

1994

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Recommended Citation

Thomas E. Powell II, *Products Liability and Optional Safety Equipment—Who Knows More?*, 73 Neb. L. Rev. (1994)

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Challenges to the Efficient Market Hypothesis: Limits to the Applicability of Fraud-on-the-Market Theory

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The authors gratefully acknowledge the contribution of I/B/E/S Inc. for providing data on the extent of analyst coverage of NYSE/AMEX stocks, available through the Institutional Brokers Estimate System. This data has been provided as part of a broad academic program to encourage research on earnings and analysts' forecasts. We also appreciate the research assistance of Brian Bushee.

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I. INTRODUCTION

Success in a fraud action has traditionally required that a plaintiff demonstrate reliance on a misrepresentation or omission by the defendant. In securities fraud cases, however, where a plaintiff can show that a fraud on the market has been perpetrated, a plaintiff may rely on the integrity of the market price, as opposed to the misrepresentation itself. The rationale for the fraud-on-the-market theory (FOMT) is that in an efficient market, market prices reflect all publicly available information quickly, completely, and without bias. As a result, any misrepresentation that is not identified as false by market participants is impounded into price. Even a plaintiff who does not know of or rely directly on the false statements may be found to have suffered a loss caused by the impact of the misrepresentation on the market price.

Whether evidence in support of market efficiency is strong enough to justify application of FOMT was debated by the Supreme Court and endorsed in the landmark decision *Basic, Inc. v. Levinson*.¹ In writing for the majority, Justice Blackmun explained that “[r]ecent empirical studies have tended to confirm Congress’ premise that the market price of shares traded on well-developed markets reflects all publicly available information, and hence, any material misrepresentations.”² In dissent, Justice White cautioned that the Court “embark[ed] on a course that it d[id] not genuinely understand,” and that “while the economists’ theories which underpin the fraud-on-the-market presumption may have the appeal of mathematical exactitude and scientific certainty, they are—in the end—nothing more than theories which may or may not prove accurate upon further consideration.”³

Since *Basic*, there has been an explosion of literature in financial economics casting doubt on the efficiency of at least some segments of the stock market. The theory once characterized in 1978 by Professor Michael Jensen as having “more solid empirical evidence supporting it . . . [than any] other proposition in economics”⁴ has undergone so much questioning that leading researchers are now creating new theories to explain how, in equilibrium, market prices could reflect random

1. 485 U.S. 224 (1988).

2. *Id.* at 246.

3. *Id.* at 254 (White, J., dissenting).

4. Michael C. Jensen, *Some Anomalous Evidence Regarding Market Efficiency*, 6 J. FIN. ECON. 95 (1978).

factors that have nothing to do with firms' underlying fundamental values.⁵

This Article summarizes recent developments in research on market efficiency and their implications for FOMT. The Article addresses whether, with the benefit of several additional years of research, the Supreme Court appears justified in relying on the efficient market hypothesis articulated in *Basic*. A second issue is, assuming the courts continue to rely on FOMT, how far should it be extended. One case, *Cammer v. Bloom*,⁶ has specified rules that could be used to judge whether a particular security is traded in an efficient market.⁷ These rules, however, were suggested without the guidance of empirical evidence on factors that explain variation in the degree of efficiency across securities. Evidence presented here and in other studies supports the validity of some of the rules suggested in *Cammer*, but maintains that a smaller number of factors may be sufficient to characterize the efficiency of a market.

Armed with the evidence on market efficiency and the validity of the rules from *Cammer*, this Article illustrates the limits to the appropriateness of FOMT in one recent case, *Biben v. Card*.⁸ The *Biben* case is especially instructive because it involves an over-the-counter stock that was larger than some New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) stocks, and would have been considered traded in an efficient market under at least one of the rules specified in *Cammer*. Nevertheless, this Article argues that FOMT would not have been appropriate in this case.

Part II of this Article offers a brief history of, and legal rationale for, FOMT and explains the relationship between the theory and the efficient market hypothesis. The recent evidence on market efficiency is summarized in Part III. Part IV presents new and previously-existing evidence on the soundness of the rules of thumb suggested in *Cammer v. Bloom*,⁹ and investigates additional rules as well. In Part V, the Article examines the appropriateness of FOMT in the specific case of

5. See, e.g., J. Bradford De Long et al., *Noise Trader Risk in Financial Markets*, 98 J. Pol. Econ. 703 (1990).

6. 711 F. Supp. 1264 (D.N.J. 1989).

7. *Id.* at 1285-87.

8. 1992 Fed. Sec. L. Rep. (CCH) ¶ 96,848 (W.D. Mo. Feb. 25, 1992). *Biben* was a consolidated action involving multiple decisions by the court. For a history of the reported decisions and the progression of the case, see *Biben v. Card*, 1991 Fed. Sec. L. Rep. (CCH) ¶ 96,512 (W.D. Mo. Dec. 10, 1991); 1987 Fed. Sec. L. Rep. (CCH) ¶ 93,549 (W.D. Mo. Nov. 6, 1987); 1986 Fed. Sec. L. Rep. (CCH) ¶ 92,462 (W.D. Mo. 1986); 1985 Fed. Sec. L. Rep. (CCH) ¶ 92,083 (W.D. Mo. June 6, 1985); 1985 Fed. Sec. L. Rep. (CCH) ¶ 92,083 (W.D. Mo. Apr. 10, 1985). *Biben* settled shortly before a hearing on the motion of Defendants Redd, Card, Jallow, Ira W. Palmer, and William H. Palmer for partial summary judgment, based on the lack of market efficiency and reliance.

9. 711 F. Supp. 1264 (D.N.J. 1989).

Biben v. Card.¹⁰ Conclusions and implications of the recent empirical evidence for the proper scope of FOMT appear in Part VI.

II. HISTORY OF, AND LEGAL RATIONALE FOR, FRAUD-ON-THE-MARKET THEORY

In 1988, the Supreme Court significantly changed the landscape of securities fraud litigation when it decided *Basic, Inc. v. Levinson*¹¹ and finally put its imprimatur on FOMT. In *Basic*, the Court reaffirmed the necessity of establishing the reliance element of a claim under Rule 10b-5: "We agree that reliance is an element of a Rule 10b-5 cause of action. Reliance provides the requisite causal connection between a defendant's misrepresentation and a plaintiff's injury."¹² The Court then held that in satisfying the reliance element, "[i]t is not inappropriate to apply a presumption of reliance supported by the fraud-on-the-market theory."¹³

The Court reasoned that "modern securities markets, literally involving millions of shares changing hands daily, differ from the face-to-face transactions contemplated by early fraud cases, and our understanding of Rule 10b-5's reliance requirement must encompass these differences."¹⁴ FOMT is one such way of dealing with these differences.¹⁵ FOMT is simply a theory under which reliance may be presumed, thereby shifting the burden of persuasion to the defendant.¹⁶ This presumption of reliance, however, may be rebutted by showing that (1) the market did not in fact impound the misrepresentations into the price of the stock, or (2) the plaintiff would have traded the securities even if he had possessed actual knowledge of the misrepresentation and that he would not have relied on the integrity of the market in any event.¹⁷ Where FOMT does not apply, actual and direct reliance on the alleged misrepresentations is required.¹⁸

Before the Supreme Court's decision in *Basic*, a number of courts adopted FOMT under the reasoning that an investor who purchased securities on the open market may be presumed to have relied on misrepresentations by virtue of his reliance on the market price as an accurate reflection of the security's value.¹⁹ In these cases, each of the

10. 1992 Fed. Sec. L. Rep. (CCH) ¶ 96,848 (W.D. Mo. Feb. 25, 1992).

11. 485 U.S. 224 (1988).

12. *Id.* at 243 (citations omitted).

13. *Id.* at 250.

14. *Id.* at 243-44.

15. *Id.*

16. *See id.* at 243-45.

17. *See id.* at 248.

18. *Id.* at 230.

19. *See, e.g.,* Peil v. Speiser, 806 F.2d 1154 (3d Cir. 1986); Lipton v. Documation, Inc., 734 F.2d 740 (11th Cir. 1984), *cert. denied*, 469 U.S. 1132 (1985); T. J. Raney & Sons, Inc. v. Fort Cobb Irrigation Fuel Auth., 717 F.2d 1330 (10th Cir. 1983), *cert.*

courts acknowledged in some fashion the conceptual underpinning of FOMT: reliance may be presumed where all available information is quickly and efficiently factored into the price of the security. For example, in *Peil v. Speiser*,²⁰ the Third Circuit noted: "The 'fraud on the market' theory rests on the assumption that there is a nearly perfect market in information, and that the market price of stock reacts to and reflects the available information."²¹ Nevertheless, none of the FOMT cases decided before 1988 examined the issue of how to determine whether the market for a particular security is efficient. In *Peil*, for example, the court expressly declined to consider what markets are efficient by stating: "While this presumption is plausible in developed markets, it may not be in the case of newly issued stock. As the case at bar involves a widely traded and established stock, we need not consider whether we would apply the 'fraud on the market' theory in other instances."²² In most FOMT cases, courts simply concluded, without meaningful discussion, that the stocks involved either were or were not traded in an efficient market.²³

In *Basic*, the Supreme Court narrowed the applicability of FOMT when it adopted the Sixth Circuit's formulation of the elements of FOMT:

(1) that the defendant made public misrepresentations; (2) that the misrepresentations were material; (3) that the shares were traded on an efficient market; (4) that the misrepresentations would induce a reasonable, relying investor to misjudge the value of the shares; and (5) that the plaintiff traded the shares between the time the misrepresentations were made and the time the truth was revealed.²⁴

Since the Supreme Court's decision in *Basic*, lower federal courts have begun to recognize that an efficient market is a prerequisite to application of the FOMT presumption. In *Freeman v. Laventhol & Horwath*,²⁵ the Sixth Circuit held that application of FOMT was inappropriate because "a primary market for newly issued municipal bonds as a matter of law is not efficient."²⁶ The Fifth Circuit held in *Abell v. Potomac Insurance Co.*²⁷ that FOMT applies only "where the subject securities were traded actively in large markets."²⁸ In *In re*

denied, 465 U.S. 1026 (1984); *Panzirer v. Wolf*, 663 F.2d 365 (2d Cir. 1981); *Shores v. Sklar*, 647 F.2d 462 (5th Cir. 1981) (en banc), *cert. denied*, 459 U.S. 1102 (1983); *Blackie v. Barrack*, 524 F.2d 891 (9th Cir. 1975).

20. 806 F.2d 1154 (3d Cir. 1986).

21. *Id.* at 1161 n.10.

22. *Id.*

23. *E.g.*, *Lipton v. Documation, Inc.*, 734 F.2d 740 (11th Cir. 1984), *cert. denied*, 469 U.S. 1132 (1985); *Blackie v. Barrack*, 524 F.2d 891, 906 (9th Cir. 1975).

24. *Basic, Inc. v. Levinson*, 485 U.S. 224, 248 n.27 (1988).

25. 915 F.2d 193 (6th Cir. 1990).

26. *Id.* at 199.

27. 858 F.2d 1104 (5th Cir. 1988).

28. *Id.* at 1122.

MDC Holdings Securities Litigation,²⁹ the Southern District of California held that "the *Basic* presumption is available only when the securities have been traded on a free, efficient, and developed market."³⁰ In *Cammer v. Bloom*,³¹ one of the leading cases involving market efficiency, the District of New Jersey held that the FOMT presumption is available only when the plaintiff alleges and proves that the securities were traded in an efficient market.³² In *In re Bexar County Health Facility Securities Litigation*,³³ the court stated clearly the reasoning for the "efficient market" requirement:

The efficient capital market hypothesis states that the market's pricing mechanism will incorporate all relevant and material information into the market price of a security.³⁴ Since the market is essentially treated as an agent of the buyer for purposes of reliance on misinformation, the plaintiff must prove that the market relied on the fraud. This entails a detailed inquiry into whether the market for the stock is sufficiently active for the pricing mechanism to function and, a priori, capable of being affected by the fraud.³⁵

Whether in fact stock markets are as efficient as believed at the time of the *Basic* decision has been questioned in recent research in financial economics. Moreover, even if one accepts that large segments of the market are efficient, it is still difficult to arrive at useful and workable formulas for determining whether a given stock is contained within those segments.

III. RECENT EVIDENCE ON MARKET EFFICIENCY

Financial economists have recognized for more than a decade that stock price behavior deviated in systematic ways from expectations based on existing theories. However, such anomalous evidence tended to be dismissed as a reflection of shortcomings in theories of how prices should behave in efficient markets, rather than as indications of market inefficiency. More recently, challenges to the efficient market hypothesis have been taken much more seriously. First, there developed a fuller recognition of how little power earlier tests had to detect some classes of mispricing, even if the mispricing was large.³⁶ Second, a wave of research arrived that either identified new anomalous evidence, or generated new evidence on previously-documented anoma-

29. 754 F. Supp. 785 (S.D. Cal. 1990).

30. *Id.* at 804.

31. 711 F. Supp. 1264 (D.N.J. 1989).

32. *Id.* at 1290.

33. 130 F.R.D. 602 (E.D. Pa. 1990).

34. See Eugene F. Fama, *Efficient Capital Markets: A Review of Theory and Empirical Work*, 25 J. FIN. 383 (1970).

35. *In re Bexar County Health Facility Sec. Litig.*, 130 F.R.D. 602, 606-07 (E.D. Pa. 1990).

36. See Lawrence Summers, *Does the Stock Market Rationally Reflect Fundamental Values?*, 41 J. FIN. 591 (1986).

lies that made them difficult to explain except as a product of market inefficiency.

The new evidence comes in several forms. One body of research indicates that stock prices appear to underreact to accounting information: not only financial statement details, but even information as visible as earnings.³⁷ Another line of literature suggests that stock prices overreact to other (unspecified) information.³⁸ Related research suggests that prices are influenced by the unpredictable opinions of not-fully-rational investors, labeled "noise traders" in the literature.³⁹ This evidence has arrived against a background of numerous other studies that document systematic patterns permitting the prediction of future stock returns based on past stock returns, past accounting data, and combinations thereof.

A. Underreaction to Earnings Information

Evidence suggestive of an underreaction of stock prices to earnings information has existed since the late 1960s.⁴⁰ Academics, however, found it difficult to believe that the market could underreact to information as visible and widely followed as earnings, and tended to dismiss the evidence as the likely product of research design flaws.⁴¹

The recent evidence is more difficult to dismiss. Two studies on the topic by market analysts Victor Bernard and Jacob Thomas present evidence that the authors conclude can only be explained as "a disturbing departure from what would be predicted by existing models of efficient markets."⁴² In combination, the studies suggest that investors' interpretation of earnings news is "naive," that the initial reaction to earnings is (on average) incomplete, and that stock prices require six to nine months to complete the reaction to earnings news. The magnitude of the delayed response is greater for small and medium-size firms, but exists to some extent even for the largest third of the firms on the NYSE and AMEX. The sluggish response to earnings

37. See *infra* notes 40-48 and accompanying text.

38. See *infra* notes 49-52 and accompanying text.

39. See *infra* notes 53-55 and accompanying text.

40. One of the first studies to document this was Ray Ball & Philip Brown, *An Empirical Evaluation of Accounting Income Numbers*, 6 J. ACCT. RES. 159 (1968).

41. See Ray Ball, *Anomalies in Relationships Between Securities' Yields and Yield-Surrogates*, 6 J. FIN. ECON., 103 (1978).

42. Victor L. Bernard & Jacob K. Thomas, *Evidence that Stock Prices Do Not Fully Reflect the Implications of Current Earnings for Future Earnings*, 13 J. ACCT. ECON. 305, 307 (1990). See also Victor L. Bernard & Jacob K. Thomas, *Post-Earnings-Announcement Drift: Delayed Price Response, or Risk Premium?* J. ACCT. RES., 1989 Supp. at 1. One indication of the widespread recognition of such challenges to market efficiency lies in the designation of these two studies in 1993 as the "Notable Contribution to the Literature," an annual award sponsored by the American Accounting Association and the American Institute of Certified Public Accountants.

news existed in every year examined (1971 through 1991), and was as evident in 1991 as in any previous year.⁴³ Overall, the evidence has led even traditional defenders of market efficiency to modify their views.⁴⁴

B. Underreaction to Detailed Financial Statement Data

Bernard and Thomas raise a disturbing question: "[I]f market prices fail to reflect fully the implications of information as freely available as earnings, how well do they reflect information that is not as well-publicized?"⁴⁵ Some recent studies suggest that the kind of financial statement details that are the focus of fundamental analysis are not fully reflected in stock prices. Two such studies test the ability of a computerized fundamental analysis to predict future stock price movements, based on information already available to the public.⁴⁶ Even though the studies rely on purely statistical prediction models, derived without any consideration of economic foundations, each appears successful in identifying publicly available information not already reflected in prices.⁴⁷ Other studies have also found evidence consistent with financial statement details not being fully reflected in stock prices.⁴⁸

43. See Victor L. Bernard et al., *How Sophisticated is the Market in Interpreting Earnings News?*, J. APPLIED CORP. FIN., Summer 1993, at 54.

44. See Ray Ball, *The Earnings-Price Anomaly*, 15 J. ACCT. & ECON. 319 (1992). Ball concludes that the evidence can be explained only as a market inefficiency, or as an indication that the costs of processing information about earnings are substantial. However, with respect to the latter possibility, Ball notes how simple it appears to be to take advantage of the earnings information not reflected in prices, and adds that "[t]he case for substantial information processing costs as an explanation of the anomaly is not clear-cut." *Id.* at 341.

45. Bernard & Thomas, *Evidence that Stock Prices Do Not Fully Reflect the Implications of Current Earnings for Future Earnings*, *supra* note 42, at 339.

46. See Robert W. Holthausen & David F. Larcker, *The Prediction of Stock Returns Using Financial Statement Information*, 15 J. ACCT. & ECON. 373 (1992); Jane A. Ou & Stephen H. Penman, *Financial Statement Analysis and the Prediction of Stock Returns*, 11 J. ACCT. & ECON. 295 (1989).

47. Holthausen and Larcker document that the specific strategy adopted by Ou and Penman does not produce excess returns in more recent years, and others have also questioned the robustness of that strategy. See also Anthony C. Grieg, *Fundamental Analysis and Subsequent Stock Returns*, 15 J. ACCT. & ECON. 413 (1992); Thomas L. Stober, *Summary Financial Statement Measures and Analysts' Forecasts of Earnings*, 15 J. ACCT. & ECON. 347 (1992). The Holthausen-Larcker strategy appears to be more robust, producing positive excess returns in every year of the test period (1978-1988).

48. See John R. Hand, *A Test of the Extended Functional Fixation Hypothesis*, 65 ACCT. REV. 739 (1990); Trevor Harris & James A. Ohlson, *Accounting Disclosures and the Market's Valuation of Oil and Gas Properties: Evaluation of Market Efficiency and Functional Fixation*, 65 ACCT. REV. 764 (1990); Jeffrey S. Abarbanell & Brian J. Bushee, *Abnormal Returns Fundamental Analysis Strategy* (1994)(working paper, University of Michigan); Richard Sloan, *Do Stock Prices*

C. Stock Price Overreaction to Information from Unspecified Sources

While the research discussed above points to underreaction to financial statement data, other research suggests the market overreacts to some unidentified information. Financial economists Werner De Bondt and Richard Thaler find that stocks suffering extreme stock price declines in the past tend to outperform those with prior extreme price increases.⁴⁹ These reversals of past stock performance may be interpreted as corrections of prior overreactions, which leads to the conclusion that trading profits can be generated by adopting a contrarian strategy of buying past losers and selling past winners.

A number of studies initially questioned De Bondt and Thaler and offered alternative explanations for the evidence.⁵⁰ However, the most recent research in the area concludes that "there is an economically-significant overreaction effect present in the stock market."⁵¹ The overreaction effect is weak or nonexistent for large firms, but is indicative of gross mispricing for the smallest twenty percent of NYSE stocks. Within that category, the evidence suggests that the combination of overpricing of past winners and underpricing of past losers is in the range of fifty percent of the stock price. Since small firms tend to be held primarily by individuals, whereas large firms tend to have a heavy concentration of institutional ownership, the authors conclude that "one interpretation of [the findings] might be that individuals overreact but institutions do not."⁵²

D. Influence of Investor Sentiment, or Other Factors Unrelated to Fundamentals

Against the backdrop of continued questioning of market efficiency, some financial economists have modeled stock prices as subject to influence by the unpredictable opinions of not-fully-rational investors,

Fully Impound Information in Accruals about Future Earnings? (1995)(working paper, University of Pennsylvania). For further discussion and critique of the Hand and Harris-Ohlson studies, see Ray Ball & S. P. Kothari, *Security Returns Around Earnings Announcements*, 66 ACCT. REV. 718 (1991); John R. Hand, *Extended Functional Fixation and Security Returns Around Earnings Announcements: A Reply to Ball and Kothari*, 66 ACCT. REV. 739 (1991); Seha M. Tinic, *A Perspective on the Stock Market's Fixation on Accounting Numbers*, 64 ACCT. REV. 781 (1990).

49. Warner F. De Bondt & Richard Thaler, *Does the Stock Market Overreact?* 40 J. FIN. 793 (1986).

50. See Ray Ball & S.P. Kothari, *Nonstationary Expected Returns*, 23 J. FIN. ECON. 51 (1989).

51. Navin Chopra et al., *Measuring Abnormal Performance: Do Stocks Overreact?*, 31 J. FIN. ECON. 235, 238 (1992).

52. *Id.*

labeled "noise traders."⁵³ One widely read test of the theory was supplied by Charles Lee and Richard Thaler in a study of the pricing of small stocks and closed-end mutual funds.⁵⁴ They conclude that stock prices of these securities are influenced by random swings in "investor sentiment," which are unrelated to the stocks' underlying economic fundamentals.⁵⁵

E. Other Evidence

Beyond the evidence discussed above, there is a large body of other work demonstrating the predictability of stock returns based on various bits of publicly available information, including historical price data, financial statement data, and combinations thereof. The implications of the evidence are subject to debate, since it may be explainable even if markets are efficient.⁵⁶ However, such predictability would be expected if markets were inefficient. For example, Eugene Fama and Kenneth French, who have argued that the tendency of firms with low price/book multiples to outperform others may be consistent with market efficiency, also acknowledge that the phenomenon could reflect "the unraveling . . . of irrational market whims about the prospects of firms."⁵⁷ Furthermore, James Poterba and Lawrence Summers, having documented the predictability of stock returns based on prior returns data, argue that the evidence is difficult to explain except as the

53. De Long et al., *supra* note 5.

54. Charles M. Lee et al., *Investor Sentiment and the Closed-End Fund Puzzle*, 46 J. FIN. 75 (1991). For additional commentary and discussion of this research, see Nai-Fu Chen et al., *Are the Discounts on Closed-End Funds a Sentiment Index?*, 48 J. FIN. 795 (1993); Navin Chopra et al., *Yes, Discounts on Closed-End Funds Are a Sentiment Index*, 48 J. FIN. 801 (1993); Nai-fu Chen et al., *A Rejoinder*, 48 J. FIN. 809 (1993); Navin Chopra et al., *Summing Up*, 48 J. FIN. 811 (1993).

55. Lee et al., *supra* note 54.

56. Stock returns consist of a "normal" return, which varies with risk, and an "abnormal return." The efficient market hypothesis requires that abnormal returns be unpredictable, but permits normal returns to vary predictably, so long as the variation is related to differences in risk. Thus, any finding that stock returns are predictable based on some factor can be construed consistent with market efficiency if the factor can be viewed as a proxy for risk. Whether any given factor should be viewed as a proxy for risk is difficult to settle, since theories of how risk should be measured—that is, capital asset pricing theories—are still incomplete, with no single theory gaining general acceptance.

57. Eugene F. Fama & Kenneth R. French, *The Cross-Section of Expected Stock Returns*, 47 J. FIN. 427, 429 (1992); Josef Lakonishok et al., *Contrarian Investment, Extrapolation, and Risk*, 49 J. FIN. 1541 (1994). Lakonishok et al. view the anomaly as a market inefficiency, perhaps arising from behavioral and institutional forces that cause investors to underprice "value stocks" and overprice "glamour stocks." In contrast, S. P. Kothari, Jay Shanken, and Richard Sloan, in *Another Look at the Cross-section of Expected Stock Returns* (1993) (working paper, University of Rochester), suggest the anomaly may simply reflect a (not yet documented) sample selection bias.

product of "persistent, but transitory disparities between prices and fundamental values."⁵⁸

F. Summary

In summary, the efficient market hypothesis, once almost universally accepted within the academic community, has undergone numerous challenges in recent years. While in some cases the recent evidence is subject to alternative interpretations, it suggests that prices appear to (1) underreact to earnings information; (2) underreact to other detailed financial statement data; (3) overreact to information from unspecified sources; and (4) be influenced by factors, such as "investor sentiment," unrelated to fundamentals. Beyond this, there is a long line of literature that demonstrates the predictability of stock returns based on a variety of factors.

The recent evidence has not caused outright abandonment of faith in market efficiency. The efficient market hypothesis still has its defenders. For example, Professor Gene Fama, well known as the strongest early proponent of the hypothesis, acknowledges the growing debate, but his 1991 review of the evidence is still largely sympathetic to market efficiency.⁵⁹ What has changed is that such views are often questioned by other leading academics. Comparing the views of twenty years ago with those of today, financial economist Richard Thaler puts it this way:

The financial world as described in Eugene Fama's 1970 efficient markets survey was one . . . [where] markets were efficient, prices were unpredictable, and financial economists did not know how to spell the word anomaly. Of course, times have changed. As Fama says in his 1991 sequel, the issues have gotten "thornier" . . . Indeed, the findings of the last two decades have been startling. . . . These research findings, and the experience of the 1987 stock market crash, have made financial economists more cautious.⁶⁰

Ironically, Thaler's 1970 review of Fama's theory has been referred to in at least one case as "the leading academic study on the efficient market hypothesis," in support of reliance on FOMT.⁶¹ If financial economists are now more cautious in their acceptance of market efficiency, then the courts should exercise more caution as well. At a minimum, the recent evidence suggests courts should carefully establish guidelines for evaluating the degree of efficiency of the market for a given stock. Note that nearly all of the anomalous evidence described

58. James M. Poterba & Lawrence H. Summers, *Mean Reversion in Stock Prices: Evidence and Implications*, 22 J. FIN. ECON. 27, 27 (1988).

59. Eugene F. Fama, *Efficient Capital Markets: II*, 46 J. FIN. 1575 (1991).

60. ADVANCES IN BEHAVIORAL FINANCE, xvi (Richard Thaler ed., 1993).

61. *Cammer v. Bloom*, 711 F. Supp. 1264, 1280 n.25 (D.N.J. 1989).

above is based on stocks on the NYSE and AMEX, so even trading on a major exchange is no guarantee of market efficiency.⁶²

While the evidence consistent with market inefficiency is often based on NYSE and AMEX stocks, it is important to recognize that, almost without exception, the inefficiencies appear characteristic of primarily smaller stocks on those major exchanges, or by stocks with little institutional following. Thus, even in light of the recent challenges to market efficiency, reliance on FOMT still appears justified for the large stocks comprising the majority of listings on the major exchanges. The important question is how one establishes boundaries to the application of FOMT, which turns on factors driving the extent of efficiency of the market for a given security.

IV. EVIDENCE ON FACTORS DETERMINING THE DEGREE OF MARKET EFFICIENCY

The predominant literature in financial economics has not focused on factors that explain the degree of market efficiency for a given security. The one factor that has been examined repeatedly—and which appears related to the degree of efficiency in a number of studies—is firm size, typically measured in terms of market capitalization.⁶³ A small number of studies suggest that market inefficiencies are greater when institutional involvement is lower,⁶⁴ and at least one study shows that the speed of adjustment of security prices to new informa-

62. *But see* 3 ALAN R. BROMBERG & LEWIS D. LOWENFELS, *SECURITIES FRAUD AND COMMODITIES FRAUD* § 8.6, at 8:815 (2d ed. 1988). Bromberg and Lowenfels are not persuaded that markets are inefficient:

We think that, at a minimum, there should be a presumption—probably conditional for class determination—that certain markets are developed and efficient for virtually all the securities traded there: the New York and American Stock Exchanges, the Chicago Board Options Exchange, and the NASDAQ National Market System. . . . For other markets a presumption is harder to frame.

Id.

63. *See* Bernard & Thomas, *supra* note 42 (indicating that delayed stock price responses to earnings announcements are greater for small firms); George Foster et al., *Earnings Releases, Anomalies, and the Behavior of Security Returns*, 59 *ACCT. REV.* 574 (1984). A number of other anomalies also have been shown to be more pronounced for small firms. Several studies have shown that excess returns correlated to strategies based on computerized fundamental analysis are largest for small firms. Holthausen & Larcker, *supra* note 46; Ou & Penman, *supra* note 46. *See also* Chopra et al., *supra* note 51 (finding that the overreaction effect is greatest for small firms); Lee et al., *supra* note 54 (showing the impact of random fluctuations in noise trader sentiment is decreasing in firm size). The predictability of stock returns based on past stock returns is also more evident for small firms. Fama, *supra* note 57.

64. *See* Chopra et al., *supra* note 51; Lee et al., *supra* note 54.

tion varies with the number of analysts following the security.⁶⁵ A recent study by Ravi Bhushan suggests that market inefficiencies are greater for stocks with low trading volume and low prices.⁶⁶ Interestingly, the low price varies inversely with percentage bid-ask spreads, and is thus intended to proxy for transaction costs.

Case law has only once suggested specific criteria for evaluating whether a stock is traded on an efficient market.⁶⁷ Indicators of market efficiency in *Cammer* were presumed to be: (1) large weekly trading volume, (2) significant analyst following, (3) numerous market makers, (4) eligibility to file an S-3 Registration Statement, and (5) a cause and effect relationship between unexpected corporate events or financial releases and an immediate response in the stock price.⁶⁸ The fourth factor, eligibility to file an S-3, is based primarily on firm size, as measured by the market capitalization of the public float, and share volume.

For purposes of establishing reliable guidance on the appropriateness of FOMT for a given case, it is necessary to determine (1) whether the factors suggested by *Cammer* are related empirically to the degree of market efficiency, (2) whether other factors should also be considered, and (3) whether some factors dominate others. This Article introduces some new evidence on this issue and also summarizes the results of two other recent related studies. The Bhushan study, though it does not discuss FOMT, includes examination of several of the same factors examined here.⁶⁹ Another recent study from the University of California-Berkeley focuses specifically on factors determining the appropriateness of FOMT, as well as other factors.⁷⁰ The most important difference between the latter study and this analysis is methodological. Since the methodological difference affects the measured relation between firm size and market efficiency, this Article explains the difference later, in that context.

The approach used here (and in Bhushan) is to measure market inefficiency in terms of the delayed stock price response to earnings announcements. A larger delayed response is viewed as indicative of a greater degree of market inefficiency. A regression analysis is used to determine which factors explain variation in this measure of ineffi-

65. Michael Brennen et al., *Investment Analysis and the Adjustment of Stock Prices to Common Information* (1994)(working paper, University of California-Los Angeles).

66. Ravi Bhushan, *An Informational Efficiency Perspective on the Post-Earnings-Announcement Drift*, 18 J. ACCT. ECON. 45 (1994).

67. *Cammer v. Bloom*, 711 F. Supp. 1264 (D.N.J. 1989).

68. *Id.* at 1286-87.

69. Bhushan, *supra* note 66.

70. Brad M. Barber et al., *The Fraud-on-the-Market Theory and the Determinants of Common Stocks' Efficiency* (1993)(working paper, University of California at Berkeley).

ciency across firms.⁷¹ The factors considered as potential drivers of efficiency are as follows:

1. Firm size, as measured by market capitalization. This factor is suggested by the literature in financial economics, and by the reliance in *Cammer* on eligibility for S-3 registration.

2. Institutional holding, measured as the fraction of outstanding shares held by institutional investors. Although not suggested in *Cammer*, some of the research described above indicates mispricing may be more severe for stocks traded primarily by individuals.

3. Analyst following. This factor is one of those listed in *Cammer*.

4. Percentage trading volume, measured as the average fraction of outstanding shares traded within a week. Again, this factor is proposed in *Cammer*.

5. Dollar trading volume. This factor was not suggested by *Cammer*. However, economic logic suggests that it should be the dollar magnitude of trading, as opposed to the percentage of shares traded, that is related to the degree of market efficiency. Dollar volume is an index of the magnitude of the economic incentive for traders to identify and eliminate mispricing.⁷²

If higher values of the five factors lead to less market inefficiency and thus smaller delayed responses to earnings, the regression coefficients associated with each should be negative. Below each coefficient is presented a t-statistic, which provides an indication of statistical significance. Under the classical assumptions underlying regression analysis, a t-statistic would be less than -1.65 only five percent of the time by chance.⁷³ Thus, t-statistics below this level provide confidence that the associated factor is indeed important.

71. See Appendix, Table 1.

72. Two factors proposed in *Cammer* are not included here. One is the responsiveness of stock price to new information; that is a direct measure of market efficiency, as opposed to a factor that determines the degree of market efficiency. The other is the number of market makers for the stock. That factor is relevant for dealer markets such as the over-the-counter (OTC) market, but not for the NYSE and AMEX exchanges from which our sample is drawn. Barber et al. investigate the relationship between the number of market makers and market inefficiency and find no statistically reliable evidence of a linkage. Barber et al., *supra* note 70.

73. One assumption of the ordinary least squares regression technique used here is that the data are independent. Cross-sectional dependence in the data could cause violation of this assumption. An alternative estimation approach that deals with this issue involves estimating a time series of coefficients, one from each quarter, and then calculating a t-statistic for the mean of this series, based on its standard deviation through time. See Victor Bernard, *Cross-sectional Dependence and Problems in Inference in Market-Based Accounting Research*, 25 J. Accr. Res. 1 (1987). Results based on this approach are qualitatively similar to those discussed in this study. Another potential dependence issue arises from the overlapping abnormal returns (i.e., the return associated with each quarter's SUE extends over six months). However, such time series dependence in the de-

The left-hand side of Table One presents results when only one of the five factors is considered at a time as a potential driver of market inefficiency; on the right-hand side, all five factors are considered simultaneously. Simultaneous consideration of all factors is important because a given factor might appear important in isolation, but could still be dominated in the presence of factors that reflect similar information.

A. Results When One Factor Is Considered at a Time

Each of the five factors is inversely related to the measure of market inefficiency, and thus, the results are consistent with expectations. Moreover, the t-statistics all indicate that the negative relations are statistically significant.

The largest negative coefficient arises for percentage volume (-.075), suggesting that if one were forced to select the single clearest indicator of delayed responses to new information, percentage volume would be the best choice. To obtain some sense of the economic importance of this and the other factors, consider that, for firms with low percentage volume, the delayed stock price response to earnings increases about eleven percent as one moves from the lowest decile to the highest decile of unexpected earnings. (That is, by shifting from the extreme bad news firms to extreme good news firms within the low volume category, a trader could enhance the return on his portfolio by eleven percent over the six months following the earnings announcement.) The negative coefficient on percentage volume (-.075) indicates that the eleven percent delayed stock price movement is tempered substantially—by 7.5 percentage points—for firms with high volume.⁷⁴ Dollar volume, analyst following, and firm size are the next most important factors, with impacts of 6.4%, 4.1%, and 4.1%, respectively.

To the extent comparisons are possible, most, though not all, of this evidence is consistent with that of the Bhushan and Barber stud-

pendent variable causes misleading t-statistics only in conjunction with time series dependence in the associated regressors. The product of the various pairs of time-series correlations is not large enough to be problematic.

74. These statements are possible because of the way the regression is constructed and because all explanatory variables are scaled from zero to one. See Appendix, Table 1. For example, firms in the highest decile of the volume distribution are assigned a value of one for PVOL, while those in the lowest decile are assigned a zero. When PVOL is the only factor within the parenthesis in equation (3) and that factor takes on a value of zero, then the delayed response to earnings is measured by γ_1 . The estimate of γ_1 is 11%. When PVOL takes on a value of one, the delayed response to earnings is equal to $\gamma_1 + \gamma_4$. The estimate of $\gamma_1 + \gamma_4$ is 3.5%. The difference between these two estimates, or γ_4 , captures the difference between the low- and high-volume groups in their delayed response to unexpected earnings. This difference is -7.5%.

ies. Specifically, the result for size is consistent with Bhushan, and the results for institutional holding, analyst following, and dollar volume are consistent with Barber. Neither Bhushan nor Barber examine percentage volume, and Bhushan does not investigate the role of any factor other than size except in combination with other factors. The Barber study obtains different results pertaining to firm size, but that difference is traceable to differences in methodology.⁷⁵

B. Results When All Factors Are Considered Simultaneously

Since some of the five factors may reflect the same underlying economic phenomenon, it is important to discern which factor or factors are most important when used in combination. The right-hand-side of Table One indicates that only two of the factors—dollar volume and percentage volume—offer significant explanatory power beyond that of the other factors.⁷⁶ The coefficients on dollar volume (-9.4%) and percentage volume (-3.8%) indicate economically important reductions in delayed responses to earnings as one moves from low- to high-volume stocks.⁷⁷

That analyst following and institutional following are dominated by other variables is interesting, since those are factors commonly believed to reflect the level of sophistication of investor following. Both of these factors are correlated with firm size, and the presence of size in the model is sufficient to eliminate their significance. One possibility is that firm size drives the level of analyst and institutional holding, and so it represents a more direct measure of investor sophistication.

Even though firm size dominates analyst following and institutional holding, it in turn is dominated by other factors, so that in the full regression, it loses significance. Dollar volume appears to be the

75. In contrast to results reported here and in the Bhushan study, Barber et al. find a statistically insignificant positive relation between size and their proxy for inefficiency. The inconsistency appears related to the way in which inefficiency is measured. Barber et al. do not measure delayed responses to news directly, but instead assume that a larger immediate (i.e., efficient) response to earnings news is indicative of a smaller delayed (i.e., inefficient) response. However, prior research suggests that even though the immediate response to earnings is greater for small firms, the delayed response for such firms is also greater. The reason is that news for such firms is less frequently anticipated in advance, so more of the response occurs at the time of and subsequent to the announcement. See Bernard & Thomas, *supra* note 42.

76. See Appendix, Table 1.

77. These coefficients can be compared to the approximately 11% difference between the post-earnings-announcement stock returns for extreme good news and extreme bad news firms with zero values on each of the five potential indicators of efficiency. This amount is not reported in Table 1, but is the estimate of γ_1 in equation (3) of the appendix.

factor most responsible for this phenomenon.⁷⁸ Since both size (i.e., market capitalization) and dollar volume could reflect the magnitude of the economic incentives to eliminate mispricing in a given security, it is not clear, a priori, which factor should dominate. The results suggest that such incentives are strong only when the potential trading opportunities reflected by a large market capitalization are also evident in actual trading activity.

It is interesting that both percentage volume and dollar volume assume significance in the full regression. Even though percentage volume is the measure suggested in *Cammer*, the economic reasoning underlying that measure is unclear. (The economic incentive to identify mispricing in stocks with little dollar volume is small, regardless of what fraction of total shares that volume represents.) Note that when important underlying economic variables are measured with error, other factors can contribute explanatory power, only because they are correlated with the underlying variables. However, even if that is the reason for the significance of percentage volume, the factor remains useful unless more accurate measures of the underlying economic phenomenon can be identified.

Again, the results can be compared to those of the Bhushan and Barber studies. Bhushan does not consider percentage volume, but consistent with the results here, finds that size, institutional holding, and analyst following are dominated by dollar volume and a factor not considered here—the level of the stock price. Some of the findings of Barber differ from those in Table One, but the differences appear traceable to their indirect approach to measuring inefficiency.⁷⁹

C. Summary

As expected, each of the five factors—size, institutional holding, analyst following, percentage trading volume, and dollar trading volume—are inversely related to the degree of market inefficiency. However, when all factors are considered simultaneously, the two volume measures dominate.

These results should be interpreted carefully because they hinge on a measure of market inefficiency based on one particular anomaly—delayed stock price responses to earnings announcements. Other anomalies—such as the overreaction effect studied by Chopra,

78. Size is most highly correlated with dollar volume, and is significant unless dollar volume is also included in the model.

79. In their full model, Barber et al. find a statistically significant positive relation between size and their measure of inefficiency. See *supra* note 75 for an explanation as to how their approach to measuring inefficiency could contribute to this finding. Also, in contrast to our results and those in the Bhushan study, Barber, et al. find that analyst following continues to retain significance even in the presence of other factors.

Lakonishok, and Ritter, or the "investor sentiment" effect discussed by Lee, Shleifer, and Thaler—were specifically posited to be driven by an absence of institutional involvement or analyst following. Thus, while these factors were dominated by others in this study, they could remain important in other contexts. This possibility represents a fruitful avenue for future research.

V. APPLICABILITY OF FOMT: A CASE STUDY

This Article illustrates the implications of the evidence reviewed in Parts III and IV through examination of a particular case, *Biben v. Card*.⁸⁰ This case helps demonstrate the limitations to the applicability of FOMT. While the security in question had a relatively small public float, it was still larger than a significant fraction of NYSE/AMEX stocks, and would have been deemed efficient on the basis of at least one of the criteria suggested by *Cammer*. Nevertheless, for most factors, including the ones most important in this empirical analysis, the security achieved relatively low values. Examination of the stock price behavior and circumstances surrounding the case seems to confirm that, in fact, the stock was not traded in an efficient market during most of the class period.

The *Biben* plaintiffs filed a class action suit in 1984, alleging various securities fraud claims under Rule 10b-5 of the Securities Act of 1934, in connection with their purchases of the stock of The Midwestern Companies ("Midwestern"). To satisfy the reliance element of the claim, the plaintiffs alleged that they "relied on the integrity of the market," thus invoking the FOMT.⁸¹

Midwestern was a Nevada corporation, headquartered in Missouri and engaged primarily in the construction of power alcohol plants. Midwestern stock traded in the over-the-counter market and was quoted on the NASDAQ Interdealer Quotation system beginning July 22, 1982. Although 10.6 million shares of Midwestern stock were outstanding, only about two million shares were held by public non-insiders. The stock traded at \$6 3/8 on November 2, 1982, the beginning of the class period, and rose to its highest level, \$24 1/2, on August 22, 1983. Plaintiffs alleged that the price increase was attributable to a number of false and fraudulent information releases from the company or its public relations firm, including earnings announcements, financial statements, and press releases. The price fell throughout the period subsequent to August 1983, and closed at \$2 3/8 on March 23, 1984, the end of the class period. In May 1984, Midwestern filed for bankruptcy and the stock ultimately ceased trading.

80. 1992 Fed. Sec. L. Rep. (CCH) ¶ 96,848 (W.D. Mo. Feb. 25, 1992).

81. Plaintiffs' Amended Complaint at 54, *Biben v. Card*, 1992 Fed. Sec. L. Rep. (CCH) ¶ 96,848 (W.D. Mo. Feb. 25, 1992)(No. 84-0844).

Whether reliance on FOMT was appropriate in *Biben* rests largely on whether the market for Midwestern stock was efficient. While the evidence reviewed in Part II suggests inefficiencies may exist, they should not be assumed to characterize any specific stock without further detailed study. Nevertheless, the existing general evidence does raise the possibility that Midwestern's stock price could have (1) overreacted to unspecified factors, such as rumors or excitement about power alcohol production; (2) underreacted to earnings; and (3) underreacted to detailed financial statement data, such as cash flow data, that would cast doubt on the quality of Midwestern earnings.

Some indication of the likelihood that the market for Midwestern stock was efficient can be based, in part, on the previously discussed determinants of market efficiency. One factor in *Cammer* on which basis Midwestern stock could qualify for a presumption of efficiency is the number of market makers. The number of market makers in Midwestern stock ranged from four to ten during 1982-1983 and up to seventeen during 1984. While *Cammer* suggests a threshold of five or ten market makers, there is, however, no empirical support for reliance on this factor. In the only empirical test available to date for this factor, the Barber study concludes that the number of market makers is not significantly related to the degree of market efficiency when placed in competition with other factors.⁸² That study notes that in contrast to analysts, market makers "generally do not analyze and disseminate information about the stock that they make a market for and therefore do not contribute to the efficiency of the stock's price."⁸³ Market makers can behave this way because listing as a dealer commits one to purchasing or delivering only a limited number of shares at the posted quotes.

For factors other than the number of market makers, including those factors that dominate in the empirical analysis of the previous section, Midwestern assumed relatively low values until at least the end of the class period. Table Two summarizes Midwestern's values for such determinants, and compares them with the values for firms in the NYSE/AMEX sample underlying the tests of Part IV.⁸⁴ Specifically, the following four factors demonstrate Midwestern's market inefficiency.

1. Dollar trading volume: Dollar volume was shown in Part III to be the single most important explainer of market inefficiency, as proxied by delayed responses to earnings news. During 1982 and 1983, Midwestern's average weekly dollar volume was \$0.2 million and \$0.7

82. Barber et al., *supra* note 70.

83. *Id.* at 18.

84. See Appendix, Table 2.

million, respectively.⁸⁵ The 1982 dollar volume is higher than only five percent of the NYSE/AMEX distribution, while the 1983 volume exceeds that of seventeen percent of the distribution.

Since *Cammer* suggests reliance on percentage volume, not dollar volume, it specifies no thresholds with which to compare the above amounts for Midwestern. However, Midwestern's volume is clearly low in 1982 and 1983, relative to NYSE/AMEX stocks. To provide some sense for the implications, firms in our sample with dollar volume comparable to Midwestern's in 1982-83 had delayed (inefficient) responses to earnings news that were, on average, about three times greater than those with dollar volume above the ninetieth percentile. By January through March of 1984, trading became much more active for Midwestern, placing it above about one-third of the NYSE/AMEX sample.

2. Percentage trading volume: During 1982 and 1983, Midwestern's average weekly volume stood at 0.3% and 0.4%, respectively. Such volumes are relatively light—well below the mean (1.2%) and median (0.9%) for the NYSE/AMEX sample, and close to the tenth percentile (0.3 percent) of the NYSE/AMEX distribution. The volumes are also well below the thresholds suggested in *Cammer* (one or two percent) as indicative of efficiency. Thus, on the basis of one of the factors indicated by the empirical analysis to be the clearest indicators of market efficiency, the Midwestern stock appears to fall short of a level necessary to support a presumption of efficiency.

By 1984 and through the end of the class period in March 1984, volume increased substantially, averaging 3.3% overall and 6.7% in March. Even the average level is sufficient to place Midwestern in the top five percent of the NYSE/AMEX sample. On this basis, Midwestern's volume had achieved levels sufficient to support a strong presumption of efficiency, according to *Cammer*. Note that it was during this period that the stock price plummeted.

85. The dollar volume reported here (as well as percentage volume reported later) is based on an estimated volume of shares. The estimate is equal to volume reported by NASDAQ, multiplied by 57% to eliminate double-counting that occurs in the OTC market. If a customer sells 100 shares to a market maker, who then resells those 100 shares to another customer, the volume reported is 200 shares, even though only 100 shares have changed hands, and even though the NYSE/AMEX specialist system could handle the transaction as a single trade of 100 shares. This double-counting is exacerbated for OTC stocks when a single order triggers inter-dealer trades. If in the previous example the 100 shares had been passed from one dealer to another before the ultimate sale, the reported volume would be 300 shares. The adjustment factor of 57% assumes that 50% of reported volume involves net changes in the positions held by ultimate customers, and that 14% of the remaining (inter-dealer) trades (i.e., seven percent of all volume) represents inter-dealer trades that are not mere pass-throughs to other dealers. The estimate was based on a sampling of Midwestern volume.

3. Size: The market capitalization of Midwestern's public float never exceeded \$50 million, even with the price at its peak in August 1983, and averaged less than \$20 million during the class period.⁸⁶ These amounts are relatively low, compared with the mean (\$193 million) and median (\$230 million) for our NYSE/AMEX sample; the average level of \$20 million is approximately equal to the tenth percentile of the sample distribution. Midwestern's public market capitalization is also well below the level required to qualify for an S-3 registration (\$100 million or \$150 million, depending on trading volume), which is one of the criteria suggested in *Cammer*.

4. Analyst following and institutional holding: Midwestern had no analyst following; the mean (median) number of security analysts in our sample was eleven (nine), and more than 99% of the firms had at least some analyst following. The fraction of Midwestern's stock held by institutions ranged from zero to 0.6%—clearly very low relative to the mean (median) of 31% (29%) for our sample.

The above analysis suggests that on the basis of any of the factors included in our empirical analysis, including those that dominated when placed in competition with other factors, Midwestern maintained relatively low values during at least 1982 and 1983, or most of the class period. Such low values suggest market inefficiency, and the suggestion appears confirmed through a study of the stock's responsiveness to new information. Bromberg and Lowenfels propose that "the presumption (that markets are developed and efficient) would be rebuttable on a showing that the specific security in question is inactively traded on the market or unresponsive to new information."⁸⁷ *Cammer* states that an immediate stock price response to unexpected corporate events or financial releases "is the essence of an efficient market and the foundation for the fraud on the market theory"⁸⁸ and suggests that "one of the most convincing ways to demonstrate efficiency would be to illustrate, over time, a cause and effect relationship

86. The market capitalization for Midwestern is based on the public float, as opposed to total outstanding shares. If firm size is related to market efficiency because it measures the economic incentives for identification of mispricing, it is only the shares available for public trading that are relevant. Alternatively, if firm size is a proxy for liquidity, it is again only the public float that is relevant. Note that this logic is consistent with the criteria for S-3 registration, which measures market capitalization based only on the public float. The data available to us for the NYSE/AMEX sample includes total market capitalization; the value of the public float would be somewhat smaller for most firms, but the difference would not be nearly as great as it was for Midwestern, for which 80% of outstanding shares were held by insiders.

87. BROMBERG & LOWENFELS, *supra* note 62, at 8:815.

88. *Cammer v. Bloom*, 711 F. Supp. 1264, 1287 (D.N.J. 1989).

between company disclosures and resulting movements in stock price."⁸⁹

Table Three summarizes a standard test of stock price responsiveness to news releases for Midwestern⁹⁰ that was presented to the court in *Biben* as part of the motion for partial summary judgment based on the lack of market efficiency and reliance.⁹¹ During 1982 and 1983, there were twenty-six press releases or published news stories about Midwestern. Only one of these is associated with a statistically significant stock price response during the surrounding three day interval—and one would expect approximately one such occurrence to be observed at random, even if Midwestern's stock price truly never responded to new information.⁹² The conclusion of the test for 1982 and 1983 is that there is no reliable evidence of stock price responsiveness to new information.

The above test was based on all press releases and news events. An alternative test was also conducted, based only on corporate announcements that included sales forecasts, earnings forecasts, or sales and earnings reports. The test indicated no statistically significant stock price responsiveness to the sales and earnings information.⁹³

At some time during 1984, reliable indications of stock price responsiveness to new information become evident for Midwestern. One

89. *Id.* at 1291. A note of caution is warranted in employing a test of stock price responsiveness. Even if there is a "cause and effect relationship between company disclosures and resulting movements in stock price," the stock in question is not necessarily priced efficiently, because the movements in stock price could be "too large" or "too small." *Id.* However, the absence of any price response to new important information is clearly inconsistent with market efficiency.

90. See Appendix, Table 3.

91. *Biben v. Card*, 1992 Fed. Sec. L. Rep. (CCH) ¶ 96,848 (W.D. Mo. Feb. 25, 1992). The statistical procedure used here is common in the academic literature. See, e.g., Katherine Schipper & Rex Thompson, *The Impact of Merger-Related Announcements on Shareholders of Acquiring Firms*, 21 J. ACCR. RES. 184 (1983). It involves estimating the linear relation between Midwestern's daily stock returns and (1) the daily return on an OTC market index and (2) a series of "dummy variables" that indicate whether a news event has occurred on the day of, the day before, or the day after the stock return is observed. (In the cases of TV news stories, where the timing could be identified more precisely, only the first trading day after the evening news spot was included in the event interval.) If the news event causes a detectable stock price response, that response should surface in the form of a reliable statistical relation between Midwestern's stock return and the dummy variable for the event.

92. The detailed results vary according to whether a single benchmark for "normal" variance in the stock price is used for the entire period or whether it is allowed to vary year-by-year. The results discussed here are based on the use of a single benchmark. When the benchmark varies, the number of significant responses rises to three (out of 37).

93. When the benchmark for "normal" variance in the stock return is permitted to vary year-by-year, two of the seven earnings- or sales-related events are associated with statistically significant stock price movements.

of the nine news events between January 1 and March 23, 1984, a reaction to a *Barron's* article in early March, was large enough to be considered statistically significant when viewed in isolation. That, in combination with large stock price responses to some other events in 1984, indicates a statistically reliable degree of stock price responsiveness for that period. Especially in light of evidence reported previously on the changing characteristics of the Midwestern stock, the responsiveness observed during 1984 appears consistent with the market for Midwestern beginning to develop and become more efficient.

The overall conclusion based on Table Three is that until 1984, there is no reliable indication of stock price responsiveness to corporate events or financial releases. To the extent there is evidence of responsiveness, it appears driven by events after February 1984. There is no evidence during any year of reliable stock price responsiveness to sales or earnings information.

Table Four essentially reverses the process used in the above test.⁹⁴ Rather than beginning with known news events and then checking for a stock price response, Table Four begins with large stock price movements—more than twenty-five percent in either direction within ten days—and then checks to see whether there are news events to explain the price moves. The conclusion of the exhibit is that until at least 1984, major stock price movements occurred at times when there were no more publicly released corporate news stories than would be expected at random. Moreover, some major price moves occurred even when there was no public news.

The combined evidence in Tables Three and Four suggests that Midwestern's stock price behavior was characterized by major moves that are unexplainable based on public news announcements, that Midwestern's stock price was not reliably responsive to corporate news events until sometime in 1984, and that Midwestern's price was never reliably responsive to corporate announcements about sales and earnings. That view is consistent with the picture suggested by Table Two: that Midwestern's trading volume, size, professional following, and institutional involvement were relatively low. Evidently, they were too low to produce an efficient market.

It is difficult, if not impossible, to explain the forces that caused Midwestern's stock price to rise so dramatically during 1982 and 1983. However, a possibility suggested by Tables Three and Four is that, like the small stocks underlying the anomalies documented by Chopra⁹⁵ and Lee,⁹⁶ the stock price experienced swings unrelated to underlying fundamentals, perhaps because of over-optimism among

94. See Appendix, Table 4.

95. Chopra et al., *supra* note 51.

96. Lee et al., *supra* note 54.

its traders about the firm and its position in the power alcohol industry. At the same time, as was the case for smaller firms in studies by Ou-Penman⁹⁷ and Holthausen-Larcker,⁹⁸ the price appears not to have reflected financial statement details in the public domain. Professional analysts who were approached by Midwestern for a potential underwriting recognized quickly that, even though the firm reported positive and increasing earnings, the firm had generated little or no cash flow through operations, and appeared to be overpriced. A Bear Stearns stock broker testified in his deposition:

Yeah, they (the Bear Stearns Corporate Finance Department) were suspect of the ethanol business, the numbers, the short history of the company, the overvaluation in the marketplace, just about everything you can possibly think of negatively not to do a deal. . . . They did not regard that (the earnings) as real at all It was all earnings and no cash flow. There is no cash flow.⁹⁹

A Paine Webber broker testified:

I recall a conversation with one of the people from Paine Webber who was in New York commenting on how earnings were taken in on, I think, on the sale of a plant prior to their actual receipt, the receipt of money, so this raised a red flag to my people in New York.¹⁰⁰

Had the stock been traded in enough volume to attract some professional following so that such views could have been communicated to traders, the price might never have reached such high levels. Indeed, when the Feschbacks, managers of the Texas-based short-trader firm, began to examine the stock in the second half of 1983, they "were real honed in on the numbers,"¹⁰¹ and decided to sell the stock short. This was the beginning of a process during which the stock attracted more visibility (ultimately being covered by *Barron's*), generated much higher levels of volume, and by sometime in 1984, might be labeled as having traded in an efficient market—but at a much lower price.

In short, based on the various methodologies discussed above, it appears that the dramatic rise in Midwestern's stock price occurred while the market for the stock was not efficient. The *Biben* case settled shortly before the hearing on the market efficiency issue.

VI. SUMMARY AND CONCLUSIONS

Fraud-on-the-market theory (FOMT) is based on a hypothesis of market efficiency that has increasingly come under attack in the financial economics literature. While the hypothesis may represent a

97. Ou & Penman, *supra* note 46.

98. Holthausen & Larcker, *supra* note 46.

99. Deposition of Steven Antebi at 62-63, *Biben v. Card*, 1992 Fed. Sec. L. Rep. (CCH) ¶ 96,848 (W.D. Mo. Feb. 25, 1992)(No. 84-0844)[hereinafter Antebi Deposition].

100. Deposition of Sanford Mock at 74, *Biben v. Card*, 1992 Fed. Sec. L. Rep. (CCH) ¶ 96,848 (W.D. Mo. Feb. 25, 1992)(No. 84-0844).

101. Antebi Deposition, *supra* note 99, at 74.

good approximation of the behavior of large, actively traded stocks, there is mounting evidence that, even within the NYSE and AMEX, mispricing exists among the remaining stocks. One implication for the courts is that even though FOMT still appears well justified for most NYSE/AMEX stocks and many NASDAQ stocks, it may not be appropriate for others; the importance of well-founded characterizations of the efficiency of a given security is thus paramount.

The empirical analysis conducted here suggests that trading volume—measured both in terms of dollars and as a percentage of outstanding shares—provides the clearest indicator of market efficiency. Firm size, analyst following, and institutional involvement are also related to the degree of efficiency, although they are dominated when placed in competition with volume and size. Since other studies have suggested that, based on different measures of market efficiency, analyst following and institutional holding are important, they may still be useful indicia, and this Article recommends continued reliance on such factors pending further research. In contrast, there is no empirical support, and only questionable logical support, for the usefulness of one other index suggested in the case law—the number of market makers in the stock.

In the *Biben* case examined here, the security in question maintained relatively low values for those factors shown in the empirical analysis to be good indicators of market efficiency, at least through most of the class period. An examination of the stock price behavior confirmed this view; until the end of the class period, the stock was not responsive to corporate news, and took large swings at times when no new public information became available. Analysis of the circumstances surrounding the case suggests that the stock price moved in response to some unidentified forces unrelated to fundamentals, and failed to reflect public information that professional analysts quickly identified as negative.

The *Biben* case serves to illustrate the limitations to FOMT. Market efficiency is a relative concept, and thus, it is inherently difficult to draw a line between efficiently and inefficiently traded stocks. However, the stock in the *Biben* case appears to be one that is best characterized as traded in an inefficient market. Given the current unsettled state of research on market efficiency, courts would be well advised to exercise caution in extending FOMT to other small, less actively traded stocks—even among those on the NYSE, the AMEX, or the NASDAQ's National Market System. Justice White may have been correct when he observed in *Basic* that the court “embark[ed] on a course that it d[id] not genuinely understand.”¹⁰²

102. *Basic, Inc. v. Levinson*, 485 U.S. 224, 254 (1988)(White, J., dissenting).

VII. APPENDIX

Methodology Used to Identify Drivers of Market Inefficiency

We assume that a larger delayed stock price response to earnings announcements is indicative of a greater degree of market inefficiency. Regression analysis is used to determine which factors explain variation in this measure of inefficiency across firms.

The amount of delayed price response to earnings can be estimated using the following regression:

$$\text{POSTRET}_{jt} = \beta_0 + \beta_{1jt} \text{UXEARN}_{jt} + \xi_{jt} \quad (1)$$

where POSTRET = stock return for firm j , for the two quarters subsequent to the earnings announcement for quarter t , adjusted by stock returns for an index of NYSE/AMEX firms in same size decile over the same period;

UXEARN = unexpected earnings for firm j in quarter t , measured as quarterly earnings minus the earnings of the comparable quarter of the prior year, and scaled by the standard deviation of the same over the prior five years; this measure is then converted to deciles within quarters to avoid undue influence of extreme observations;

ξ_{jt} = a random disturbance term.

If the response to unexpected earnings for a given firm is complete and immediate, then stock returns subsequent to the earnings announcement would be unrelated to the unexpected earnings. In that case, β_{1jt} would be zero, and the post-announcement stock return would be completely reflected in the random error, ξ_{jt} . However, to the extent the post-announcement return still reflects a response to the unexpected earnings, β_{1jt} would be positive. The larger is β_{1jt} , the greater the delayed response to earnings, and the greater the assumed degree of market inefficiency. This coefficient may differ across firms and over time; it can be viewed as an index of the degree of market inefficiency for stock j in quarter t .

At issue here are the factors which cause the measure of inefficiency, β_{1jt} , to vary across firms (and potentially, across time as well). Our analysis allows β_{1jt} to vary as a function of five factors, as indicated in the following equation:

$$\beta_{1jt} = \gamma_1 + \gamma_2 \text{SIZE}_{jt} + \gamma_3 \text{IH}_{jt} + \gamma_4 \text{AN}_{jt} + \gamma_5 \text{PVOL}_{jt} + \gamma_6 \text{DVOL}_{jt} \quad (2)$$

where SIZE = decile within year of firm size (market capitalization);

IH = decile within year of fraction of outstanding shares held by institutions;

AN = decile within year of analyst following (number of analysts following the firm);

PVOL = decile within year of average weekly trading volume, as percentage of total outstanding shares;

DVOL = decile within year of average weekly dollar trading volume.

The key statistics in our analysis are the coefficients γ_1 through γ_5 . They can be estimated by substituting (2) into (1) and estimating a single regression:

$$\text{POSTRET}_{jt} = \beta_0 + \{\gamma_1 + \gamma_2\text{SIZE}_{jt} + \gamma_3\text{IH}_{jt} + \gamma_4\text{AN}_{jt} + \gamma_5\text{PVOL}_{jt} + \gamma_6\text{DVOL}_{jt}\} \text{UXEARN}_{jt} + \xi_{jt} \quad (3)$$

The coefficient γ_1 measures the amount of delayed response to a unit of unexpected earnings, conditional on zero values for values of SIZE, IH, AN, PVOL, and DVOL. If higher values of the five factors lead to less market inefficiency and (thus) smaller delayed responses to earnings, the coefficients on each (γ_2 through γ_6) should be negative. All factors are scaled so as to range from 0 to 1, and thus the coefficients on the factors can be compared directly to assess relative importance.

The sample examined here is the same used in Bernard, Thomas, and Abarbanell study,¹⁰³ and covers most NYSE/AMEX firms for 1983-1991. Stock returns, market value, volume, and earnings data used here were derived from the University of Chicago's CRSP files and Standard & Poors' Compustat files. Data on institutional holding was derived from the Spectrum files. The extent of analyst following was drawn from the IBES files, furnished by the Institutional Brokers Estimate System.

103. See *supra* note 42 and accompanying text.

Table 1
Factors Explaining Degree of Market Inefficiency,
as Measured by Delayed Response to Earnings News

Factor	Regression coefficients (t-statistics) when:	
	Each factor considered individually:	All factors considered simultaneously:
Size (market capitalization)	-.041 (-5.75)	.040 (1.40)
Institutional holding	-.039 (-5.62)	.001 (.11)
Analyst following	-.041 (-5.84)	.014 (.974)
Percentage volume	-.075 (-10.73)	-.038 (-2.63)
Dollar volume	-.064 (-9.08)	-.094 (-2.65)

Explanation: results based on estimation of following regression equation (see appendix):

$$\text{POSTRET}_{jt} = \beta_0 +$$

$$\left\{ \gamma_1 + \gamma_2 \text{SIZE}_{jt} + \gamma_3 \text{IH}_{jt} + \gamma_4 \text{AN}_{jt} + \gamma_5 \text{PVOL}_{jt} + \gamma_6 \text{DVOL}_{jt} \right\} \text{UXEARN}_{jt} + \varepsilon_{jt}$$

where POSTRET = stock return for two quarters subsequent to the earnings announcement, adjusted by stock returns for index of NYSE/AMEX firms in same size decile over the same period;

UXEARN = unexpected earnings (see text for details);

SIZE = firm size (market capitalization);

IH = fraction of shares held by institutions;

AN = number of analysts following the firm;

PVOL = average weekly trading volume as fraction of outstanding shares;

DVOL = dollar value of average weekly trading volume;

and all variables are measured in terms of deciles within years, relative to the distribution for the NYSE/AMEX sample.

A negative coefficient on a given variable indicates that increases in that variable are associated with less market inefficiency (as measured here). Under the classic assumptions of ordinary least squares regression, t-statistics below -1.65 indicate that there is less than a 5 percent chance of having obtained such a large negative coefficient by chance, and thus suggest the estimate is reliably negative.

Table 2
Indicators of market (in)efficiency for Midwestern common stock

Indicator of (in)efficiency:	Value for Midwestern:	Mean (median) for sample from NYSE/AMEX:	Percentile of Midwestern value, relative to sample from NYSE/AMEX:
Dollar volume* (weekly):	\$0.2 mill in 1982 0.7 mill in 1983 2.0 mill in 1984 (through 3/23)	\$21.4 mill (\$4.5 mill)	5 th percentile in 1982; 17 th percentile in 1983; 30 th percentile in 1984
Percentage volume* (weekly):	0.3% in 1982 0.4% in 1983 3.3% in 1984	1.2% (0.9%)	10 th percentile in 1982-1983; 97 th percentile in 1984
Size (market capitalization):	\$20 million, on average	\$1193 million (\$230 million)	10 th percentile
Analyst following:	0 analysts	11 analysts (9 analysts)	0 th percentile
Institutional holding:	0.6%	31% (29%)	6 th percentile

*Volume estimates are equal to 57 percent of reported levels, to eliminate the double-counting of OTC volume (supra note 72), and thus produce estimates comparable to those of NYSE/AMEX stocks.

Table 3
Responsiveness of Midwestern stock price to new information

Tests of responsiveness of stock price to all news events, including earnings reports:	1982	1983	1984 thru 3/23
Number of corporate news events:	9	19	9
Number of news releases accompanied by a statistically significant stock price movement in surrounding interval:	1	0	1
When events of year are viewed as a group, are accompanying price movements significant?	NO	NO	YES

Tests of responsiveness of stock price to sales forecasts, earnings forecasts, and earnings reports:	1982	1983	1984 thru 3/23
Number of news events:	2	7	1
Number of events accompanied by statistically significant price movement in surrounding interval:	0	0	0
When events of year are viewed as a group, are accompanying price movements statistically significant?	NO	NO	NO

Explanation: Tests are based on regression of daily stock price movements (market-model residuals) against dummy variables indicating event periods. Event intervals are three day periods surrounding the news release, except for television news events, for which the interval includes only the following trading day. (Results are similar when 3-day intervals are used for all events.) Stock price movements are considered significant if there is less than a 5 percent probability of observing such a movement by chance. Results are qualitatively unchanged when price movements are defined as raw returns or market-adjusted returns, as opposed to market model residuals.

Table 4

Relation between large Midwestern stock price movements
and corporate news events

	1982	1983	1984 thru 3/23
Number of major price moves (greater than 25 percent change over any non-overlapping 10-day trading interval) ^a :	4	3	3
Number of major price move intervals that would contain news events, if price moves were uncorrelated with existence of news (specifically, if news events were distributed <i>randomly</i> within years)	2	2	2
Actual number of major price move intervals including at least one news event:	2	2	3
Number of major price moves that contain news events with significant price movement during surrounding three-day interval:	1	0	1

^aWhere there is a series of overlapping 10-day price movements of more than 25 percent, the movements analyzed here constitute the maximum number of non-overlapping 10-day movements within the series; where more than one such set of non-overlapping movements exists, the set with the largest total price movement was selected for analysis.