 1985, compared with 18 in 1984.

*Id.* (citing W. T. Grimm, *Mergerstat Review* [1985] for his data).

Arthur Fleischer, Jr., in his testimony before the House Subcommittee on Telecommunications and Finance on July 9, 1987 referred to the following data from W.T. Grimm, *Mergerstat Review* (1986):

Chart 1	1983	1984	1985	1986
Acquisitions	2,533	2,543	3,001	3,336
No. involving				
Public companies	190	211	336	386
Tender Offers	37	79	84	150
Contested Tender Offers	11	18	32	40

*Written Statement on the Tender Offer Reform Act of 1987 (H.R. 2172) and the Securities Trading Reform Act of 1987 (H.R. 2668), Appearance Before the House Subcommittee on Telecommunications and Finance, 100th Cong., 2d Sess. (1987) (Statement of Arthur Fleischer, Jr.) [hereinafter Fleisher].*

Individual contested bids and acquisitions may be enormous and of great significance to shareholders and the local communities. Martin Lipton points out that, for example, Pantry Pride acquired Revlon "by means of a \$1.7 billion hostile tender offer." Lipton, *Corporate Governance in the Age of Finance Corporatism*, 136 U. PA. L. REV. 1, 11 n.40 (1987). Many of these deals are structured with risky bond financing or "junk bonds." See *id.* Some examples are Turner Broadcasting System's unsuccessful bid for CBS (\$5.4 million in junk financing) and Revlon Group Inc.'s bid for Gillette Co. (\$3.9 billion in junk bonds). See *id.* at 11 n.42.

An influential piece on takeovers and the market for control is Manne, *Mergers and the Market for Corporate Control*, 73 J. POL. ECON. 110 (1965). There has been an outpouring of articles on this topic. Some representative samples are: Baysinger & Butler, *Antitakeover Amendments, Managerial Entrenchment and the Contractual Theory of the Corporation*, 71 VA. L. REV. 1257 (1985); Bebchuk, *The Case for Facilitating Competing Tender Offers*, 95 HARV. L. REV. 1028 (1982); Coffee, *Regulating The Market For Corporate Control: A Critical Assessment of the Tender Offer's Role in Corporate Governance*, 84 COLUM. L. REV. 1146 (1984); Easterbrook & Fischel, *The Proper Role of a Target's Management in Responding to a Tender Offer*, 94 HARV. L. REV. 1161 (1981); Gilson, *A Structural Approach to Corporations: The Case Against Defensive Tactics in Tender Offers*, 33 STAN. L. REV. 819 (1981); Leebron, *Games Corporations Play: A Theory of Tender Offers*, 61 N.Y.U. L. REV. 153 (1986); Romano, *The Political Economy of Takeover Statutes*, 73 VA. L. REV. 111 (1987).

<sup>6</sup> REPORT OF THE PRESIDENTIAL TASK FORCE ON MARKET MECHANISMS 9 (1988). Other factors contributing to the bull market included stock retirements arising from mergers, leveraged buyouts and share repurchase programs, and an increasing tendency to include

for the October crash.<sup>7</sup> In 1968, Congress passed the Williams Act<sup>8</sup> to protect the shareholders of target corporations<sup>9</sup> by requiring full disclosure from the tender offeror.<sup>10</sup> The Act also requires (as implemented or perfected by rules) certain substantive protections such as withdrawal rights, minimum open periods for the bid, and rights of proration.<sup>11</sup> Commission rules also restrict the target management by setting limits on target repurchase<sup>12</sup> and target management disclosure.<sup>13</sup> The underlying philosophy calls for maintaining a balance between bidder and target.<sup>14</sup>

takeover premiums in the valuation of a large number of stocks. *Id.*

<sup>7</sup> *Id.* at 15. On October 14, 1987, members of the House Ways and Means Committee announced the filing of legislation to eliminate the tax benefits associated with the financing of corporate takeovers. *Id.*

<sup>8</sup> 15 U.S.C. §§ 78m(d)-(e), 78n(d)-(f), 78s (1982 & Supp. V 1987).

<sup>9</sup> The United States Supreme Court recently gave a brief summary of the Act:

Congress passed the Williams Act in 1968 in response to the increasing number of hostile tender offers. Before its passage, these transactions were not covered by the disclosure requirements of the federal securities laws. The Williams Act, backed by regulations of the SEC, imposes requirements in two basic areas. First, it requires the offeror to file a statement disclosing information about the offer, including: the offeror's background and identity; the source and amount of the funds to be used in making the purchase; the purpose of the purchase, including any plans to liquidate the company or make major changes in its corporate structure; and the extent of the offeror's holdings in the target company.

Second, the Williams Act, and the regulations that accompany it, establish procedural rules to govern tender offers. For example, stockholders who tender their shares may withdraw them while the offer remains open, and, if the offeror has not purchased their shares, any time after 60 days from commencement of the offer. The offer must remain open for at least 20 business days. If more shares are tendered than the offeror sought to purchase, purchases must be made on a pro rata basis from each tendering shareholder. Finally, the offeror must pay the same price for all purchases; if the offering price is increased before the end of the offer, those who already have tendered must receive the benefit of the increased price.

*CTS Corp. v. Dynamics Corp. of America*, 481 U.S. 69, 79-80 (1987) (citations omitted).

"Congress sought to protect the investor not only by furnishing him with the necessary information but also by withholding from management or the bidder any undue advantage that could frustrate the exercise of an informed choice." *Edgar v. Mite Corp.*, 457 U.S. 624, 634 (1982) (citation omitted).

<sup>10</sup> See R. GILSON, *THE LAW AND FINANCE OF CORPORATE ACQUISITIONS* 934-48 (1986).

The Act requires the bidder to make certain disclosures as specified by Commission regulation. *Id.* at 937-48.

<sup>11</sup> See *id.* at 979.

<sup>12</sup> See DIVISION OF MARKET REGULATION, U.S. SEC. & EXCH. COMM'N, *THE OCTOBER 1987 MARKET BREAK* 6 (1988).

<sup>13</sup> See R. GILSON, *supra* note 10, at 948.

<sup>14</sup> See Easterbrook & Fischel, *supra* note 5, at 1162-63. The goals of the Williams Act were set forth by the Supreme Court in *Edgar v. Mite Corp.*, 457 U.S. 624, 633 (1982):

There is no question that in imposing these requirements, Congress intended to protect investors. But it is also crystal clear that a major aspect of the effort to

Related legislation,<sup>15</sup> as well as efforts to amend it, have been influenced enormously by evaluations of the impact of unsolicited tender offers.<sup>16</sup> Scholarship in this field has also been influenced by stock price studies into the effect, positive or negative, of takeovers on shareholder welfare.<sup>17</sup> Needless to say, if the aggregate unsolic-

protect the investor was to avoid favoring either management or the takeover bidder . . . Congress became convinced "that takeover bids should not be discouraged because they serve a useful purpose in providing a check on entrenched but inefficient management." It also became apparent that entrenched management was often successful in defeating takeover attempts. As the legislation evolved, therefore, Congress disclaimed any "intention to provide a weapon for management to discourage takeover bids," and expressly embraced a policy of neutrality.

*Id.* (citations omitted).

<sup>15</sup> See Finkelstein, *The New Delaware Takeover Statute*, 21 SECURITIES & COMMODITIES REGULATION 47 (1988). "For more than a decade, various states have sought to regulate non-negotiated takeover bids . . . After the 1987 Supreme Court decision in *CTS Corp. v. Dynamics Corp. of America* [upholding the constitutionality of an Indiana statute] a number of states began to examine the advisability of advising new statutes . . . At least 27 states now have laws specifically regulating takeover transactions. *Id.*

Supporters of the values of takeovers have criticized such legislation. For example, SEC Commissioner Joseph A. Grundfest wrote that:

these statutes are, to quote Mr. Justice Scalia, "economic folly." [*CTS Corp. v. Dynamics Corp. of America*, 107 S. Ct. 1637, 1652-53 (1987) (Scalia, J., concurring).] In the aggregate, these statutes cause substantial harm to our economy. They slow a restructuring process that is necessary and beneficial if American industry is to become fully competitive in an internationalized trading environment; they impede the reorganization of conglomerate structures that may have outlived their usefulness; they impair the market's ability to allocate capital to its highest valued use; and they deter productivity enhancing reorganizations that increase output per worker and thereby secure American jobs in a highly competitive marketplace.

*Corporations and Acquisitions—Special Voting Requirements and Control Share Acquisitions Concerning House Bill No. 1321, Before the Judiciary Committee of the Maryland House of Delegates, at 1-2 (1988)* (statement of Joseph A. Grundfest, Commissioner, SEC).

<sup>16</sup> See e.g., Easterbrook & Fischel, *Auctions and Sunk Costs in Tender Offers*, 35 STAN. L. REV. 1, 16-17 (1982); Easterbrook & Fischel, *Corporate Control Transactions*, 91 YALE L.J. 698, 699 (1982); Easterbrook & Jarrell, *Do Targets Gain From Defeating Tender Offers?*, 59 N.Y.U. L. REV. 277, 279-280 (1984); Gilson, *The Case Against Shark Repellant Amendments: Structural Limitations on the Enabling Concept*, 34 STAN. L. REV. 775, 809-18 (1982); Bebchuk, *supra* note 5, at 1029; Gilson, *supra* note 5, at 842-45.

<sup>17</sup> See, e.g., Ruback, *The Conoco Takeover and Stockholder Returns*, SLOAN MGMT. REV. 13, 13-33 (1982); Ruback, *An Economic View of the Market for Corporate Control*, 9 DEL. J. CORP. L. 613, 616-19 (1984); Easterbrook, *supra* note 4, at 557-64.

Arthur Fleischer stated:

At present, the evidence as to the overall impact of unsolicited offers is, in our view, unclear. Most of the research cited by proponents of takeover activity centers on stock price studies. On the one hand, these studies show that takeovers significantly increase the wealth of target shareholders and also increase the wealth of successful bidder shareholders, although the latter benefit to a lesser extent. On the other hand, these studies only examine stock prices over short peri-

ited takeover gain of target and bidder shareholders is negative, there is good reason to restrict tender offers and less reason to criticize intrusive legislation designed to limit such takeovers. If unsolicited tender offers positively affect target shareholders but, to a lesser extent, negatively impact bidders, a somewhat more optimistic appraisal of tender offers is possible. If unsolicited takeovers generally benefit target shareholders, and neither hurt nor benefit bidder shareholders, an even more benign interpretation of the phenomenon is possible.

The shareholder stock price studies used to evaluate the impact are based upon a philosophy of efficient market-rational expectations. As is true in much of traditional economic research, the theory and studies assume that multitudes of rational investors buy and sell securities based upon a rational prediction of the future returns on investments.<sup>18</sup> Fads and fashions are generally ignored by economists. Thus economists usually depreciate the theories of psychologists which typically encompass the irrational thought processes of individuals.<sup>19</sup> The reference to "irrational" does not imply a mild form of madness. As Herbert A. Simon points out, psychologists agree that people have reasons for what they do; although they may not coldly maximize gain or utility in the fashion economists suppose, "[t]hey have motivations, and they use reason (well or badly) to respond to these motivations and reach their goals."<sup>20</sup> In this respect, a seminal paper by economics Professor Richard Roll, entitled *The Hubris Hypothesis of Corporate Takeovers*,<sup>21</sup> is of crucial importance in that it departs from the rationalist approach of economic theory. If Roll's hypothesis is

ods of time and typically do not cover the period after completion of a merger. Fleischer, *supra* note 5, at 8.

Many would argue that the evidence was positive. In a recent paper, SEC Commissioner Joseph Grundfest argued that the event study data conclusively proved that "a conservative estimate of gains from takeovers from public companies in this period is 139.8 billion." Grundfest & Black, *Stock Market Profits from Takeover Activity Between 1981 and 1986: \$167 Billion is a Lot of Money*, at 38 (SEC News Release Sept. 1987).

<sup>18</sup> See Kleidon, *Anomalies in Financial Economics: Blueprint for Change?*, in *CONTRAST*, *supra* note 3, at 285-315. Professor Kenneth J. Arrow, however, has pointed out: "If agents are all alike, there is really no room for trade. The very basis of economic analysis, from Smith on, is the existence of differences in agents." Arrow, *Rationality of Self and Others in an Economic System*, in *CONTRAST*, *supra* note 3, at 205. If agents are different in unspecifiable ways, then this creates an obvious problem in analysis. *Id.*

<sup>19</sup> For a dissenting view on the value of psychological research, see Shiller, *Comments on Miller and Kleidon*, in *CONTRAST*, *supra* note 3, at 317-21.

<sup>20</sup> Simon, *Rationality in Psychology and Economics*, in *CONTRAST*, *supra* note 3, at 25.

<sup>21</sup> Roll, *The Hubris Hypothesis of Corporate Takeovers*, 59 J. Bus. 197 (1986).

valid, then a considerable body of legal scholarship on unsolicited takeovers may need to be revised. If, at a minimum, the paper is worthy of consideration and further investigation, then legal scholarship on the nature of suitable regulation must be of an extremely tentative nature until the paper is proven or rebutted beyond some degree of reasonable belief.

The potentially drastic impact of the Roll paper illustrates the force of remarks, by scholars such as R. Coase, that economists would someday virtually expropriate scholarship.<sup>22</sup> It is also part of a growing literature that has suggested—although the proposition is not yet proven—systematic divergence from the patterns of rational economic behavior.<sup>23</sup> The Roll paper is part of a growing body of research that tends to cast doubt upon a dogmatic adherence to efficient market-rational choice theory. Even some of its most ardent supporters may have been a bit disturbed by the recent October 1987 crash and its assault upon rational choice theory.<sup>24</sup>

Roll analyzes the relevant empirical research on takeovers in the light of a psychological hypothesis. If his research proves correct, much of current policy-oriented legal scholarship on proper takeover legislation and judicial approach will have to be reexamined. Descriptive law scholarship, for example, treatise exposition, will thus turn to a summary of new cases and legislation. In other fields this process is called a review of the literature to distinguish it from original research.

The development of the so-called "Chaos theory"<sup>25</sup> constitutes an even more radical break from traditional theory than that implied by the use of psychology. As developed in this paper, the Chaos theory requires a radical restructuring of finance theory, law (insofar as it relies upon finance theory), and at least a partial abandonment of the long-held notions of the random walk and efficient market hypotheses. At the outset, I should point out that I am not attempting to validate the Roll thesis, the Chaos theory, or other critiques of orthodox economic theory. That is an endeavor which depends upon experiment, research, and further experiment, all of which are very likely to come up, in the final analysis with a

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<sup>22</sup> Coase, *Economics and Contiguous Disciplines*, 7 J. LEGAL STUD. 201 (1978).

<sup>23</sup> See CONTRAST, *supra* note 3 *passim*.

<sup>24</sup> See *infra* notes 78-88 and accompanying text.

<sup>25</sup> See J. GLEICK, CHAOS (1987); see also *infra* notes 89-128 and accompanying text (discussion of Chaos theory).

mouse rather than a lion. As one scholar has forcefully pointed out, Roll and others who challenge orthodoxy must bear a great burden.<sup>26</sup> The point I do make in this paper is that legal scholarship in the area of corporate takeover, as well as in other areas of corporate law, is derivative of, and almost parasitical upon, the research done by psychologists, economists, and, as Chaos theory shows, mathematicians. Only to the extent that legal scholars become cognizant of these social sciences can they partake in serious scholarship.<sup>27</sup> Otherwise, they are destined to be astute students of orthodoxy in other fields, always behind the knowledge curve as the flaws of orthodoxy are revealed. They are limited to the writing of treatises which merely describe the outpouring of prior decisions and legislative bodies.

In Part I, I will evaluate the significance of the paper by Professor Roll. Part II will analyze the Roll paper's impact on recent legal literature. In Part III, I will discuss other uses of behavioral theory, similar to the Roll paper, to develop certain anomalies in finance literature. In Part IV, I will develop the impact of the new theory of Chaos on finance theory and the law. I will conclude by further developing the notion of law as a derivative field of scholarship.

## PART I: THE HUBRIS HYPOTHESIS

One of the key questions raised regarding unsolicited tender offers is whether they have a positive or negative impact on corporate efficiency. A popular view is that unsolicited takeovers, on average, displace inefficient managements and hence serve as a useful check on corporate control groups.<sup>28</sup> Other theorists argue that on average, or in some significant number (however defined), takeovers maximize synergy—the combination of disparate businesses resulting in lower costs of doing business.<sup>29</sup> Some theorists point to tax savings as a significant cause of takeovers.<sup>30</sup> Others argue that

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<sup>26</sup> See Kleidon, *supra* note 18, at 312-13.

<sup>27</sup> Fortunately, there are some scholars who have already bridged the creative gap. A prominent example is Dean Henry Manne, who, in a series of articles, explored the meaning of law in light of modern economic theory. See Manne, *supra* note 5, *passim*; Manne, *Some Theoretical Aspects of Shore Voting*, 64 COLUM. L. REV. 1427, *passim* (1964).

<sup>28</sup> See Easterbrook & Fischel, *supra* note 5, at 1173.

<sup>29</sup> See Warshawsky, *Determinants of Corporate Merger Activity: A Review of the Literature*, at 6 (Board of Governors of the Federal Reserve System, April 1987).

<sup>30</sup> *Id.* at 4.



corporate takeovers generally maximize managerial utility, not shareholder utility.<sup>31</sup> A variation on the prior theory maintains that acquisitions are driven by a desire to restrict competition.<sup>32</sup> Still other theorists argue that takeovers are stimulated by inefficiencies in the market that leave certain corporations undervalued in relationship to their real or intrinsic worth.<sup>33</sup> Some theorists may argue that some or all of the above account for the unsolicited takeover phenomenon.<sup>34</sup>

Roll argues that the empirical data demonstrate that "takeover gains may have been overestimated if they exist at all."<sup>35</sup> He points out that there is considerable reason to believe that there are no aggregate gains associated with takeovers.<sup>36</sup>

If this is in fact true, how does one account for unsolicited bids? Roll argues for what he terms the "hubris hypothesis."<sup>37</sup>

The hubris hypothesis is founded on the simple premise that takeovers reflect individual overconfidence. The bidder/manager, while evaluating the proposed acquisition, erroneously convinces himself that his valuation is correct and that the market does not reflect the realizable economic value of the combined firm.<sup>38</sup>

The next hurdle is to explain the existence and persistence of hubris. Roll departs from the usual rational expectations model of economists and adopts the irrationality assumptions of certain psychologists:

Psychologists are constantly bombarding economists with empirical evidence that individuals do not always make rational decisions under uncertainty . . . . Among psychologists, economists have a reputation for arrogance mainly because this evidence is ignored; but psychologists seem not to appreciate that economists disregard the evidence on individual decision making because it usually has little predictive content for market behavior. Corporate takeovers are, I believe, one area of research in which this

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<sup>31</sup> See *supra* note 21 and accompanying text.

<sup>32</sup> See Warshawsky, *supra* note 29, at 6-7.

<sup>33</sup> *Id.* at 8.

<sup>34</sup> See Jensen, *supra* note 5, at 12-13. Jensen discusses additional theories to explain takeovers. For example, he mentions his free cash theory which, in part, asserts that managers with too much cash sometimes use it wastefully instead of paying it out to shareholders. Certain takeovers will create value by creating debt, which forces managers to make cuts in unnecessary expansion programs. *Id.*

<sup>35</sup> Roll, *supra* note 21, at 198.

<sup>36</sup> *Id.* at 202-06.

<sup>37</sup> *Id.* at 197.

<sup>38</sup> *Id.* at 199-200.

usually valid reaction of economists should be abandoned; takeovers reflect individual decisions.

There is little reason to expect that a particular individual bidder will refrain from bidding because he has learned from his own past errors. Although some firms engage in many acquisitions, the average individual bidder/manager has the opportunity to make only a few takeover offers during his career. He may convince himself that the valuation is right and that the market does not reflect the full economic value of the combined firm.<sup>39</sup>

Roll's paper is based upon competitive bidding strategy, which indicates that successful bidders are infected by the winner's curse,<sup>40</sup> a systematic tendency to overestimate value. Proponents of the theory have pointed out that "[i]n competitive bidding, the winner tends to be the player who most overestimates true tract value."<sup>41</sup> They have also concluded that "[h]e who bids on a parcel what he thinks it is worth will, in the long run, be taken for a cleaning."<sup>42</sup> Despite the objection that, on average, bidders might be correct, although sometimes high and sometimes low, the crucial point is that winning bids are, in fact, not correct on average. As the theorists point out, "in a takeover situation a bidder/manager has a poor chance of winning when he has underestimated value and has a good chance of winning when he has overestimated it."<sup>43</sup> Therefore, the theorists have presented a mathematical model to the effect that a "player tends to win a biased set of tracts—namely, those on which he has overestimated value or reserves."<sup>44</sup>

Takeovers are similar to bidding auctions, even when there is only one bidder.<sup>45</sup> In a tender offer, the market is the initial bidder and the corporate offeror is the second bidder.<sup>46</sup> Roll points out

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<sup>39</sup> *Id.* at 199-200.

<sup>40</sup> *Id.* at 200; see Varaiya & Ferris, *Overpaying in Corporate Takeovers: The Winner's Curse*, FIN. ANALYSTS. J., May-June 1987, at 64.

<sup>41</sup> Capen, Clapp & Campbell, *Competitive Bidding in High-Risk Situations*, J. PETROLEUM TECH. 641, 643 (June 1971).

<sup>42</sup> *Id.*

<sup>43</sup> *Id.*

<sup>44</sup> *Id.*

<sup>45</sup> "In 1983, for instance, bidders in contested tender offers acquired the target in 7 of 11 attempts (63%), while in 1986 bidders succeeded in just 15 of 40 contested offers (38%). The success rate has usually been less than 50% . . ." Fleischer, *supra* note 5, at 4-5. However, when acquisitions by friendly bidders, i.e., white knights, are factored in, then "the likelihood of targets remaining independent varies, but is around 1 in 4." *Id.* at 5.

<sup>46</sup> Roll, *supra* note 21, at 200.

that "[t]he hubris hypothesis is consistent with strong-form market efficiency,"<sup>47</sup> i.e., the assumed efficiency of financial, product and labor markets. Hence, no reorganization can bring aggregate gains. Other explanations of takeovers assume "strong-form market inefficiency of at least a temporary duration."<sup>48</sup> For example, since labor markets are inefficient, takeovers can result in aggregate gains by eliminating inefficient management.<sup>49</sup> Roll argues, perhaps with some irony, that the hubris hypothesis is "the null against which other hypotheses of corporate takeovers should be compared."<sup>50</sup> The Roll hypothesis indicates that, on average, increases in target shareholder gains should be more than counterbalanced by decreases in bidder shareholder losses, with takeover expenses accounting for the aggregate net loss.<sup>51</sup> Roll argues that "[t]he central prediction of the hubris hypothesis is that the total combined takeover gain to target and bidding firm shareholders is nonpositive."<sup>52</sup>

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<sup>47</sup> *Id.*

<sup>48</sup> *Id.* at 201.

<sup>49</sup> *See id.*

<sup>50</sup> *Id.* at 201.

<sup>51</sup> *Id.*

<sup>52</sup> *Id.* at 202; *see also id.* at 205-06 (discussing studies by economists showing that existence of either gains or losses to combined firms involved in corporate combinations remains in doubt). For a discussion on losses by bidder company shareholders see Dent, *Unprofitable Mergers: Toward a Market-Based Legal Response*, 80 NW. U.L. REV. 777, 778-79 (1986). For other relevant discussions, see Lipton, *Takeover Bids in the Target's Boardroom: An Update After One Year*, 36 BUS. LAW. 1017, 1025-26 (1981); Easterbrook & Jarrell, *supra* note 16, at 277-92.

Roll also asserts that "[i]f we could be sure that (a) the bid was unanticipated and (b) the bid conveys no information about the bidder other than that it is seeking a combination with a particular target," then his hypothesis would predict a price decline on announcement of a bid and a price decline on winning a bid. Roll, *supra* note 21, at 201.

This too is an important concept. If the bid is motivated by hubris, then an efficient market should downgrade the value of the hubris-driven bidder. Indeed, even if immediate market gain to target exceeds immediate market loss to bidder, the hubris phenomenon may still be valid in modified form. That is, the market may simply value the target highly, due to the excessive price being paid by the bidder. Although the extreme version of hubris states that all markets are operating efficiently and takeovers result in combined losses, a modified, less extreme, version of hubris, defined as irrational bidders bidding too high, is consistent with gains to target exceeding losses to bidder shareholders.

Additional evidence for the hubris or winner's curse hypothesis is found in Professor Michael E. Porter's recent study. He studied the diversification records of 33 large U.S. companies over the 1950-86 period. He concluded that "most of them had divested many more acquisitions than they had kept. The corporate strategies of most companies have dissipated instead of created shareholder value." Porter, *From Comparative Advantage to Corporate Strategy*, 65 HARVARD BUS. REV. 43, 43 (1987). With reference to the problem of bidders overpaying he asserts:

## PART II: IMPACT OF HUBRIS HYPOTHESIS ON LEGAL LITERATURE

Roll's article is a good example of an intelligent effort to ex-

Acquisitions expose it to an increasingly efficient merger market. An acquirer beats the market if it pays a price not fully reflecting the prospects of the new unit. Yet multiple bidders are commonplace, information flows rapidly, and investment bankers and other intermediaries work aggressively to make the market as efficient as possible. . . . Acquisition premiums are high and reflect the acquired company's future prospects—sometimes too well. Philip Morris paid more than four times book value for Seven-Up Company, for example. Simple arithmetic means that profits had to more than quadruple to sustain the preacquisition.

*Id.* at 49.

Ravenscraft & Schere concluded in their recent study, "Tender offer targets of the 1960s and early 1970s entered their acquirers' organizations with a profit record slightly inferior to that of their two-digit industry peers. Nine years later on average they performed appreciably less well." Ravenscraft & Scherer, *Life After Takeover*, 36 J. INDUS. ECON. 147, 154 (Dec. 1987). They add that an important reason for negative after takeover performance was the "writeup of asset values stemming from the payment of acquisition premiums. But those premiums were supposedly paid in anticipation of enhanced profitability, which is not evident in our post-takeover operating income and cash flow regressions. This is an anomaly for the theory of takeovers as efficiency-increasing mechanism." *Id.* at 155.

Bradley, Desai & Kim in an event study conclude that a successful tender offer increases the combined value of the target and acquiring firms by an average of 7.4%. Bradley, Desai and Kim, *Synergistic Gain From Corporate Acquisitions and Their Division Between the Stockholders of Target and Acquiring Firms*, J. FIN. ECON. 3, 3 (May 1988). However, they also find that the abnormal returns for acquiring firms in 52 tender offers during the latest period they studied, January 1981-December 1984 was a negative 2.93% (although the combined values of bidder and target were positive). They also conclude that "our data indicate that the average white knight pays 'too much' for the target it acquires." *Id.* at 25. They recognize that multiple bidding may result in bidder overvaluations and that the "acquirer's shareholders will suffer a capital loss." *Id.* at 29. But where bidders overpay, a positive combined value for the target and bidder shareholders may merely reflect the markets evaluation of the hubris driven bonanza give to the target. An event study is a measure of short-term immediate reaction. Porter, *supra* at 45, argues "short-term market reaction is a highly imperfect measure of the long-term success of diversification, and no self-respecting executive would judge a corporate strategy this way."

In a recent study Veraiya found support for the winner's curse hypothesis in the case of corporate takeovers. He concluded: "For a sample of corporate takeovers our results also show that, on average, the winning bid premium significantly overstates the capital market's estimate of the expected takeover gain. . . . These results also provide support for Roll's (1986) observation that 'Bidding firms infected by hubris simply pay too much for their targets' (p. 197). The hubris hypothesis may be viewed as a special case of the winner's curse hypothesis . . ." Veraiya, *The 'Winner's Curse' Hypothesis and Corporate Takeovers*, MANAGERIAL AND DECISION ECON., Sept. 1988, 209-16.

Veraiya also states that "at least for this sample, the dollar premium paid to target shareholders is, on average associated with a dollar loss of like magnitude for bidder shareholders." *Id.* at 215-16. He also concludes that "pre-acquisition winning Buyer profitability is positively related to the magnitude of overpayment." *Id.* at 216-17.

In a recent article, Black advances the theory that "for many takeovers, target shareholders gain partly because the bidder pays too much. These overpayments don't cause bidder stock prices to drop because investors already expect the bidder to waste the money, one way or another." Black, *Bidder Overpayment in Takeovers*, 41 STAN. L. REV. 597, 599

plain stock price information based upon behavioral theory. "Behavioral" in this context connotes emotion or excessive self-confidence, as distinguished from cool calculation of future gain.<sup>53</sup> The available data surely contain considerable information indicating negative aggregate gain on takeovers. Hubris is a convincing explanation, given the infrequent episodic nature of takeovers.<sup>54</sup> There is less opportunity, perhaps, for rational players to eliminate the hubris operators.<sup>55</sup> However, there are data to the contrary.<sup>56</sup> Until conclusive data become available, legal and economic scholars must delay final conclusions about the welfare effect of unsolicited takeovers. However, by any reasonable judgment, the data pointing to negative aggregate gain are disturbing.

Roll's thesis makes a plausible case to the effect that bidder shareholders, on average, lose more than target shareholders gain over pre-bid market values after the takeovers. This hypothesis also indicates that, on average, unsolicited tender offers adversely affect target shareholders prior to the takeover. For if bidders indeed proceed from hubris, and not from a monitoring role, then unsolicited takeovers do not perform a monitoring of agency costs.<sup>57</sup> Hence, *ex ante*, takeovers do not raise the price of shares and, indeed, may, on average, depress them.<sup>58</sup>

Further explanation on this point is appropriate. One of the most widely accepted theories of takeovers is that they serve to

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(1989). He is sympathetic to the winner's curse theory yet disagrees with Roll's hubris theory. *Id.* at 625.

<sup>53</sup> See Oskamp, *Overconfidence in Case-Study Judgments*, 29 J. CONSULTING PSYCHOLOGY, 261, 261-65 (1965). The study involved psychologists' confidence in their clinical setting. See *id.* at 262. The study concluded that confidence, but not predictive accuracy, increased when additional information became available. See *id.* at 263-64.

<sup>54</sup> "[T]he classic model of prices determined by the atomistic behavior of numerous individuals seems far from the process involved in a typical merger . . ." Kleidon, *supra* note 18, at 312.

<sup>55</sup> The argument is that smart money will knock out non-rational players. See Shiller, *supra* note 19, at 319 (discussing studies that cast doubt on smart money theory).

<sup>56</sup> For a particularly powerful article on the value of takeovers and the rational assumption, see Jensen, *supra* note 5.

<sup>57</sup> For the seminal discussion of the market for control and its disciplining impact on management, see Manne, *supra* note 5, at 110-20, and Jensen & Meckling, *Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure*, 3 J. FIN. ECON. 305 (1976). Agency cost is a term referring to the inefficiency cost arising from the conflict of interest between management and shareholders. Agency costs are kept to a lower level by the monitoring function of rival bidder control groups.

<sup>58</sup> See Easterbrook & Fischel, *supra* note 5, at 1174-82, 1188-90. Easterbrook and Fischel had argued that takeovers, by disciplining management, encourage investment and hence, in general, raise the level of stock prices. *Id.* at 1165-74.

discipline management. Potential bidders search the universe of possible target corporations. When they perceive a mismanaged corporation, they bid at a premium over market price. They expect to recoup the premium by managing the acquired corporation in a more efficient manner than did the incumbent management. Therefore, the stock prices of corporations rise prior to takeovers because shareholders are willing to pay more, knowing that corporations are monitored by bidder corporations.<sup>59</sup> However, if bidders systematically misjudge the value of target corporations due to the hubris or winner's curse phenomenon, they are systematically miscalculating the nature and extent of alleged target management incompetence. Thus, their monitoring role is more imperfect than anticipated by the theory that rests on bidder efficiency in monitoring inefficient targets. Indeed, the hubris phenomenon is consistent with bidders, on average, selecting out efficient targets on which to bid. This is the basis for asserting above that the hubris phenomenon is consistent with a general pre-takeover lowering of the price of shares of stock of publicly held corporations as a result of the unsolicited takeover movement.

Takeovers arguably benefit target shareholders after the acquisition, in that shareholders—or at least those who tender or sell in the market to arbitrageurs—gain some or all of the premium paid over market price prior to announcement of the bid.<sup>60</sup> However, if hubris moves bidders, well run targets will be bought out as often as those that are poorly run. It is, therefore, a reasonable prediction that many target shareholder groups would have done better had the takeover not occurred, since long run future gains from competent incumbent management might well have exceeded the gain from the hubris-driven takeover. It is possible, however, that the hubris-driven takeover price is so high that it exceeds what competent management might accomplish even in the long run.

The bidders' hubris will also adversely harm bidder shareholders prior to the takeover, since the hubris phenomenon will depress the general level of shares, or more particularly, the prices of classes of corporations likely to engage in takeovers, assuming those prices can be identified. It will cause losses after the event, since

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<sup>59</sup> See Jensen & Ruback, *The Market for Corporate Control: The Scientific Evidence*, 11-12 J. FIN. ECON. 5, 5-50 (1983) (exhaustive summary of data on takeovers).

<sup>60</sup> See Jensen, *supra* note 5, at 6. "Premiums in hostile offers historically exceed 30 percent on average and in recent times have averaged about 50 percent." *Id.*

bidders' shareholders will lose after a takeover is announced.

The hubris phenomenon renders suspect the significance of a series of major law review articles in recent years debating whether the authors' distaste for target defensive maneuvers should allow for facilitating competitive takeover bids.<sup>61</sup> The authors, all prominent scholars in the tender offer field, agreed that markets were temporarily inefficient, and that takeovers, on average, increased synergy or displaced incompetent management. The articles debated whether increasing the number of bidders maximized or decreased aggregate gain from takeovers. If the hubris phenomenon is correct, the debate's importance is decreased. Where takeovers, on average, produce negative gain, the question becomes whether we should chill takeover activity or, at a minimum, devise new bidding techniques, not whether we should increase competitive takeover bidding. The argument that facilitating competitive bids will, on average, increase aggregate gains to target and bidder shareholders contradicts the hubris phenomenon, since the successful bids will, on average, result in aggregate loss.

Furthermore, the issue is empirical: given the authors' belief in the validity of stock price studies,<sup>62</sup> their debate turns on the direction of the data. If the data conclusively prove that aggregate gains resulting from takeovers are, on average, negative, the hubris phenomenon is valid, and competitive auctions will merely maximize the "winner's curse."<sup>63</sup> That phenomenon, consistent with hubris, suggests that in the case of competitive bids, the "successful bidder will tend to be the one that most overestimates the target's value."<sup>64</sup>

An additional example to consider at this juncture is the famous Easterbrook and Fischel article on takeovers and efficient market data.<sup>65</sup> This influential article advanced the notion that

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<sup>61</sup> See R. GILSON, *supra* note 10, at 765-84.

<sup>62</sup> "The efficient-markets . . . hypothesis posits that security prices reflect all available information. Hence, unanticipated changes in regulation result in a current change in security prices, and the price change is an unbiased estimate of the value of the change in future cash flows to the firm. This hypothesis underlies a variety of methods for estimating the effects of unanticipated regulatory change on shareholder wealth." Schwert, *Using Financial Data to Measure Effects of Financial Regulation*, 24 LAW & ECON. 121, 121-22 (1981). Event studies are a typical method to measure the impact of data change, such as increased deficits, on prices of securities. See *infra* note 77 and accompanying text.

<sup>63</sup> See Veraiya & Ferris, *supra* note 40, at 64.

<sup>64</sup> *Id.* at 65.

<sup>65</sup> Easterbrook & Fischel, *supra* note 5.

management should take no action to resist takeovers, even if, after the takeover, such defensive action would increase the price received by target shareholders.<sup>66</sup> This conclusion finds its basis in the theory that the corporate market for control disciplines incumbent management. Underlying that basis was a traditional, efficient market, rational choice hypothesis.<sup>67</sup> Reliance was placed on event studies to the extent they demonstrated that bidders went after inefficient managements or searched for so-called synergistic mergers.<sup>68</sup> Hence, facilitating takeovers would increase, on average, the price of the universe of publicly held corporate stock. The loss caused by management's resistance will arguably exceed any gain realized after the takeover. This is an empirical point: if, for example, the hubris phenomenon dominates, the Easterbrook and Fischel thesis would appear to be fatally flawed.

A related empirical point is whether increasing takeover prices, *ex post*, will increase significantly the universe of likely target investors, and thereby increase the number of targets, such that bidder incentive rises with the growing "likelihood that a bidder can locate a target of sufficient attraction."<sup>69</sup> If this *ex post* phenomenon exceeds the Easterbrook and Fischel *ex ante* impact then a good argument can be made for facilitating some management resistance, on the ground that the net effect is to increase bidding. Economists and other social scientists are usually better trained than most law professors to conduct such studies. Of course, as previously noted, if Roll's hypothesis—which is ultimately based on theories developed by psychologists studying behavior under conditions of uncertainty—is correct the focus of discussion shifts radically. The rationale for increasing bidders' incentives disappears, or at least becomes more complex.

Another major subject of legal literature regarding takeovers has been termed the "prisoner's dilemma."<sup>70</sup> Scholars point out

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<sup>66</sup> See *id.* at 1164.

<sup>67</sup> *Id.* at 1165-66. This rational choice theory provides that since estimation by investors leads to prices which are informative as to value of shares, "[i]t is very unlikely that price and 'value' will diverge in large markets for shares." *Id.* at 1165.

<sup>68</sup> *Id.* at 1170-72.

<sup>69</sup> Haddock, Macy & Mc Chesney, *Property Rights in Assets and Resistance to Tender Offers*, 73 VA. L. REV. 701, 724 (1987).

<sup>70</sup> See Carney, *Two-Tier Tender Offers and Shark Repellents*, 4 MIDLAND CORP. FIN. J. 48, 49 (1986). This refers to a situation in which the impossibility of joint action leads individuals to accept deals inferior to that which they could have negotiated in common. Thus, target shareholders may be forced to tender at prices inferior to that which shareholders



that the inability of target shareholders to coordinate bargaining permits bidders to succeed at lower premiums than would otherwise result. Therefore, suggestions are made to facilitate such coordination. One approach is to condition partial takeovers on the affirmative vote of disinterested shareholders in the target.<sup>71</sup> But if aggregate returns are negative, then there is, on average, a real social loss from takeovers. Legislative solutions that minimize the target shareholders' "prisoner's dilemma" merely increase the transfer of wealth from bidders to target shareholders in the context of a transaction that maximizes losses to investors generally.

### PART III: OTHER ANOMALIES IN THE FINANCE LITERATURE

The Roll article is not the only recent work to question the most sweeping versions of the efficient market-rational behavior school. A group of scholars, the "investor behaviorists," have unearthed interesting evidence that during certain periods investors may behave irrationally.<sup>72</sup> For example, professors De Bondt and Thaler demonstrated that investors "overreact" to unexpected and dramatic news events.<sup>73</sup> They proved that "portfolios of prior 'losers' are found to outperform prior 'winners' though they are a greater risk."<sup>74</sup> There is no adequate explanation for the great amount of positive excess returns earned by the loser portfolios every year. Surprisingly, "the effect is observed as late as five years after portfolio formation."<sup>75</sup>

The recent October 1987 crash reinforced the validity of the irrationalist approach. Investors appeared to have overbid share prices in August, and then reacted excessively on the down side.

These results tend to contradict the efficient market views that prices simply reflect rational predictions of future investment returns and that higher returns are trade-offs for higher risks.<sup>76</sup> Al-

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acting together could have obtained. *Id.* at 50-51.

<sup>71</sup> See Bebchuk, *Toward Undistorted Choice and Equal Treatment in Corporate Takeovers*, 98 HARV. L. REV. 1693, 1760-61 (1985).

<sup>72</sup> See Donnelly, *Investors' Overreactions May Yield Opportunities in the Stock Market*, Wall St. J., Jan. 7, 1988, Sec. 2, at 21, col. 4.

<sup>73</sup> See De Bondt & Thaler, *Does the Stock Market Overreact?*, Vol. XL no. 3, J. FIN. 793 (1985).

<sup>74</sup> *Id.* at 804. "Thirty-six months after portfolio formation, the losing stocks have earned about 25% more than the winners, even though the latter are significantly more risky." *Id.*

<sup>75</sup> *Id.*

<sup>76</sup> See R. GILSON, *supra* note 10, at 133-55.

though these behavioral theorists do not question the ultimate influence that fundamental economic factors will have on share prices, they have proven that the gravity of irrational movements cannot be discounted.

Like the Roll paper, these developments in psychology may be fundamental. Legal scholars must await development by psychology scholars before absorbing them into their essentially derivative legal scholarship.

One exponent of the rational assumption describes the impact of psychological approaches as follows:

[H]ow much of existing knowledge is likely to be lost . . . [?] Clearly, the answer is very much since virtually all extant results based on stock price data rely strongly on the informational content in prices . . . . [F]or example, consider event studies . . . . Today, arguments are appearing in courts . . . that evidence based on stock prices should be disregarded.<sup>77</sup>

#### PART IV: CHAOS THEORY

##### A. *Orthodox Theory and Mayhem in the Markets*

There is yet another possible threat to the established doctrine. The stock market crash in October 1987<sup>78</sup> raises questions about the complete applicability of the efficient market thesis. This theory, broadly and oversimply stated, assumes that stock prices rapidly reflect new data about the future earnings of a corporation.<sup>79</sup> A related assumption is that "stock prices can be regarded as the present value of rationally forecasted future cash flows."<sup>80</sup> As Shiller notes: "Obviously the efficient markets theory

<sup>77</sup> Kleidon, *supra* note 18, at 308.

<sup>78</sup> The SEC reported:

The Dow Jones Industrial Average ('DJIA') index of 30 New York Stock Exchange ('NYSE') stocks, had reached an intra-day high of 2746.65 on August 27, 1987. On October 2, the DJIA closed at 2640.99. During the week of October 5, the index declined by 158.78 points; during the week of October 12, by 235.47 points. On October 19, the DJIA declined 508.32 points, and by its low point mid-day on October 20 it had declined to 1708.70, or over 1000 points (37%) below its August 25 high . . . . [B]y October 30 the DJIA stood at 1,994, down over 26% from its August high.

MARKET REGUL. DIV. SEC, THE OCT. 1987 MARKET BREAK, at xi (Feb. 1988) [hereinafter 1987 MARKET BREAK].

<sup>79</sup> See Shiller, *supra* note 19, at 317.

<sup>80</sup> Kleidon, *supra* note 18, at 286.

does capture an element of the truth. For example, when important concrete information about the future earnings potential of a corporation becomes public, the price of the stock in that company tends to jump immediately."<sup>81</sup> To the extent that prices turn on irrational fads or fancies or hubris, the hypothesis is weakened.

The October crash raises a variety of doubts about the efficient market-rational expectations theory.<sup>82</sup> Many have attributed the sudden drop to fears about the effects of trade, budget deficits, and/or the proposed bill to raise taxes on hostile takeovers.<sup>83</sup> Why did the market rise for years in the presence of the deficits? Why did it suddenly drop? Of course, one answer is that the drop was not caused by the deficits, but rather by some other fundamental factor. If so, what is this other factor? Perhaps it was the proposed tax measure. However, for months after the crash, tax fears abated, and yet the market, until recently, remained depressed, compared to the August highs preceding the October 19 crash. This question can be broadened: if fundamental factors, such as certain basic trends in the economy, caused the crash, why, as mentioned previously, did the crash occur when it did and not earlier? Also, if the deficits caused the crash, why did the markets recover some of the drop in post-October days?

The inability to ascertain which fundamental factors, if any, caused the crash, and in what proportion, further demonstrates the extent of our ignorance. Everyone is guessing about the causes.

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<sup>81</sup> Shiller, *supra* note 19, at 317.

<sup>82</sup> The SEC report made the following interesting admission: "[T]he Report does not answer the question of why in October of 1987 the value of common stocks was reduced by approximately 30%. We may never know what precise combination of investor psychology, economic developments and trading technologies caused the events of October." 1987 MARKET BREAK, *supra* note 78, at xi.

<sup>83</sup> Professors Robert J. Shiller and John Pound of the Investor Behavior Project at Yale University sent out questionnaires on the crash. The most significant news story for investors was "early news of the crash itself—the 200-point drop in the Dow the morning of Oct. 19." Shiller, *Investors Acted from the Gut on Black Monday*, Hartford Courant, Apr. 17, 1988, § C, at 1, col. 2. The next most important news story was the decline in U.S. stock prices the week before. *Id.* Another concern was the federal debt. *Id.* Very few investors mentioned the House Ways and Means Committee agreement to raise taxes on corporate takeovers. *Id.* "The survey findings thus suggest that Black Monday is best explained as a vicious circle—price declines feeding on previous price declines." *Id.* The Yale professors discount the importance of portfolio insurance. *Id.* at 4, col. 3. The professors also write that the investors "often wrote 'gut feeling' as their primary forecasting method and many seemed to be guessing about the psychology of other investors, trying to figure out when others might start selling." *Id.* The author warns that "[m]ost economists rarely use such surveys; they are skeptical of explanations people give for their behavior." *Id.* at 1, col. 4.

Some have argued that the market was rationally depressed for many months after the crash—as compared to August 1987—because the volatility in the markets requires a lower price to compensate investors for the greater risk.<sup>84</sup> Perhaps this is so; however, there is a problem. Assuming that there was greater risk, it is unclear whether the risk was caused by fundamental rational factors or irrational psychological factors such as the deflation of hubris on the part of many investors. No one has a completely satisfactory answer. In any event, if so-called unknown fundamental factors caused the greater risk, then the greater volatility theory is a dignified answer to disguise our ignorance of the fundamental factors. If the greater risk flows from irrational psychological factors such as fear and panic, then alleged “greater risk” also seems a dignified manner of admitting our ignorance, since we have no adequate theories of when and why panic arises.

Many have argued that the existence of index arbitrage<sup>85</sup> and portfolio insurance<sup>86</sup> accelerated the October drop. The various stock market reports differ on this point and are inconclusive.<sup>87</sup> Certainly they all emphasize that the crash was caused by a combination of many factors, and that specifying the impact of any one cause would be difficult.<sup>88</sup> This vague conclusion is a polite method

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<sup>84</sup> See T. Schneeweis, Remarks at ABA Conference Program, *The General Effect of New Financial Instruments on Traditional Markets* (Philadelphia, Pa. March 26, 1988).

<sup>85</sup> See, e.g., 1987 MARKET BREAK, *supra* note 78, at xiii. The SEC reported as follows: If the value of the stocks in an index is known, it is possible to calculate the theoretical value of a futures contract on that index . . . . When sufficient premiums or discounts to the theoretical value occur, index arbitrageurs buy in the lower priced market (stock or derivative) and sell in the other, higher priced market.

*Id.* at 1-3, 1-4 (footnotes omitted).

<sup>86</sup> *Id.* “The ‘insurance’ protection comes through . . . selling futures . . . as stock values decline.” *Id.* at 1-2. Arguably, the institutions drove future prices down as the market broke. Other institutions bought futures and sold stocks, hence accelerating the break. *Id.* at 1-2, 1-3.

<sup>87</sup> See, e.g., DIV. OF ECON. ANALYSIS, DIV. OF TRADING AND MKTS., U.S. COMMODITY FUTURES TRADING COMM’N, STOCK INDEX FUTURES AND CASH MARKET ACTIVITY DURING OCTOBER 1987, 94 (1988). “In sum, the analysis of intra-day trading does not support a contention that on October 19 the stock market fell as fast and as far as it did because of a continuously intensifying interaction between index arbitrage stock sales and portfolio insurance selling in the futures market.” *Id.* But see 1987 MARKET BREAK, *supra* note 78, at xiii. The SEC concluded that “the existence of futures on stock indexes and use of the various strategies involving ‘program trading’ were significant factors in accelerating and exacerbating the declines.” *Id.*

<sup>88</sup> See, e.g., U.S. GEN. ACCT. OFF., FINANCIAL MARKETS, PRELIMINARY OBSERVATIONS ON THE OCTOBER 1987 CRASH 5 (1988). In a recent article, Professor Richard Roll may have

of expressing lack of knowledge. If these technical reasons have such great effect, how do the nonfundamental factors relate to the impact of fundamental factors such as inflation and deficits? We have no satisfactory answer. More particularly, if technical trading devices cause great changes in prices, then the efficient market-rational choice hypothesis—that prices turn on predictions of future values—appears to be weakened.

Some of the stock crash reports appear to assert that fear and hysteria, in conjunction with the ease of using derivative products to sell large quantities quickly, may have had an impact. Fear? That raises the psychological versus the rational explanation once again.

### *B. The New Science of Disorder*

There is a developing mathematical theory, called the Chaos theory, that may hold an answer to the October crash.<sup>89</sup> It is a new discipline that finds a kind of order in disorder.<sup>90</sup> The theory can

disproved some of the popular explanations for the October crash. Roll, *The International Crash of October 1987*, FIN. ANALYSTS J., Sept.-Oct. 1988, at 19. He argued that "no one has been able to substantiate the underlying cause for the October market decline." *Id.* at 20. He compared price movements of 23 markets around the world and concluded that portfolio insurance, index arbitrage, options, futures hedging and a specialist system were not the significant factors. *Id.* at 32. The crucial variable in explaining how much each market moved was the underlying volatility of each market, that is, its historic inclination to move up and down over time. Roll postulates that there was a "fundamental, worldwide triggering variable [that] caused the crash," *Id.* at 31, but he is unable to identify it. *Id.* at 31-32. All he could demonstrate was that "the relative movement of each market was simply the usual relation between that particular market and the [unknown] underlying factor." *Id.* at 31.

In a very recent study, M. Mitchell and J. Netter, then of the SEC Office of Economic Analysis presented data to the effect that it was the House Ways and Means Committee proposed tax bill adversely affecting takeovers that precipitated the large ten percent United States stock market drop on October 14-16. *See supra* note 83. This drop, they theorize, triggered the October 19 crash. OFFICE OF ECONOMIC ANALYSIS, U.S. SEC. & EXCHG. COMM'N, TRIGGERING THE 1987 STOCK MARKET CRASH: ANTITAKEOVER PROVISIONS IN THE PROPOSED HOUSE WAYS AND MEANS TAX BILL? (1989). This contradicts Roll's study, in which Roll asserted that "the overall pattern of intertemporal price movements in the various markets suggests the presence of some underlying fundamental factor . . . but . . . seems inconsistent with a U.S.- specific macroeconomic event." Roll, *supra*, at 22. However, Mitchell and Netter state that their "data does not show that the tax bill caused the crash on the 19th, so indeed structural factors must have been important." OFFICE OF ECONOMIC ANALYSIS, *supra*, at 31. Roll's study appeared to disprove any such structural factors however.

<sup>89</sup> *See* J. GLEICK, *supra* note 25. The potential significance of the Chaos theory for economics is explored in Baumol & Bennabib, *Chaos, Significance, Mechanism, and Economic Applications*, 3 J. ECON. PERSPECTIVES 77 (1989).

<sup>90</sup> "[T]he basic idea hinges on looking at what might be called mathematical feedback loops: expressions whose output can be fed back into them as new input . . . . From the

best be introduced by the following incident. Benoit Mandelbrot, a mathematician, had been studying the patterns of large and small incomes in an economy.<sup>91</sup> He was invited by Professor Houthakker, a Harvard economist, to give a lecture on his findings. When the mathematician arrived at Harvard, he was surprised to see his findings already charted on the Professor's blackboard. The diagram had nothing to do with income distribution; it represented eight years of cotton prices.<sup>92</sup>

Mandelbrot found similar patterns in both sets of data. He found that the relations for daily and monthly price changes were the same:

Each particular price change was random and unpredictable. But the sequence of changes was independent of scale: curves for daily price changes and monthly price changes matched perfectly. Incredibly, analyzed Mandelbrot's way, the degree of variation [in cotton prices] had remained constant over a tumultuous sixty-year period that saw two World Wars and a depression.<sup>93</sup>

This finding indicated that in chaos, or apparent disorder, there may be discernable patterns. The patterns, however, seem to be the "effect" of deep-seated mathematical theorems as opposed to historical causes. Hence, this finding also casts doubt on the assumption of economists that although small ups and downs over minutes are unpredictable noise, longer changes reflect deep fundamental changes such as recession or war.<sup>94</sup> Mandelbrot also described what he calls the "Noah Effect":<sup>95</sup> prices change in instantaneous jumps. It implies discontinuity as distinguished from the economists' assumption that prices change smoothly—whether rapidly or slowly.<sup>96</sup>

Chaos theorists describe what they call "strange attractors."<sup>97</sup> These are the shapes data make in areas of disorder and apparent random behavior.<sup>98</sup> Each point may be unpredictable, but the data

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simplest of such loops, it seemed, both stable patterns and chaotic patterns . . . could emerge." Hofstadter, *Metamagical Themas*, *Sci. Am.*, Nov. 1981, at 22.

<sup>91</sup> See J. GLEICK, *supra* note 25, at 83-84.

<sup>92</sup> *Id.* at 83.

<sup>93</sup> *Id.* at 86.

<sup>94</sup> *Id.* at 85.

<sup>95</sup> *Id.* at 92-93.

<sup>96</sup> *Id.*

<sup>97</sup> *Id.* at 133.

<sup>98</sup> *Id.* at 143.

as a whole move in apparently ordered shapes.<sup>99</sup> Today, some economists are looking for strange attractors to explain the apparent random movement of the stock markets.<sup>100</sup>

To the mathematical layman, such as this writer, there is a sort of numbers mystery in this theory.<sup>101</sup> There is no longer a kind of simple determinism in the universe. For example, in meteorology, chaos theory questions whether exhaustive knowledge of data can lead to accurate prediction of the weather.<sup>102</sup> Apparently, chaos sets in over a wide range of data.<sup>103</sup> The scientist cannot then predict the exact weather, but may be able to forecast the onset of unpredictable weather. When charted on a computer screen, the weather may take a particular shape, the strange attractor, although particular points on the map cannot be predicted.<sup>104</sup>

Population theory is another example. Biologists assume that with enough data they can predict the future population of salmon.<sup>105</sup> All they need is complete data on food, predation, weather, birth rate, and the like. Yet chaos theorists appear to have demonstrated that this simple 19th century determinism does not always work. At certain ranges of data input, the population numbers move disorderly in what we call chaos.<sup>106</sup> The theorists may be able to predict the onset of the turbulent data, but not the precise population at given times.<sup>107</sup>

<sup>99</sup> *Id.* at 151.

<sup>100</sup> *Id.* at 152.

<sup>101</sup> Professor James Ramsey, a New York University economist who has become a specialist in chaos theory, has stated: "We now know very clearly that stock market prices cannot be analyzed by the old procedures that we used." Gleick, *When Chaos Rules the Market*, N.Y. Times, Nov. 22, 1987, § 3, at *i*. This article reported that leading economists and chaos theorists met to explore the new theory. Stanford professor Kenneth J. Arrow pointed out that Chaos theory tends to disprove the notion of the random walk; that notion posits that there is no underlying dynamic, but chaos theory sees order in disorder. *Id.* at 9.

<sup>102</sup> See J. GLEICK, *supra* note 25, at 11-23.

<sup>103</sup> *Id.*

<sup>104</sup> *Id.*

<sup>105</sup> *Id.* at 59-77.

<sup>106</sup> *Id.*

<sup>107</sup> Population may be described by a simple equation such as  $x_{next} = rx(1-x)$ . *Id.* at 63. The parameter 'r' represents a rate of growth. The term '1-x' bounds the growth such that the population falls or rises as the parameter is varied. Iteration creates fascinating results. If the parameter is set at certain values, and 'x' is set at a certain value, then 'x<sub>next</sub>' can be solved for a certain result. Finally, that result is fed back into 'x'. If this is done repeatedly, a certain periodicity surfaces in the results. That is, numbers or solutions create a repetitive pattern. But, when the 'r' parameter is changed to a certain range and iterate, at a certain point, chaos sets in; the solutions will meander without apparent order. See Hofstadter,

Another example may assist in understanding. Climatologists attempt to use computers to model the long term variations in weather. Under some assumptions, the earth would experience a glaciated surface.<sup>108</sup> Reaching this result would require some severe external changes. Yet there is another behavior called "almost-intransitivity"<sup>109</sup> that shifts from one pattern to another without the impact of external real world changes such as changes in the earth's orbit. The chaos theorists opine: "[A]lmost-intransitivity might well explain why the earth's climate has drifted in and out of long Ice Ages at mysterious, irregular intervals. If so, no physical cause need be found for the timing. The Ice Ages might simply be a byproduct of chaos."<sup>110</sup>

Similarly, the stock market may sometimes move in patterns called 'strange attractors.'<sup>111</sup> These patterns do not bear a causal relationship to fundamental factors—such as war and inflation—in the simple sense that efficient market rational choice theory assumes. The impact of this new theory on ordinary law and economics scholarship is obscure. However, the traditional event

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*supra* note 90, at 24-28. The patterned results close in on a number or group of numbers that are called attractors. Where chaos enters, the solutions or results move erratically inside a restricted range, which, when diagrammed, frequently create a "delicate filigree that recalls the 'faint fantastic traceries made by frost on glass.'" *Id.* at 42 (quoting music critic James Huneker). This shape is called a strange attractor. *Id.*

This iteration, within a fairly simple kind of mathematical equation, seems to capture the study of turbulence in hydrodynamic flow, "the erratic population fluctuations in predator-prey relations," *id.* at 31, and possibly, many other chaotic patterns in nature such as stock market movement. Chaotic systems are extremely sensitive to minute perturbations. Small changes result in large disturbances. J. GLEICK, *supra* note 25, at 23.

Mathematicians have captured the formula for predicting when turbulence or chaos will erupt in certain areas. *Id.* at 180.

"[A]ny section of such an attractor, when blown up, reveals itself to be just as exquisitely detailed as was the larger picture from which it was taken. In other words, there is an infinite regress of detail, a never ending nesting of pattern within pattern." Hofstadter, *supra* note 90, at 42. These are similar to the "fractals" of Mandelbrot. *Id.* See B. MANDELBROT, *FRACTALS: FORM CHANCE AND DIMENSION* (1978). This is what Mandelbrot found in the cotton prices. See *supra* notes 91-96 and accompanying text. Within chaos he found a form of order. But chaos means that the mathematician cannot predict a future price where turbulence or chaos has started. It is possible that the October 1987 crash, as discussed in the text, is an example of chaos. Discovery of the "strange attractor" will not enable prediction of a given price, but it will amount to an advance in knowledge in that we may be able to predict the beginnings of turbulence.

<sup>108</sup> J. GLEICK, *supra* note 25 at 170. While a glaciated surface is possible, it should be noted that it has really never occurred. See *id.*

<sup>109</sup> *Id.*

<sup>110</sup> *Id.*

<sup>111</sup> *Id.* at 271.



study which underlies the past two decades of stock market research would be suspect. Needless to say, the assumption that certain events, such as poison pills,<sup>112</sup> hostile takeovers,<sup>113</sup> and state takeover laws,<sup>114</sup> have a simple deterministic impact on stock prices may have to be reexamined.

For example, the assumption that the bill proposing a new tax on takeovers caused the October 19 crash<sup>115</sup> may not stand up if chaos theory is valid. Hence, the related assumption that takeovers are valuable does not follow from that drop in the stock market averages. Likewise, the assumption that takeover activity contributed to a general "overvaluation" of the market in August<sup>116</sup> may be inaccurate.

There is yet another aspect to chaos theory. The efficient market, random walk theory assumes that observers cannot predict the future price of a stock or the market. Once data are impounded in the price of a stock, only new material data will change that price; yet, the nature of that new data cannot be accurately predicted. Hence, so-called fundamental analysis cannot serve to predict the future price of a stock.<sup>117</sup> Likewise, prior stock prices cannot serve as a guide to future prices. This is the so-called weak version of the theory.<sup>118</sup> Thus, modern orthodoxy in finance offers a theory for the essential unknowability of the future with respect to the subject it studies. This is, on reflection, a fairly remarkable confirmation of ignorance about the future of the market. Chaos theory, however, postulates an inherent underlying dynamic in the turbulence of the market, as demonstrated by the Mandelbrot analysis described above.<sup>119</sup> It offers a method for predicting the onset of turbulence or chaos but does not necessarily involve a simple determinism between events, such as budget deficits and prices, as currently believed. Hence, if "strange attractors" are found ultimately in the market, the future will prove to be more predictable than current theory believes.

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<sup>112</sup> See generally *Moran v. Household Int'l, Inc.*, 500 A.2d 1346, 1352-57 (Del. 1985) (discussion of a poison pill).

<sup>113</sup> For a recent exhaustive discussion of this phenomenon, see Lipton, *supra* note 5.

<sup>114</sup> See *id.* at 29.

<sup>115</sup> See *supra* note 88 and accompanying text.

<sup>116</sup> See PRESIDENTIAL TASK FORCE ON MARKET MECHANISMS, 1988 REPORT 9.

<sup>117</sup> See Note, *The Efficient Capital Market Hypothesis, Economic Theory and the Regulation of the Securities Industry*, 29 STAN. L. REV. 1031, 1041-56 (1977).

<sup>118</sup> See *id.* at 1041-44.

<sup>119</sup> See *supra* notes 91-96 and accompanying text.

## PART V: CONCLUSION

This analysis, like most other articles on takeovers, will not settle the issues discussed herein.<sup>120</sup> The scholarship on unsolicited takeovers does not seem to proceed in the manner of certain "hard" sciences, such as physics, where a form of linear progress in knowledge is made. After a decade of law and economics—and anti-law and anti-economics literature—basic issues such as the nature, source and existence of long-term aggregate gains or losses from takeovers are still unresolved.

Perhaps this field is too complex for the current methodological resources of economics or psychology. It may be that the hubris analysis will be completely validated by further empirical studies. It may be that the stock price studies considered by Professor Roll and others may suffer from fundamental flaws because the underlying assumptions, such as a fairly strong notion of efficient markets, may prove invalid for the studies considered. Marvel of marvels, the strange attractor may be found, and all previous scholarly bets will be lost.

Even if some of the anomalies in finance economics withstand the vigor of further testing, this does not mean that economists and psychologists will soon abandon their current theories. Popper has argued that the impact of crucial experiments will overturn important old theories.<sup>121</sup> Kuhn, however, has cautioned against imprudent abandonment of a theory simply because an anomaly is present in its supporting data. Many of today's most accepted theories exhibited anomalies that eventually were removed by patient observation and testing.<sup>122</sup> The point, nevertheless, is that the cor-

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<sup>120</sup> See Kleidon, *supra* note 18, at 285-286.

<sup>121</sup> K. POPPER, *OBJECTIVE KNOWLEDGE: AN EVOLUTIONARY APPROACH* (1972).

<sup>122</sup> See Kleidon, *supra* note 18, at 286.

How then, to return to the initial question, do scientists respond to the awareness of an anomaly in the fit between theory and nature? What has just been said indicates that even a discrepancy unaccountably larger than that experienced in other applications of the theory need not draw any very profound response. There are always some discrepancies. Even the most stubborn ones usually respond at last to normal practice. Very often scientists are willing to wait, particularly if there are many problems available in other parts of the field. We have already noted, for example, that during the sixty years after Newton's original computation, the predicted motion of the moon's perigee remained only half of that observed. As Europe's best mathematical physicists continued to wrestle unsuccessfully with the well-known discrepancy, there were occasional proposals for a modification of Newton's inverse square law. But no one took these proposals very seriously, and in practice this patience with a major anomaly proved justified.

porate law scholar is bound by the Posnerian notion of law as a dependent field.<sup>123</sup> The scholar may tend toward a practitioner-oriented direction, that is, the writing of treatises that describe the current state of the cases and the statutes. This is an honorable pursuit as long as one values the more expeditious finding of the law by busy practitioners. Deeper scholarship requires the law scholar to do the kind of work that Roll did,<sup>124</sup> or the kind of empirical work that Professors Veraiya and Ferris did<sup>125</sup> in attempting to validate or disprove the Roll thesis. Many corporate law scholars pursue studies which approach this style. They take an economic theory or group of theories and suggest that it is applicable to the case at hand. They look to empirical studies, usually stock price studies, and cite the literature that supports or questions the model.

There is a disturbing professional problem in all this. A number of law scholars have been able to do seminal work in the fields of law and economics and corporate law. Easterbrook and Fischel, for example, introduced important relationships between economic research and the law that other legal scholars were forced to confront. Through a series of seminal articles, Dean Henry Manne played a major role in relating law to the discipline of economics.<sup>126</sup> However, with the exception of a number of notable pieces, there is a kind of hubris in this general effort. Law scholars appear to believe that they can produce creative work in these fields based upon a law degree and an energetic self-study effort in interdisciplinary areas. It may, however, be too much to expect that law professors and attorneys can creatively master two fields, based upon the traditional law school education, plus a course or two in economics or psychology. In any event, success, in the sense of creative scholarship, means experiment and research in fields other than the law. The latter then becomes simply another subject for experts in psychology, economics, mathematics, and the like, to study.

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Clairaut in 1750 was able to show that only the mathematics of the application had been wrong and that Newtonian theory could stand as before.

*Id.* (quoting T. KUHN, *THE STRUCTURE OF SCIENTIFIC REVOLUTION* 81 (1970)).

<sup>123</sup> See Posner, *supra* note 1, at 778.

<sup>124</sup> See *supra* notes 21-24 and accompanying text.

<sup>125</sup> See *supra* notes 40-44 and accompanying text.

<sup>126</sup> See, e.g., Manne, *supra* notes 5 & 27. A number of other legal scholars have also mastered the skills of research in other social sciences, including economics.

