Cleveland State Law Review

Volume 52 | Issue 3 Article 5

2004

The Proportionate Trading Model: Real Science or Junk Science

Brian P. Murray
Murray, Frank & Sailer LLP

THE PROPORTIONATE TRADING MODEL: REAL SCIENCE OR JUNK SCIENCE?

BRIAN P. MURRAY[1]
ERIC J. BELFI[2]

[1]J.D., *cum laude*, St. John's University School of Law; B.A., M.A., University of Notre Dame. Mr. Murray is a member of Murray, Frank & Sailer LLP.

[2]J.D., St. John's University School of Law; B.A., Georgetown University. Mr. Belfi is an associate at Murray, Frank & Sailer LLP.

I. INTRODUCTION

For over 100 years debate has raged in academia and in the courts over the standards of admissibility for expert testimony. From Learned Hand to *Frye v. United States* to the Federal Rules of Evidence and beyond, courts and commentators have struggled with the threshold for expert testimony. For scientific and technical testimony, the changing world has only exacerbated the difficulty of the issue. One hundred years ago, quantum mechanics didn't exist, the theory of relativity had yet to be invented (and superceded), and the quark hadn't been discovered. As far as the stock market was concerned, trades were executed by hand and the New York Stock Exchange bore a closer resemblance to the men who executed the Buttonwood Tree Agreement than today's computerized trading pits. As science and technology have evolved, so has the test for expert testimony in these areas.

In class action securities litigation, a pitched battle is often fought over the size of the class. The question boils down to how many of the shares purchased during the class period are shares which are traded during the class period for the first time and how many shares are traded repeatedly throughout the class period. Those shares which are traded in the class period for the first time are damaged to the full extent of the fraud. Shares which trade more than once during the class period count towards reported volume, but can only be damaged to the full extent of the fraud once. For example, *A* buys a share of stock after the price is inflated by fraud. While the stock price is still inflated by the fraud, *A* sells his share to *B*. Reported class period volume will reflect at least two shares purchased.[3] But *A* has recouped some or all of his loss by selling at an inflated price, and if the market price was still inflated by the full value of the false information, only *B* has suffered the full extent of the fraud. Determining how much of reported volume during the class period represents repurchases and how much represents new purchases is thus critical to determining class-wide damages.

To solve this problem, experts use the Proportionate Trading Model ("PTM"). The PTM assumes that a fixed proportion of shares purchased on each day represent newly traded versus previously traded shares. While there is some debate over whether the shares should be drawn in equal proportions or some other proportion, virtually every expert, whether testifying for the defendants or plaintiffs, now uses some form of the PTM.

The Supreme Court, in a trilogy of cases in the 1990s, set forth the requirements for admissibility of expert testimony. It is the authors' contention that the PTM,

[3]If the stock is traded on the NASDAQ, more than two shares can be reflected in reported volume. *See infra* note 67, and accompanying text.

drawing shares into the new and previously traded groups in equal proportions, meets the criteria for admission.

II. EVOLUTION OF TEST FOR ADMISSIBILITY OF EXPERT TESTIMONY

A. Learned Hand

Judge Learned Hand kicked off the modern dispute about expert testimony with an article in Harvard Law Review published in 1900.[4] Judge Hand begins the article by stating that "[t]here are good historical reasons" for calling expert witnesses, "but they by no means justify" doing so, and it is "an anomaly fertile of much practical inconvenience."[5] Thus the modern hostility to expert testimony was born, or at least given its first influential public airing.

Judge Hand's objection to expert testimony was premised on the expert's inability to testify to the facts of the case and his ability to testify only to general propositions on his area of expertise.[6] The problem for Judge Hand was how the jury was to choose between conflicting expert testimony. If the jury had experience in the subject matter, the experts would be unnecessary; if they had no experience, how can they choose which expert to believe? "It is just because they are incompetent for such a task that the expert is necessary at all."[7] Judge Hand's solution to this dilemma was to suggest an independent tribunal of experts to hear the expert testimony.[8] This tribunal would decide which general propositions to put to the jury, and the jury could then apply these general propositions to the facts of the case.[9]

B. Frye v. United States

The seminal case of *Frye v. United States*,[10] which stood as the standard for admissibility of expert testimony for seventy years, is two pages long. At issue was the appellate court's refusal to admit exculpatory evidence of a primitive polygraph, or lie detector test.[11] The court recognized that expert testimony was admissible, but stated

> [j]ust when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or

---

[4]Learned Hand, *Historical and Practical Considerations Concerning Expert Testimony*, 15 HARV. L. REV. 40 (1900).

[5]*Id.* at 40.

[6]*Id*. at 50-52.

[7]*Id*. at 54.

[8]*Id*. at 56.

[9]*Id*.

[10]293 F. 1013 (D.C. Cir. 1923).

[11]*Id*. at 1013. The test in question measured changes in blood pressure as the respondent answered questions.

> discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.[12]

This brief opinion would be followed for seventy years, even after the passage of the Federal Rules of Evidence.

To some extent, the *Frye* test performs some of the function Judge Hand envisioned in 1900. By insisting on general acceptance in the scientific community, the scientific community is, in effect, acting as the expert tribunal of Judge Hand. The scientific community weeds out the good science from the bad and the general propositions put to the jury to aid it in its deliberations are those on which there is widespread agreement. Thus, the jury should be spared the task of having to choose between experts with regard to general scientific principles, but not with regard to application of those principles.

C. Federal Rule of Evidence 702

The Federal Rules of Evidence were passed in 1975. The question of whether the Federal Rules of Evidence, specifically Rules 401, 402, and 702, superceded the *Frye* test was not addressed in the Rules, the Advisory Committee's Notes, the Congressional Committee Reports, or the hearing on the Federal Rules. Rule 401 defines "relevant evidence" as that which has any tendency to make a fact more or less probable.[13] Rule 402 states that all relevant evidence is admissible, unless otherwise prescribed.[14] Rule 702, which specifically governs the admissibility of expert testimony, states that "[i]f scientific, technical, or other specialized knowledge will assist the trier of fact in issue, a witness may testify thereto in the form of an opinion or otherwise."[15] Courts were split over whether the Federal Rules of Evidence superceded the *Frye* test for the next twenty years.[16]

---

[12]*Id.* at 1014.

[13]FED. R. EVID. 401. "'Relevant evidence' means evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable that it would be without the evidence." *Id.*

[14]FED. R. EVID. 402. "All relevant evidence is admissible, except as otherwise provided by the Constitution of the United States, by Act of Congress, by these rules, or by other rules prescribed by the Supreme Court pursuant to statutory authority. Evidence which is not relevant is not admissible." *Id.*

[15]Fed. R. Evid. 702.

> If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.

Id.

[16]For a detailed description of the *Frye* debate, see *Symposium on Science and the Rules of Evidence*, 99 Fed. R. Dec. 187 (William A. Thomas, ed., 1983).

D. The Daubert/Joiner/Kumho Tire *Trilogy*

1. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*

In *Daubert v. Merrell Dow Pharmaceuticals, Inc.*,[17] the Supreme Court decided two questions. The first was whether the *Frye* test of general acceptance survived the passage of the Federal Rules of Evidence. The second was what standard should be applied if the *Frye* test was not used.

The facts of *Daubert* are relatively simple. The parents of a minor born with birth defects sued the maker of the drug Bendectin, alleging the mother's use of the drug during pregnancy caused the birth defects.[18] The defendant moved for summary judgment, claiming there was no admissible evidence that Bendectin caused birth defects in humans.[19] The defendant submitted an affidavit of an epidemologist who stated he had reviewed all the literature on Bendectin and birth defects (30 published studies involving over 130,000 patients) and no study found that Bendectin was capable of causing malformations in human fetuses.[20] The plaintiffs countered with eight experts of their own, who concluded that Bendectin can cause birth defects.[21] These experts based their conclusions on animal test-tube studies, live animal studies, and the reanalysis of previously published studies which had concluded there was no causation.[22] The trial judge refused to admit the evidence, holding that it did not meet the general acceptance standard; the Ninth Circuit Court of Appeals affirmed on the same grounds.[23]

In determining whether *Frye* survived the passage of the Federal Rules of Evidence, the Court began with Federal Rules of Evidence 401 and 402.[24] Rule 402 states "[a]ll relevant evidence is admissible, except as otherwise provided. . . . Evidence which is not relevant is not admissible."[25] Rule 401 defines relevant evidence as "any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence."[26] After considering the specific text of Rule 702 and the "liberal thrust" of the Federal Rules of Evidence, the Court held that the *Frye* test was not assimilated into Rule 702.[27] Ultimately, the Court held "[t]hat austere

---

[17]509 U.S. 579 (1993).

[18]*Id*. at 582.

[19]*Id*.

[20]*Id*.

[21]*Id*. at 583. The credentials of the experts were beyond reproach. *Id*. at 582.

[22]*Id*.

[23]951 F.2d 1128 (1991).

[24]*Daubert*, 509 U.S. at 587-88.

[25]FED. R. EVID. 402.

[26]FED. R. EVID. 401.

[27]*Daubert*, 509 U.S. at 588-89.

[general acceptance] standard, absent from, and incompatible with, the Federal Rules of Evidence, should not be applied in federal trials."[28]

Having determined that the *Frye* test did not apply, the Court examined the gatekeeping responsibilities of the trial judge. The Court began with the definitions of "scientific" and "knowledge." Scientific "implies a grounding in the methods and procedures of science."[29] Knowledge "connotes more than subjective belief or unsupported speculation."[30] While acknowledging that the subject of the scientific testimony need not be known to a certainty, because there are arguably no certainties in science, the Court noted that the inference or assertion "must be derived by the scientific method."[31] In a footnote, the Court took pains to distinguish between scientific reliability, scientific validity, and evidentiary reliability.[32] Scientific reliability is whether the application of the principle produces consistent results.[33] Scientific validity is whether the principle supports what it purports to show.[34] Evidentiary reliability, for scientific evidence, will be based on scientific validity.[35] The Court held that a trial judge must make a "preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology can be applied to the facts in issue."[36]

The initial inquiry is whether the expert testimony "will assist the trier of fact understand or determine a fact in issue."[37]

> Ordinarily, a key question to be answered in determining whether a theory or technique is scientific knowledge that will assist the trier of fact will be whether it can be (and has been) tested. "Scientific methodology today is based on generating hypotheses and testing them to see if they can be falsified; indeed, this methodology is what distinguishes science from other fields of human inquiry."[38]

The second consideration is whether the theory or technique has been subjected to peer review and publication. The Court, however, took pains to point out this factor is not dispositive.[39] The third consideration is the known or potential rate of

---

[28]*Id*. at 589.

[29]*Id*. at 590.

[30]*Id*.

[31]*Id.*

[32]*Id*. at 590 n.9

[33]*Id.* at 599.

[34]*Id*.

[35]*Id*.

[36]*Id*. at 592-93.

[37]*Id*. at 592.

[38]*Id*. at 593 (quoting Michael D. Green, *Expert Witnesses and Sufficiency of Evidence in Toxic Substances Litigation: The Legacy of Agent Orange and Bendectin Litigation*, 86 NW. U. L. REV. 643, 645 (1992)).

[39]*Id*.

error and the existence and maintenance of standards controlling the technique's operations.[40] The final factor is the "general acceptance" of the theory: Widespread acceptance can be an important factor in admitting testimony and minimal support may be a factor in excluding it.[41]

The Court emphasized the Rule 702 inquiry was flexible, and the "overarching subject is the scientific validity and thus the evidentiary relevance and reliability of the principles that underlie a proposed submission. The focus, of course, must be solely on principles and methodology, not on the conclusions that they generate."[42] It also addressed the concerns that abandonment of the general acceptance test would "result in a free-for-all in which befuddled juries are confounded by absurd and irrational pseudoscientific assertions."[43] The Court rejected such concerns, holding that "[v]igorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence."[44]

The unspoken undercurrent in the *Daubert* opinion, and the subject of fierce debate in the lower courts and academia, was how to deal with expert testimony based on "junk science." The *Daubert* Court never explicitly uses this term, although the testimony at issue is what some would consider to be a paradigmatic example of junk science. At its core, the plaintiffs' experts in *Daubert* took overwhelmingly convincing evidence to the contrary, and without doing any additional scientific studies, simply concluded that the original scientists' work supported the opposite conclusion than the one originally stated. The closest the *Daubert* Court comes to addressing this issue is an aside when it states that the study of the moon "will not assist the trier of fact in determining whether an individual was unusually likely to have behaved irrationally" on the night of a full moon.[45] Even so, the *Daubert* Court stops short of saying the plaintiffs' experts' testimony at issue was inadmissible. The Court remanded the case for further proceedings consistent with the opinion. The door was thus left open that the testimony, questionable though it may have been, was in fact admissible, and the adversary system, through effective advocacy, cross-examination, and opposing experts, would expose the testimony as being not credible, or at least much less credible than the opposing side's testimony.

---

[40] *Id*. at 594.

[41] *Id*.

[42] *Id*. at 594-95.

[43] *Id*. at 595.

[44] *Id*. at 596.

[45] *Id*. at 591. Justice Stevens, concurring in part and dissenting in part in General Electric Co. v. Joiner, 522 U.S. 136 (1997), returned to this theme. "An example of 'junk science' that should be excluded under *Daubert* as too unreliable would be the testimony of a phrenologist who would purport to prove a defendant's future dangerousness based on the contours of the defendant's skull." *Id*. at 154 n.6 (Stevens, J., concurring in part and dissenting in part).

2. *General Electric Co. v. Joiner*

In *General Electric Co. v. Joiner*,[46] the Supreme Court granted certiorari to determine which standard should be applied by an appellate court reviewing a decision to admit or exclude testimony under *Daubert*. The short answer to this question is that an abuse of discretion standard should be applied.[47] The Court then went beyond the scope of its grant of certiorari and discussed whether, when applying this standard, the trial court abused its discretion in excluding the expert testimony.[48]

In *Joiner*, the plaintiff was an electrician who was exposed to PCBs in the course of his work. The plaintiff alleged that his exposure to PCBs "promoted" his lung cancer; specifically, had it not been for his exposure to PCBs, his lung cancer would not have developed for years, if at all. The trial court ruled that although there was a genuine issue of fact as to whether the plaintiff was exposed to PCBs, the plaintiff's experts' testimony failed to show a link between PCBs and small-cell lung cancer, and was, therefore, inadmissible. The Eleventh Circuit Court of Appeals held that "[b]ecause the Federal Rules of Evidence governing expert testimony display a preference for admissibility, we apply a particularly stringent standard of review to the trial judge's exclusion of expert testimony."[49] The Supreme Court held that the "particularity stringent" standard was erroneous, and the correct standard was the usual abuse of discretion.[50]

The plaintiff's experts had relied upon animal studies, in which mice were exposed to PCBs, as well as epidemiological studies. The Court examined whether these studies could have been a proper foundation for the testimony at issue. As phrased by the Court, "whether animal studies can ever be a proper foundation for an expert's opinion was not the issue. The issue was whether *these* expert's opinions were sufficiently supported by the animal studies on which they purported to rely."[51] In so phrasing the issue, the *Joiner* Court seems to have run afoul of the *Daubert* Court's admonition that the focus be on principles and methodology, not the conclusions drawn therefrom. But answering this criticism, the Court stated that "conclusions and methodology are not entirely distinct."[52]

3. *Kumho Tire Co., Ltd. v. Carmichael*

Daubert involved expert scientific testimony. In the six years that followed *Daubert*, the lower courts were divided as to whether the principles set forth in *Daubert* applied only to expert scientific testimony or also to technical and other

---

[46]522 U.S. 136 (1997).

[47]*Id*. at 139.

[48]*Id*. at 142.

[49]78 F.3d 524, 529 (11th Cir. 1996).

[50]522 U.S. at 142.

[51]*Id*. at 144.

[52]*Id*. at 146.

expert testimony.[53] The Supreme Court decided the issue in *Kumho Tire Co., Ltd. v. Carmichael*.[54]

Kumho Tire involved a products liability lawsuit against a tire manufacturer for a blow-out that caused death and serious injury.[55] An engineer testified for the plaintiff concerning the cause of the blow-out, claiming it was due to a defect in manufacture or design.[56] The trial court excluded his testimony, relying on *Daubert*, but the Eleventh Circuit reversed, holding that *Daubert* only applied to scientific testimony.[57] The Supreme Court, after looking at the express language of Rule 702 ("scientific, technical, or other specialized knowledge") and its prior holding in *Daubert* (stating it was referring to scientific testimony "because that was the nature of the expertise at issue"), held that *Daubert* applied to all expert testimony.[58]

The Court then considered the question of whether the four factors mentioned in *Daubert* were mandatory and exclusive. The answer was no to both questions. Quoting from *Daubert*, the *Kumho Tire* Court stated that the *Daubert* factors do not constitute a "definitive checklist or test," and, quoting from the Solicitor General's brief, the Court stated that the "factors identified in *Daubert* may or may not be pertinent in assessing reliability, depending on the nature of the issue, the expert's particular expertise, and the subject of his testimony."[59]

The *Kumho Tire* Court took pains to point out that each *Daubert* factor might not apply in every case. "It might not be surprising in a particular case, for example, that a claim made by a scientific witness has never been the subject of peer review, for the particular application at issue may never previously have interested any scientist."[60] Again alluding to but not mentioning "junk science," the Court stated that general acceptance is useless when the entire discipline lacks reliability, citing astrology and necromancy as examples.[61] The objective of the gatekeeping requirement is to ensure reliability and relevancy and to make certain the expert "employs in the courtroom the same level of intellectual rigor that characterizes the

---

[53]*Compare* Watkins v. Telsmith, Inc., 121 F.3d 984, 990-91 (5th Cir. 1997) (holding that *Daubert* applies to engineering testimony); Cummins v. Lyle Indus., 93 F.3d 362, 366-71 (7th Cir. 1996); Peitzmeier v. Hennessy Indus., Inc., 97 F.3d 293, 296-98 (8th Cir. 1996), *cert. denied*, 520 U.S. 1196 (1997), *with* Compton v. Subaru of Am., Inc., 82 F.3d 1513, 1518-19 (10th Cir.) (holding that *Daubert* does not apply to expert testimony of engineering car rollover case), *cert. denied*, 519 U.S. 1042 (1996); Desrosiers v. Flight Int'l of Fla. Inc., 156 F.3d 952, 960 (9th Cir. 1998) (holding that *Daubert* "may not apply to expert testimony based on technical, rather than scientific, knowledge.").

[54]526 U.S. 137 (1999).

[55]*Id*. at 142.

[56]*Id*. at 143.

[57]*Id*. at 146.

[58]*Id*. at 147-48.

[59]*Id*. at 150.

[60]*Id*. at 151.

[61]*Id*.

practice of an expert in the relevant field."[62] To date, this has been the last word from the Supreme Court on the subject.

III. TRADING MODELS

Trading models are commonly used as a tool to determine the number of shares traded in a class period to assess damages in securities class actions. When experts determine damages they do not have the actual trading records of each of the purchasing shareholders during the class period. The key question for experts testifying as to damages in securities cases is whether the trading model will satisfy the criteria laid out in *Daubert/Joiner/Kumho Tire*; specifically, whether the principles and methodology used employed the appropriate level of intellectual rigor in the field. The testifying expert in a securities case will calculate damages by determining how much the price per share was artificially inflated, multiplied by the total number of shares damaged. The shares are damaged when the stock price is artificially inflated by false and misleading statements disseminated to public, causing the price of the stock to be higher than the price the market would place on the stock if only truthful information had been available to traders.[63] Once the fraud is revealed or the market no longer places value on the false statement, the inflation is removed from the stock price and the market value represents the stock's true value. As a result, shareholders who purchased during the period of artificial inflation (the class period) suffer damages. A key variable in the damage calculation is how many shares traded during the class period represent shares that were purchased prior to the class period (and thus were previously purchased at an uninflated price) and how many shares purchased during the class period represent shares which have already been traded during the class period (and thus been previously purchased at a price already inflated by the fraud). Shares purchased for the first time during the class period and held until the end of the class period are commonly referred to as "retained shares and have been damaged to the full extent of the artificial inflation."[64] Shares purchased during the class period and resold during the class period are referred to as "in-and-out" shares.[65] The issue for the trading model to decide is how many shares purchased during the class period were later sold during the class period and are thus "in-and-out" shares and how many shares purchased during the class period were retained until the end of the class period.

---

[62]*Id.*

[63]Michael Barclay & Frank C. Torchio, *Complex Litigation at the Millenium: A Comparison of Trading Models Used for Calculating Aggregate Damages in Securities Litigation*, 64 LAW & CONTEMP. PROBS. 105, 106 (2001).

[64]Retained shares are damaged by the amount that the stock was artificially inflated when the shareholder purchased them.

[65]In-and-out shares may be damaged if there is partial disclosure of the fraud during the class period, creating partial damages to the shareholder, or if the value of the false information changes. For a lengthy discussion of in-and-out damages, see Green v. Occidental Petroleum Corp., 541 F.2d 1335, 1345-46 (9th Cir. 1976) (Sneed, J., concurring). In-and-out purchasers are often included in the class for class certification purposes. *See* The Nathan Gordon Trust v. Northgate Exploration, Ltd., 148 F.R.D. 105, 108 (S.D.N.Y. 1993).

A. Determining the Universe of Shares Available to Trade

The starting point of any trading model is to determine how many shares are available to trade during the class period and how many were actually traded. Initially, the "adjusted volume-to-float" ratio is determined by calculating the total number of shares that could have been traded on a given day (the float) and dividing by the adjusted volume.[66] The adjusted volume is calculated by starting with the total reported volume and eliminating reported volume attributable to intra-day market makers, specialist trades, and insider trades.[67] The float is determined by subtracting the number of shares that have been known not to trade during the class period from the total outstanding shares.[68] The adjusted volume-to-float ratio is an important factor in all trading models. As the float declines, so does the number of retained shares; conversely, as the float increases, the number of retained shares increases.[69]

B. Early Versions of the Proportionate Trading Model (Single Trader Model)

The early version of the PTM would be considered crude by today's standards. Ten years ago the PTM used gross volume figures without reductions for market makers or specialists, did not adjust float to control for shares held by insiders, and did not use institutional trading data.[70] This crude model thus used very high float and volume figures and treated institutional investors (who publicly report their trades) and individual investors (who do not) as fungible entities in the model. Using unadjusted trading volume and raw float, each share (whether held by an institution or an individual) would be given an equal probability of trading the next day. Whatever the merits or lack thereof of this approach, it bears little resemblance to the multi-trader PTM commonly used today.

C. Multi-Trader Models

There are several different variations of the PTM. Each of the models have different formulas and factors. The models can initially be divided into the single-trader PTM and the multi-trader PTM. One of the multi-trader models, the two trader model, divides the shares of stock into two groups: shares held by active traders and shares held by passive traders.[71] Each of these groups is assigned a different acceleration factor, which is a proportionality assumption about trading propensities. Proportional trading models assume that every share purchased has an equal chance of being sold on a subsequent day in the class period and thus have an

---

[66]Barclay & Torchio, *supra* note 63, at 107.

[67]*Id.* For instance, a stock traded on the NASDAQ is sold by one market maker and bought by another market maker, meaning two trades are reported but only one share is sold.

[68]*Id.* This can be determined from Securities and Exchange Commission (SEC) filings by institutions or insiders.

[69]*Id.*

[70]*See* Daniel R. Fischel & David J. Ross, *The Use of Trading Models to Estimate Aggregate Damages in Securities Fraud Litigation: A Proposal for Change*, in SECURITIES CLASS ACTIONS: ABUSES AND REMEDIES (Nat'l Legal Center for the Public Interest 1994).

[71]Barclay & Torchio, *supra* note 63, at 108.

acceleration factor of one. If the acceleration factor rises above one, however, shares purchased during the class period are more likely to have been sold later in the class period.[72] If the acceleration factor is less than one (actually, a deceleration factor), the purchased shares are less likely to be sold later in the class period.[73] An accelerated trading model uses an acceleration factor of more than one, as opposed to the most commonly used PTM among testifying experts for plaintiffs, which has an acceleration factor of exactly one.[74] With a higher acceleration factor, shares that have traded during the class period are more likely to be re-traded during the class period than shares that have not traded yet.[75] Some multi-trader models divide traders into two or more groups with different acceleration factors. One multi-trader model commonly used by defense testifying experts has two groups, one in which "active traders" are assumed to have held 20% of a company's stock and have an acceleration factor 20 times that of "passive" traders, who are assumed to hold 80% of the stock.[76]

Barclay and Torchio describe a PTM, with an acceleration factor of one, commonly used by plaintiffs' testifying experts in which institutional trading data is used to adjust the available float. Shares which are known not to have traded during the class period are removed from shares available to trade.[77] The group of shares with a known trading propensity of zero is removed from the calculations, making it in essence a two-trader PTM with a group of known non-traders and a group of traders with an acceleration factor of one.[78] In these circumstances, the results of a two-trader PTM with a set of non-traders and a set of proportionate traders with an acceleration factor of one is very similar (89% correlation) to a four trader model in which the group with the highest propensity to trade has an acceleration factor 40 times greater than the lowest propensity trading group.[79]

Distinctions between the PTM and Multi-Trader PTM are further muted in cases where there are longer class periods. The statute of limitations for Securities Exchange Act of 1934 ("Exchange Act") violations is five years and at least three years for Securities Act of 1993 violations.[80] Thus, in cases with a five year class

---

[72]Use of an acceleration factor has been criticized as placing an artificial cap on damages. Craig J. McCann & David Hsu, *Accelerated Trading Models Used in Securities Class Action Lawsuits*, 8 J. LEGAL ECON. 1, 3 (1998-99).

[73]Barclay & Torchio, *supra* note 63, at 107.

[74]A decelerated trading model has an acceleration factor of less than one. The most extreme example is a decelerated trading model in which no shares represent shares already traded, which can only be assumed until adjusted volume equals float available to trade. This extreme deceleration model maximizes damages in the shortest period.

[75]Barclay & Torchio, *supra* note 63, at 107-08; McCann & Hsu, *supra* note 72, at 7.

[76]Barclay & Torchio, *supra* note 63, at 111. Not surprisingly, the popular defense model results in the lowest possible damages. *Id*.

[77]*Id*. at 112.

[78]*Id*.

[79]*Id*.

[80]*See* 28 U.S.C. § 1658(b)(2) (five year statute of limitations for Exchange Act); 15 U.S.C. § 77m (three year statute of limitations for Securities Act violations.) It is a matter of dispute

period, there should be no discernable differences between the models, because no matter what acceleration factor is used, traded shares will usually exceed volume.

IV. *DAUBERT* SHOULD NOT PRECLUDE USE OF THE PROPORTIONATE TRADING MODEL

The critical issue is whether the PTM meets the criteria for expert testimony set forth in *Daubert*. As the plaintiffs have the burden of proof of damages for cases under the Exchange Act,[81] failure to have the testimony admitted would be fatal.[82] This issue, surprisingly, is not litigated often.

A. Limited Case Law Discussing the Proportionate Trading Model

There is sparse case law on the admissibility of the PTM. One early case, *RMED Int'l, Inc. v. Sloan's Supermarkets, Inc.* was the subject of both an opinion by the Magistrate Judge ("*RMED I*") and later the Article 3 Judge ("*RMED II*") handling the case. In *RMED I*,[83] the expert calculated inflation per share (by measuring the difference between closing prices and "true value") and then calculated the aggregate class damages by multiplying the inflation per share by the number of shares affected, using the PTM.[84]

In *RMED II*,[85] the defendants asked the judge to set aside the magistrate's order admitting the expert testimony. The court declined, stating that

> Surely, every [s]tock pricing model will be subject to some form of statistical criticism or unwanted interpretation. The court also recognizes that aggregate damages in securities fraud cases are generally incapable of mathematical precision. Nevertheless, to the extent defendants' concerns about [the expert's] analysis are valid, they go to the weight and credibility of her testimony, not its admissibility.[86]

---

whether the Sarbanes-Oxley Act of 2002 changed the statute of limitations for Securities Act claims from three years to five years in 2002. *See In re* Global Crossing Sec. Litig., 2003WL 22999478, at *3 (S.D.N.Y. 2003) (rejecting plaintiffs' claim that Sarbanes-Oxley Act extended statute of limitations for Securities Act to five years because claims were negligence-based). The holding of *Global Crossing* may have been overruled by the Second Circuit when it held that a claim under the Securities Act that "sounds in fraud" must comply with the requirements of FED. R. CIV. P. 9(b). *See* Rombach v. Chang, 355 F.3d 164, 171 (2d Cir. 2004). As the language of Sarbanes-Oxley states that statute of limitations for a private right of action that "involves a claim of fraud [or] deceit is five years," a plausible argument can be made that if a claim under the Securities Act "sounds in fraud," Sarbanes-Oxley extended the statute of limitations for such a claim to five years.

[81]15 U.S.C. § 78u-4(b)(4).

[82]The burden of proof of damages is reversed under the Securities Act, with a presumption of damages and a burden on defendants to disprove damages if they can. 15 U.S.C. § 77(k)(e).

[83]2000 WL 310352 (S.D.N.Y. Mar. 24, 2000).

[84]*Id*. at *5. The opinion does not explicitly state that the proportionate trading model was used, but the expert has informed the authors that it was.

[85]2000 WL 420548 (S.D.N.Y. Apr. 18, 2000).

[86]*Id*. at *2 (footnotes and citations omitted).

The defendants' remedy was vigorous cross-examination or a rebuttal expert.[87]

In *Kaufman v. Motorola, Inc.*,[88] the court rejected an expert's use of the PTM. The court stated that the plaintiff's expert admitted that the PTM did not meet any of the *Daubert* standards. In criticizing the PTM, the defendants' expert used a reliability test for economic theory developed by Milton Friedman: "The reliability of an economic theory is tested by comparing it to reality."[89] The plaintiff's expert stated that the model was never tested against reality and the court noted it was never accepted by professional economists and "seems to be a theory developed more for securities litigation than anything else."[90]

The statements/admissions by the plaintiff's expert in *Kaufman* seems odd, but odder still is the court's analysis. First, use of Friedman's test for reliability seems out of place in this context. Some theories are impossible to test against reality. Second, calculating the number of shares damaged by a securities fraud, almost by definition, will not be of interest to anyone other than a testifying expert in a lawsuit. It is not surprising the theory was developed in a litigation context.

B. Academic Criticism of the Proportionate Trading Model

The PTM has long been a target of the defense bar and their experts. Since the PTM is often used by experts testifying on behalf of plaintiffs, it is squarely within the sights of defendants as a way to limit their exposure.[91]

---

[87] *Id.*

[88] 2000 WL 1506892 (N.D. Ill. Sept. 21, 2000).

[89] *Id.* at *2. This is a very odd test to use in a litigation context. A testifying damages expert in a securities or antitrust case will inevitably hypothesize about what would have happened "but-for" the wrongdoing. Since the wrong did occur (which is the only reality we then have), there is no unaltered reality to compare the "but-for" hypothesis to. *See* Andrew I. Gavil, *After* Daubert: *Discerning the Increasingly Fine Line Between the Admissibility and Sufficiency of Expert Testimony in Antitrust Litigation*, 65 ANTITRUST L.J., 663, 674 (establishing level of control necessary to create a "but-for" reality is virtually impossible to achieve). In a sense, it is a variation of Heisenberg's uncertainty principle, which states that if an object's precise momentum is known, its position cannot be known with exact certainty. Likewise, an expert can know precisely what happened in a universe in which the wrong occurred, but can never state with absolute certainty what would have happened had the wrong not occurred.

[90] *Id.*

[91] Ironically, defendants may soon be hoisted on their own petard on this issue. Plaintiffs are now bringing what are referred to as "holder" cases in state court for breach of fiduciary duty or common law fraud claims on behalf of buyers who held stock before the class period and did not sell during the class period. *See*, *e.g.*, Small v. Fritz Cos., 65 P.3d 1255 (Cal. 2003) (alleging claims on behalf of a holder class for common law fraud); *In re* Worldcom Sec. Litig., 336 F. Supp. 2d 310 (S.D.N.Y. 2004) (denying claims on behalf of a holder class for breach of fiduciary duty); Meyer v. Putnam Int'l Voyager Fund, 2004 WL 199833 (D. Mass. Jan. 27, 2004) (alleging claims on behalf of holder class for breach of fiduciary duty). Retained shares in a federal fraud action plus the shares representing holders who did not purchase during the class period must add up to the float. The defense tactic of using mega-acceleration factors minimizes federal securities fraud damages, but maximizes state holder claim damages.

One early critique, by a popular defense expert, did not appear in a peer-reviewed journal, but in a privately published compendium of articles by the securities defense bar. In the article, Fischel and Ross list six perceived problems with the PTM: 1) over-estimating volume, 2) "outs-and-ins", 3) derivative or other securities, 4) no-shows and opt-outs, 5) indirect empirical tests, and 6) direct empirical tests.[92] We discuss each in turn.

Fischel and Ross's first criticism is that the reported volume during the class period may overstate the number of shares actually traded due to activity by market makers or specialists. This is not truly a criticism of the PTM, however. No matter what assumptions are used concerning the propensity of shares to trade during the class period, reported volume will have to be reduced to account for market makers and specialists. This has no direct bearing on the accuracy or inaccuracy of the PTM. It is merely a factual assumption that provides a starting point for any trading model, and most experts using a version of the PTM will, in fact, reduce reported volume to account for market makers and specialists.

The second criticism is that the PTM does not estimate the number of investors who sold shares that were purchased prior to the class period. "[I]t provides no mechanism for finding out the extent to which investors avoided injury because they were out-and-in during the Class Period (first selling and then buying)."[93] Fischel and Ross examined institutional holdings for one year of Intel Corp. and stated that 60 million shares were purchased by institutions and held until the end of the year, but institutions sold 14 million shares during the year prior to their purchases. "Thus, only 77% of the retained shares were retained by shareholders who were not out-and-in."[94] The factual predicate of this statement is sketchy and the significance, if any, is left unsaid. Fischel and Ross conspicuously do not state that the institutions that sold shares are the same institutions which later bought and retained shares. Therefore, the assumption that 23% of retained shares were retained by previous sellers is not a given. Furthermore, even if it were true, Fischel and Ross do not state what significance this fact has. Under this theory, a buyer who buys stock prior to the class period (at an uninflated price) and sells the stock during the class period (at an artificially inflated price) may actually benefit from the fraud.[95] For every securities fraud committed, there are countless unnamed beneficiaries: those people who sold stock during the class period at inflated prices. The "out-and-in" criticism seems to be saying that one person's gain from the fraud must be used to offset the losses suffered by some other class member.[96] This argument was recently rejected by a judge in the Southern District of New York.[97] Likewise, Fischel and Ross state

---

[92]*See* Fischel & Ross, *supra* note 70.

[93]*Id*. at 138. They concede the PTM controls for "in-and-outs" during the class period.

[94]*Id*.

[95]This "out-and-in" would not be a class member, because he did not purchase shares during the class period.

[96]Typically, a class member who is "in-and-out" during a class period, that is, buying and then selling, will have either no recognized loss or a much smaller recognized loss than a class member who is only a purchaser.

[97]*See In re* Blech Sec. Litig., 2003 WL 1610775, at *26 (S.D.N.Y. Mar. 26, 2003) (holding that defendants are not entitled to an offset for out-and-ins).

that the PTM does not purport to calculate which purchasers of common stock may have sold calls or purchased put options and thus profited from the fraud. What Fischel and Ross seem to be saying is that the damages a purchaser suffers from buying a stock at a fraudulently inflated price are mitigated if he has sold stock or options at an inflated price. This may or may not be true, but has no bearing on the accuracy of the PTM.

Fischel and Ross's fourth criticism is that not all class members file proofs of claim. "At best, the [PTM] predicts trading patterns. It does not provide any information about which class members will file claims."[98] That some class members will fail to submit a proof of claim to participate in a recovery is axiomatic: Some class members cannot be located, some cannot be bothered, some simply do not understand.[99] It is true that the PTM does not predict the number of non-participating class members; the PTM makes no attempt to do so. What is unclear is the significance of this truism. The PTM attempts to estimate the total number of shares traded during a class period and whether those shares were inflated by fraud. Whether the buyer of the share chooses to submit a proof of claim or not is irrelevant to the issue of whether that share was damaged.[100] The criticism that the PTM fails to predict the number of class members who will not submit their claims appears to be based on the premise that if you do not submit a proof of claim, you have not suffered any damages. This is like saying that if Party *A* bulldozes Party *B*'s house without Party *B*'s permission, and Party *B* does not sue Party *A*, Party *B* has not suffered compensable damages. Party *B* has clearly suffered tortious damages, but simply has not pressed his claim.

Fischel and Ross also conduct what they call an "indirect empirical test," again using institutional trading records for Intel for one year. They state that the PTM would predict 142.6 of Intel's 148.7 million outstanding shares were bought during the year, whereas institutional records state that institutions held and did not trade 77.4 million shares.[101] The flaws in this "indirect empirical test" are obvious. Fischel and Ross admit in a footnote that they made no adjustment to reported

---

[98]Fischel & Ross, *supra* note 70, at 139.

[99]This criticism has been repeated by others. *See* Robert A. Alessi, *The Emerging Judicial Hostility to the Typical Damages Model Employed By Plaintiffs in Securities Class Action Lawsuits*, 56 BUS. LAW. 483, 488-89 (2001). The "emerging hostility" Mr. Alessi refers to seem to boil down to two cases, Kaufman v. Motorola, 2000 WL 1506892 (N.D. Ill. Sept. 21, 2000), and *In re* N. Telecom Ltd. Sec. Litig., 116 F. Supp. 2d 446 (S.D.N.Y. 2000). 56 BUS. LAW. at 483. One court recently allowed the type of testimony excluded in *Kaufman*. *See In re* Blech Sec. Litig., 2003 WL 1610775, at *26 (S.D.N.Y. Mar. 26, 2003). Thus, one could say there is an emerging hostility to the hostility shown in *Kaufman*.

[100]*See* Barclay & Torchio, *supra* note 63, at 116 ("Each shareholder faces an economic decision about whether the time and effort required to retrieve trading records and complete the proof of claims forms is worth the expected damage award. But this individual decision about whether to file a claim does not alter the economic fact that a given share was damaged."). This criticism has been met with judicial skepticism. "Whether or not class member ultimately submit a claim form, as long as they have not opted out they remain members of the class and are bound by the judgment." *In re* Blech Sec. Litig., 2003 WL 1610775, at *26 (S.D.N.Y. March 26, 2004) (rejecting attack on plaintiffs' damages expert for not estimating number of class members who would not file claims).

[101]*See* Fischel & Ross, *supra* note 70, at 139.

volume, so their starting point is erroneous.[102] They also do not say whether they adjusted the number of outstanding shares to control for shares held by insiders. Additionally, most damage estimates using the PTM reduce the float by shares known to not have been traded, usually through institutional trading reports, which Fischel and Ross did not do in their test.

Finally, Fischel and Ross state that direct empirical tests undermine the PTM. Fischel and Ross rely on an article by two of their colleagues for this is discussed below.[103]

In addition to Fischel and Ross's criticisms of the PTM, Dean Furbush and Jeffery Smith argue that the PTM, with an acceleration factor of one, is unrealistic because "shares that have not traded recently are less likely to be traded than more recently traded shares."[104] Furbush and Smith offer no support for this integral assumption to their thesis,[105] and to a large extent it is counter-intuitive. A more compelling argument can be made that an investor, having recently spent all the time and money necessary to do his due diligence before purchasing a stock, is more likely to hold and retain the benefit of the due diligence than to sell and have to begin the process all over again.[106]

It has also been said that the PTM, with an acceleration factor of one, maximizes the damage estimates. This is demonstrably untrue. Maximum damages are realized

---

[102]*See* Barclay & Torchio, *supra* note 63.

[103]*See infra,* notes 110-122 and accompanying text.

[104]Dean Furbush & Jeffrey W. Smith, *Estimating the Number of Damaged Shares in Securities Fraud Litigation: An Introduction to Stock Trading Models*, 49 BUS. LAW. 527, 541 (1994).

[105]Seven years after the Furbush and Smith article, two professors have stated that "in spring 2000, new orders originating from firms that cater to day traders made up approximately 20 percent of new orders flowing into Nasdaq stocks." Brad M. Barber & Terrance Odeon, *The Internet and the Investor*, 15 J. ECON. PERSP. 41, 51 (2001). Shares purchased by day traders are certainly more likely to trade than other shares. However, while day-trading may have been a phenomenon in 2000, it is a curious footnote to history in 2004.

[106]The hypothesis that recently purchased shares are more likely to trade has been reiterated in a recent law review article. *See* John Finnerty and George Pushner, *An Improved Two-Trader Model for Measuring Damages in Securities Fraud Actions*, 8 STANFORD J.L. BUS. & FIN. 213, 230 (2003). Finnerty and Pushner state the that Accelerated Trading Model is "generally recognized by financial economists as superior to the PTM bcause of empirical evidence that investors trade the common stocks in their portfolios with different intensities." *Id*. To support this statement, Finnerty and Pushner cite to Furbush and Smith (discussed in note 104, *supra*, which offers no empirical support), Mayer (discussed in note 129, *infra*, which has no empirical support), Cone and Laurence (discussed in notes 110-122, *infra* and accompanying text, which has no empirical support), and two other unpublished articles. The unpublished articles, William H. Beaver and James K. Malernee, *Estimating Damages in Securities Fraud Cases* (1999), *at* http://www.cornerstone.com/fram_res.html, and William H. Beaver, James K. Malernee, & Michael C. Keeley, *Stock Trading Behavior and Damage Estimation in Securities Cases* (1999), *at* http://www.cornerstone.com/fram_res.html, contain no empirical evidence or cite any empirical evidence. If these "financial economists" are in fact relying on empirical evidence and not wishful thinking, such evidence is not evident.

when no share purchased during the class period has previously traded in the class period.[107]

C. Academic Support for the Proportionate Trading Model

To the extent the *Kaufman* court relied on the empirical testing and general acceptance prongs of *Daubert* in rejecting the proportionate trading model, such avenues may not be open to future courts considering the issue.[108] Recently, an article was published in *Law and Contemporary Problems* authored by a graduate business professor, Michael Barclay, at the University of Rochester, and a consultant, Frank C. Torchio.[109] This article exposes the errors in early criticism of the PTM and the mythology that has surrounded and grown from these flawed studies. Professor Barclay and Mr. Torchio expose the fallacies in a frequently cited criticism of the PTM authored by Kenneth Cone and James Laurence.[110] Cone and Laurence purported to test the PTM against empirical evidence based on claims submitted in two cases and concluded that the PTM overestimated the number of damaged shares.

The two cases cited by Cone and Laurence are *Biben v. Card* ("*Midwestern*")[111] and *Levit v. Aweida* ("*Storage Technology*").[112] In *Storage Technology*, Cone and Laurence state that only 9.3 million retained shares submitted claims, whereas they claim the PTM predicts a class three times that size. Barclay and Torchio show, however, that this analysis exposes the inherent fallacy of using claims submitted as a proxy for damaged shares.

Barclay and Torchio analyzed institutional trading records and found that institutions owned 15.4 million shares before the class period began that were traded during the class period.[113] Thus, at a minimum, there were 15.4 million damaged shares sold by institutions to class members during the class period. Institutions owned only 50% of the outstanding shares,[114] so shares owned and sold by individuals to class members must also have accounted for purchases of damaged shares during the class period as well. At a minimum, the 15.4 million damaged shares known to have been purchased during the class period by institutions makes the "9.3 million buy-and-hold shares submitted for claims a misleading and

---

[107]The practical limitation on this is float available to trade, so that once discounted volume during the class period equals float available to trade, damages are maximized.

[108]Even absent any academic support, testimony concerning the PTM would still be admissible. *See* Amorgianos v. Nat'l RR Passenger Corp., 303 F.3d 256, 267 (2d Cir. 2002) ("Where an expert otherwise reliably utilizes scientific methods to reach a conclusion, lack of textual support may 'go to weight, not the admissibility' of the expert's testimony.") (quoting McCullough v. H.B. Fuller Co., 61 F.3d 1038 (2d Cir. 1995)).

[109]Barclay & Torchio, *supra* note 63, at 105.

[110]*See* Kenneth R. Cone & James E. Laurence, *How Accurate are Estimates of Aggregate Damages in Securities Fraud Cases?*, 49 BUS. LAW. 505 (1994).

[111]789 F. Supp. 1001 (W.D. Mo. 1992).

[112]630 F. Supp. 1072 (D. Colo. 1986).

[113]Barclay & Torchio, *supra* note 63, at 114.

[114]*Id.*

inappropriate benchmark for assessing the efficacy of any trading model."[115] Furthermore, in a two year class period, during which the market gained 65% and Storage Technology lost 75% of its value, 125 million shares traded when 33 million shares were outstanding.[116] Thus, under Cone and Laurence's analysis, during the two year class period, 9.3 million shares traded of the 33 million outstanding shares, and almost 24 million shares did not trade. The 9.3 million shares Cone and Laurence believe did trade must have traded an average of over 13 times. The 9.3 million number not only fails in light of Barclay and Torchio's empirical analysis, but also defies any sort of common sense. Cone and Laurence state that the PTM predicts about 28 million retained shares.[117] This comports with intuitive judgments. With a volume of 125 million shares with a stock going in the opposite direction of the market,[118] one could expect a near-total turnover of the stock, with the buy-and-hold class members being the ones left holding the bag at the end of the class period. In fact, this is what the PTM predicts: 28 million of 33 million shares were bought and held, thus 5 million shares of the 33 million remained untraded during the class period. Cone and Laurence would have one believe that 9.3 million shares were bought and held, and 23 million remained untraded (with a total volume during the class period of 125 million). Aside from being demonstrably untrue, as the 9.3 million shares are only 60% of institutional shares *known* to have been sold during the class period, the 9.3 million figure violates any sort of common sense given the volume and the float involved. Use of claims submitted data as a proxy for *all* shares bought and held is thus improper.

In the *Midwestern* case, Cone and Laurence state that the claims submitted were 87% of the shares predicted by the PTM. Although Barclay is quick to disclaim that this is empirical evidence supporting use of the PTM, he claims a difference of 13%, when considered with the number of class members who undoubtedly will not submit claims, is not empirical evidence the PTM is inaccurate.[119]

Barclay counters the two cases cited by Cone and Laurence with more recent empirical data from the *In re Health Management, Inc. Securities Litigation* case. In *Health Management*, the plaintiffs' expert estimated that 5.631 million shares were damaged using the PTM.[120] The claims data submitted showed over 5 million shares were submitted for claim, or 89% of the number estimated by the PTM.[121] Barclay also notes that if reported NASDAQ volume was reduced by 67% (the number advocated by Cone and Laurence), instead of 50%, the correlation between shares submitted for claim and shares predicted by the proportionate trading model would have been more than 90%.[122]

---

[115] *Id.*

[116] *Id.*

[117] Cone & Laurence, *supra* note 110.

[118] *See* Barclay & Torchio, *supra* note 63, at 114.

[119] *Id.*

[120] *Id.* at 116-17 (citing *In re* Health Mgmt., Inc., Sec. Litig., 180 F.R.D. 40 (E.D.N.Y. 1999)).

[121] *Id.* at 117.

[122] *Id.*

D. Is the Proportionate Trading Model Real Science or Junk Science?

The *Daubert* Court stated that the key issue in determining whether a technique is scientific knowledge is whether it can or has been tested.[123] "Scientific methodology is based on generating hypotheses and testing them to see if they can be falsified."[124] In so holding, the *Daubert* Court is roughly summarizing the scientific process through paradigms described by Thomas Kuhn in his seminal work, *The Structure of Scientific Revolutions*.[125]

Kuhn describes a "paradigm" as that which is "sufficiently unprecedented to attract an enduring group of adherents away from competing modes of scientific activity, . . . and sufficiently open-ended to leave all sorts of problems . . . to resolve."[126] A paradigm is "more successful than [its] competitors in solving a few problems that the group of practitioners has come to recognize as acute."[127] Certainly, the PTM, with an acceleration factor of one, can be considered a paradigm in the classic sense. It is unprecedented. In fact the *Motorola* court recognized it was created to solve a particular problem.[128] It has attracted a large number of adherents. And to borrow again from Kuhn, all that remains is what he calls "puzzle-solving," i.e. solving problems, refining the theory, and testing it.[129]

Every expert and practitioner now uses some form of the PTM. The issues that remain are simply ones of refinement. The Multi-Trader PTM represented a step forward in the evolution of the PTM when it began treating institutional traders separately from individual traders.[130] The only real issue is not whether the PTM should be used but whether an acceleration factor of one should be used or not. If science, paraphrasing Kuhn, consists of finding a theory to explain observed facts and provide hypotheses for future events that serves as a working model until observed anomalies force a paradigm shift, the PTM seems to function as science.

---

[123]509 U.S. 579, 593 (1993).

[124]*Id.* (quoting E. GREEN & CO. REASON, PROBLEMS, CASES AND MATERIALS ON EVIDENCE 648 (1983)).

[125]THOMAS S. KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS (3d ed. 1996).

[126]*Id.* at 10.

[127]*Id*. at 23.

[128]Kaufman v. Motorola, 2000 WL 1506892, at *2 (N.D. Ill. Sept. 21, 2000) ("It seems to be a theory developed more for securities litigation than anything else.").

[129]KUHN, *supra*, note 125, at 36-39. An alternative way of viewing it is that the PTM, with an acceleration factor of one, and the multi-trader PTM with an acceleration factor greater than one, are competing paradigms in a field which has yet to develop its first firm paradigm. *See id*. at 15-17. "No wonder, then, that in the early stages of the development of any science different men confronting the same range of phenomena, but not usually all the same particular phenomena, describe and interpret them in different ways." *Id*. at 17.

[130]Thus, the early criticism that the Single Trader Model "takes no special account either from a volume perspective or an ownership perspective of institutional shares known to have traded during the [class] period," is no longer an issue if the expert uses the Multi-Trader Model calculating institutional and individual damages separately. *See* Marcia Kramer Mayer, *Best-Fit Estimation of Damaged Volume In Shareholder Class Actions: The Multi-Sector, Multi-Trader Model of Investor Behavior*, at 4 (unpublished 1996) (on file with authors).

Practitioners in the narrow field of estimating class size use the PTM and use observed facts to fit within their particular variants of the paradigms as best they can.

Using the criteria set forth in *Daubert*, the PTM also seems to be "real" science as opposed to "junk" science. The *Daubert* test has four prongs: 1) whether the testimony will assist the trier of fact; 2) whether it is subject to peer review and publication; 3) the known or potential rate of error; and 4) the general acceptance of the theory. All four prongs support admitting expert testimony using the PTM.

1. Assisting the Trier of Fact

There can be little argument that the PTM will assist the trier of fact. The Advisory Committee notes to FED. R. EVID. 702 state that

> [t]here is no more certain test for determining when experts may be used than the common sense inquiry whether the untrained layman would be qualified to determine intelligently and to the best possible degree the particular issue without enlightenment from those having a specialized understanding of the subject involved in the dispute.[131]

A jury, left to its own devices, would have absolutely no idea how to determine the amount of shares damaged by the fraud. An expert testifying as to damages, using the PTM to estimate retention damages and in-and-out damages, is thus an invaluable aid to the jury.

2. Peer Review

The PTM, in its most basic form, has been subjected to peer review and publication numerous times. Barclay and Torchio forcefully and persuasively make the case that the Multi-Trader PTM, with an acceleration factor of one, is proper.[132] Cone and Laurence argue against an acceleration factor of one, but use a variant of the Multi-Trader PTM. The question being debated in the journals is not whether to use the PTM, but which acceleration factor to use. This is a fact about which reasonable minds can disagree, and is a determination best left to the jury.

3. Rate of Error

The rate of error for the Multi-Trader PTM, using an acceleration factor of one, is open to discussion. In some ways, the true rate of error will never be known, but attempts have been made to quantify it. As discussed above, Cone and Laurence find a high, and in their view unacceptable, rate of error.[133] However, Barclay and Torchio, using more current data, find a rate of error within acceptable tolerances, in their opinion.[134] In the authors' opinion, the Barclay and Torchio empirical analysis is sounder, and the rate of error supports admission of expert testimony using the PTM.

---

[131] *See also* United States v. Bilzeran, 926 F.2d 1285, 1294 (2d Cir. 1991) ("Particularly in complex cases involving the securities industry expert testimony may help a jury understand unfamiliar terms and concepts.").

[132] Barclay & Torchio, *supra* note 63, 114-17.

[133] *See supra* notes 110-122 and accompanying text.

[134] *Id.*

4. General Acceptance

As stated above, the Multi-Trader PTM, which computes damages for institutional traders using data from public filings, and then uses this data as a starting point to compute non-institutional trading volume, is used by both plaintiffs and defendants in most securities cases. The only difference is the question of which acceleration factor to use. There is general acceptance on using the PTM; there is still disagreement on which acceleration factor to use.

V. CONCLUSION

The PTM has all the hallmarks of "real" science, using either a scientists' definition or that of the *Daubert* Court. From a scientist's perspective, it is a functional paradigm, serving as a working model. The practitioners in the field are engaged in "clean-up," for example, deciding which acceleration factor best fits observed data. Under the *Daubert* test, the PTM will assist the trier of fact, has been subjected to peer review (unlike the major critique), and has acceptable rates of error and general acceptance. Testifying experts may disagree as to which acceleration factor to use, but that is merely fair ground for impeachment and cross-examination.[135] The testimony should be admitted and left to the jury to decide.

[135] *See* D.H. Kaye, *The Dynamics of Daubert: Methodology, Conclusions, and Fit in Statistical and Econometric Studies*, 87 VA. L. REV. 1933, 1968-69 (2001) (explaining that unlike novel theories of chemistry or physics, adequacy, limits, and assumptions in mathematical and statistical models can be readily defined by other experts and thus effective opposing testimony is generally available).