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THE LEGAL RELEVANCE OF ECONOMICS

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ABSTRACT

All courtroom evidence must be legally relevant to be admissible. A consensus among contemporary economists is that econometric modeling has successfully created a vast web of interrelated causal inferences that collectively constitute “economic theory.” Econometric models have become an important part of complex litigation involving employment, antitrust, and the measurement of damages. Although judicial opinions exhibit considerable inconsistency and incoherence with respect to the admissibility of this testimony under the Daubert trilogy, judges typically defer to professional consensus and find the evidence relevant. Forms of economic testimony other than econometrics are almost nonexistent.

However, the mainstream adulation among professional economists for “orthodox” econometric modeling conceals noteworthy, outlier, “heterodox” economists who reject econometrics as a valid method of scientific inquiry. Given outlier economists’ disdain for the vast body of mainstream economic theory and inferences derived from econometrics, the proper processes for deciding which economic theories are legally relevant, and which are not, are far murkier than previously contemplated.

Because scholars call for a conversation among different schools of economics, and jurors, in ascertaining truth, reason about the relevance of even conflicting expert testimony, this Article argues that judges should admit as legally relevant any proposed

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economic testimony—whether econometric or heterodox. Judges should, however, fashion jury instructions describing (but not advocating or criticizing) the witness's “type” or “camp” of economic beliefs to ensure the economic testimony's legal relevance.

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INTRODUCTION

Although economists only started to incorporate math and statistics in the 1940s, by the turn of the century, econometric models built on sophisticated statistical techniques like regression analysis had become “the predominant epistemic genre in economic science.”¹ Econometrics has impacted litigation where expert testimony based

1. Mary S. Morgan & Tarja Knuuttila, *Models and Modelling in Economics*, in 13 *PHILOSOPHY OF ECONOMICS* 49, 49 (Uskali Mäki ed., 2012); see Robert M. Solow, *How Did Economics Get That Way and What Way Did It Get?*, 126 *DAEDALUS* 39, 43 (1997) (contrasting the dearth of modeling in economics education in the 1940s with how econometrics became a required part of an economist's education).

upon statistical models is “ubiquitous” if not essential for many complex cases.² For example, an economics expert can help prove discrimination by correlating race or gender, instead of seniority or job title, with an adverse employment action.³ Alternatively, a model can help an expert explain that, but for the anticompetitive conduct of the defendant, the plaintiff would have thrived in a particular market.⁴ In these and other business lawsuits, calculating damages requires considering a counterfactual past and years of data, so an econometrician constructs a model and performs a regression analysis that accounts for numerous variables in arriving at a dollar amount.⁵

The economics expert often provides the only evidence of discrimination, causation, and damages; without this testimony, plaintiffs cannot prevail.⁶ Defendants therefore fight the admissibility of model-based economics expert testimony through a *Daubert* challenge under Federal Rule of Evidence 702.⁷ *Daubert v. Merrell Dow Pharmaceuticals, Inc.*⁸ and Rule 702 require trial judges to be “gatekeepers” by assessing the reliability of expert testimony before admitting it for the jury to consider.⁹ The

2. See Rebecca Haw Allensworth, *Law and the Art of Modeling: Are Models Facts?*, 103 GEO. L.J. 825, 835 (2015); D.H. Kaye, *The Dynamics of Daubert: Methodology, Conclusions, and Fit in Statistical and Econometric Studies*, 87 VA. L. REV. 1933, 1986 (2001) [hereinafter Kaye, *The Dynamics of Daubert*] (“[T]hrough the efforts of economists and statisticians in a broad spectrum of cases, courts became exposed to—and came to expect—more sophisticated and potentially more useful statistical models.” (citations omitted)).

3. E.g., Joni Hersch & Blair Druhan Bullock, *The Use and Misuse of Econometric Evidence in Employment Discrimination Cases*, 71 WASH. & LEE L. REV. 2365, 2373–76 (2014); see Marc Chase McAllister, *Subgroup Analysis in Disparate Impact Age Discrimination Cases: Striking the Appropriate Balance Through Age Cutoffs*, 70 ALA. L. REV. 1073, 1080 (2019) (claiming that employment disparate impact claims, particularly for age discrimination, require evidence of statistical disparity between the plaintiff subgroup and comparators).

4. See John E. Lopatka & William H. Page, *Economic Authority and the Limits of Expertise in Antitrust Cases*, 90 CORNELL L. REV. 617, 684–85 (2005); see also Camden Hutchison, *Law and Economics Scholarship and Supreme Court Antitrust Jurisprudence, 1950-2010*, 21 LEWIS & CLARK L. REV. 145, 151 (2017) (“[A]ntitrust trials in district courts . . . regularly include the participation of economists as expert trial witnesses.”).

5. See Mark A. Allen, Robert E. Hall & Victoria A. Lazear, *Reference Guide on Estimation of Economic Damages*, in FED. JUDICIAL CTR., REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 425, 430–31 (3d ed. 2011); see also 1 DAN B. DOBBS, LAW OF REMEDIES: DAMAGES—EQUITY—RESTITUTION 324–26 (2d ed. 1993).

6. Jeff Todd, *An Interdisciplinary Perspective on Economic Models in Complex Litigation*, 46 HOFSTRA L. REV. 971, 976, 995–97 (2018) [hereinafter Todd, *An Interdisciplinary Perspective*] (listing examples where full or partial exclusion of economics expert testimony resulted in defendants winning summary judgment, money damages being denied, and a class not being certified); see also Roger D. Blair & Jill Boylston Herndon, *The Implications of Daubert for Economic Evidence in Antitrust Cases*, 57 WASH. & LEE L. REV. 801, 802 (2000) (“[I]f a court strikes a plaintiff’s economic expert [in an antitrust case,] [t]he plaintiff would have no one to define relevant markets, to analyze antitrust injury, or to provide damages estimates. . . . [T]he plaintiff’s case may evaporate.”).

7. FED. R. EVID. 702; see, e.g., Blair & Herndon, *supra* note 6, at 801–02 (claiming that *Daubert* challenges to economics expert testimony in antitrust cases had already become “routine” as early as 2000); John W. Hill, Paul Hogan, Yassir Karam & Arlen Langvardt, *Increasing Complexity and Partisanship in Business Damages Expert Testimony: The Need for a Modified Trial Regime in Quantification of Damages*, 11 U. PA. J. BUS. L. 297, 310–11 (2009) (writing that “district courts are taking their gatekeeper role seriously in the post-*Daubert* era,” including by considering opponents’ challenges to expert testimony regarding damages).

8. 509 U.S. 579 (1993).

9. E.g., Blair & Herndon, *supra* note 6, at 809; Hill et al., *supra* note 7, at 310–11; see FED. R. EVID. 702; *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 141 (1999) (extending judges’ gatekeeping role under *Daubert* to technical and other specialized knowledge); *Gen. Elec. Co. v. Joiner*, 522 U.S. 136, 142 (1997) (holding that a

Daubert trilogy—the three Supreme Court cases that essentially govern the admissibility of expert testimony—dealt with experts in medicine and the hard sciences.¹⁰ Those cases therefore offer insufficient guidance for economics, which is not only a science because it relies on statistics but also an art because economists make numerous assumptions and choices in constructing a model.¹¹

Opponents typically challenge the modeler's artistry rather than her mathematics,¹² which results in courts applying *Daubert* factors that are inapt for gauging the reliability of assumptions and omissions. As such, it is not surprising that courts make inconsistent rulings, such as rulings on the admissibility of testimony based upon models with numerous questionable assumptions.¹³ Sometimes this testimony is admitted for the jury to weigh, while other times courts catalogue the issues as a reason to deny admission.¹⁴ Further, many rulings lack a clear—or any—rationale, making the reasoning underlying an opinion difficult to decipher and creating other problems like blurring the standards for evaluating the sufficiency versus reliability of the evidence.¹⁵

Though scholars have addressed these problems in thorough detail, the scholarship itself lacks sufficient coherence and consistency to offer a solution.¹⁶ For example, the

judge's decision to admit or exclude expert evidence is reviewed under an abuse of discretion standard); *Daubert*, 509 U.S. at 597.

10. *Kumho*, 526 U.S. at 142–45, 153 (proposing an engineering expert who relied upon measurement and inspection of the allegedly defective tire); *Joiner*, 522 U.S. at 143–46 (proposing expert testimony based upon studies of animals exposed to polychlorinated biphenyls and epidemiological studies); *Daubert*, 509 U.S. at 583 (proposing experts who testified based upon in vitro and in vivo animal studies, pharmacological reports, and reanalysis of epidemiological studies); see Aaron D. Twerski & Lior Sapir, *Sufficiency of the Evidence Does Not Meet Daubert Standards: A Critique of the Green-Sanders Proposal*, 23 WIDENER L.J. 641, 650 (2014) (writing that the *Daubert* factors have served primarily as a screen in toxic tort cases).

11. See, e.g., Allensworth, *supra* note 2, at 828–29 (writing that models blend science and art so that “assumptions and choices” go into the construction of a model); Kenneth G. Dau-Schmidt, *Relaxing Traditional Economic Assumptions and Values: Toward a New Multidisciplinary Discourse on Law*, 42 SYRACUSE L. REV. 181, 184 (1991) (“[T]he true art of economic analysis lies in understanding the assumptions of the model and their implications for the analysis.”); Mark Klock, *Contrasting the Art of Economic Science with Pseudo-Economic Nonsense: The Distinction Between Reasonable Assumptions and Ridiculous Assumptions*, 37 PEPP. L. REV. 153, 194 (2010) (“The economist’s claim to being a scientist comes from the discipline’s commitment to a methodology which is scientific.”); Jeff Todd & R. Todd Jewell, *Dubious Assumptions, Economic Models, and Expert Testimony*, 42 DEL. J. CORP. L. 279, 287–90 (2018) [hereinafter Todd & Jewell, *Dubious Assumptions*] (explaining the scientific aspects of modeling, like the use of regression analysis to account for multiple factors and voluminous data and the artistic aspects, like the choices and intuition of the economist in constructing the model).

12. See Hill et al., *supra* note 7, at 331 n.253.

13. See *id.* at 311–14.

14. See *id.* at 311, 314–15 (citing, *inter alia*, *Lippe v. Bairnco Corp.*, 99 F. App’x 274, 278–79 (2d Cir. 2004); *Audubon Veterinary Hosp., Inc. v. U.S. Fid. & Guar. Co.*, No. 06-5875, 2007 WL 1853369, at *2 (E.D. La. June 25, 2007)).

15. See Allensworth, *supra* note 2, at 862–65; Michael D. Green & Joseph Sanders, *Admissibility Versus Sufficiency: Controlling the Quality of Expert Witness Testimony*, 50 WAKE FOREST L. REV. 1057, 1057 (2015) [hereinafter Green & Sanders, *Admissibility Versus Sufficiency*] (“[C]onfusion exists because of the unresolved relationship between the admissibility of expert testimony on the one hand and the sufficiency of the scientific evidence to support a plaintiff verdict on the other hand.”).

16. David L. Faigman, Christopher Slobogin & John Monahan, *Gatekeeping Science: Using the Structure of Scientific Research to Distinguish Between Admissibility and Weight in Expert Testimony*, 110 NW. U. L. REV. 859, 873–74 (2016) [hereinafter Faigman et al., *Gatekeeping Science*] (noting that the Supreme Court, Federal

party proffering an expert can find academic support for a low admissibility threshold and argue that the judge should step aside in most instances and allow the fact finder to gauge the expert's credibility.¹⁷ The opponent, however, can also find commentary arguing that the judge should be a strong gatekeeper who limits how much the jury sees.¹⁸ The *Daubert* trilogy and comments to Rule 702 refer specifically to economics when explaining that courts should reference the "knowledge and experience" of the relevant field during admissibility determinations.¹⁹ Accordingly, one commentator in a pair of articles attempts to resolve the impasse by drawing upon the multidecade debate among economics methodologists about what models are and how they function.²⁰ He argues that the methodological theory supports admitting economics expert testimony for the jury to assess credibility.²¹

While these guidelines can aid in the admissibility of testimony based upon econometric models, the "knowledge and experience" of the field also includes many noteworthy, outlier economists who disparage econometrics as a valid method of scientific inquiry.²² For instance, "Austrian school" economists believe that only logical

Rules of Evidence, and commentators have not offered "a clear conceptual basis for making the necessary distinctions" between admissibility and weight).

17. See, e.g., Anthony J. Casey & Julia Simon-Kerr, *A Simple Theory of Complex Valuation*, 113 MICH. L. REV. 1175, 1181–82, 1187–88 (2015) (arguing that courts should approach complex valuation as "run-of-the-mill" fact finding based on credibility judgments); Malcolm B. Coate & Jeffrey H. Fischer, *Daubert, Science, and Modern Game Theory: Implications for Merger Analysis*, 20 SUP. CT. ECON. REV. 125, 151 (2012) (writing that courts should admit expert testimony based on game theoretic economic models that "ha[ve] survived some minimal level of scientific testing" and that "offer[] some ability to resolve the question in dispute" (emphasis added)); Jonah B. Gelbach, *Estimation Evidence*, 168 U. PA. L. REV. 549, 630 (2020) ("[T]he Federal Rules require much more liberal treatment of plaintiffs' statistical evidence than much current practice reflects.").

18. E.g., Allensworth, *supra* note 2, at 839–46, 850–52 (urging that the approach to model-based testimony is a mixed question of law and fact, so most issues are decided by the judge rather than the jury); Robert M. Lloyd, *Proving Lost Profits after Daubert: Five Questions Every Court Should Ask Before Admitting Expert Testimony*, 41 U. RICH. L. REV. 379, 380–81 (2007) (proposing five questions that judges should ask to limit the admission of damages expert testimony that can "bamboozle" the jury).

19. FED. R. EVID. 702 advisory committee's note to 2000 amendment ("[W]hether the testimony concerns economic principles, accounting standards, property valuation or other non-scientific subjects, it should be evaluated by reference to the 'knowledge and experience' of that particular field." (alteration in original) (quoting Am. Coll. of Trial Lawyers, *Standards and Procedures for Determining the Admissibility of Expert Evidence After Daubert*, 157 F.R.D. 571, 579 (1994))).

20. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 1025–26; Jeff Todd, *Realistic Assumptions in Economic Models*, 47 HOFSTRA L. REV. 231, 292 (2018) [hereinafter Todd, *Realistic Assumptions*].

21. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 1025–26 (explaining how models are tropes and modelers are storytellers so the jury, as the target audience, should be allowed to assess whether the model and the expert's narrative explaining the model are credible); Jeff Todd, *Realistic Assumptions*, *supra* note 20, at 292 (concluding that the different types of assumptions and different meanings of "realistic" allow for most, though not all, questions about the credibility of artistic assumptions to go to the jury for an assessment of credibility); see Hannah Faulkner, *Realistic Assumptions, Economic Models, and the Admissibility of Expert Testimony in the Class Action Lawsuit Dover v. British Airways*, 17 J.L. ECON. & POL'Y (forthcoming 2021) (on file with authors) (applying economics methodologist theory to the court's admissibility rulings in a class action lawsuit).

22. See Christopher P. Guzelian, *Testing Economic Theory*, 15 PROCESOS DE MERCADO 303, 305–06, (2018) (Spain) [hereinafter Guzelian, *Testing*]; Christopher P. Guzelian & Robert F. Mulligan, *The Wisselbank*

and deductive reasoning from an axiom that “humans act,” rather than inductive and quantitative inferences derived from econometrics, yields true economic theory.²³ Austrians therefore consider econometrics as misleading quackery and pseudoscience.²⁴

Separately, “fractal” economists, in the tradition of Benoit Mandelbrot, believe that most economic phenomena are too complex to be modeled in simple cause-and-effect relationships between specific isolated variables.²⁵ Thus, while fractal economists build models, they reject the idea of trying to create causal inferences either inductively (as econometricians do) or deductively (as Austrians do).²⁶

A judge faced with a challenge to an econometrician’s model-based testimony could reject heterodox economists by reasoning that, because the opposing testimony is outside the consensus of contemporary economics, it is unreliable under *Daubert* and Rule 702.²⁷ However, ignoring these voices on this basis also ignores the order of operation: under the Federal Rules of Evidence, the judge’s first responsibility is truth seeking, then relevance, and then reliability.²⁸ After all, the Court in *Daubert* began its analysis not with Rule 702 but with Federal Rules of Evidence 401 and 402 on relevance.²⁹ The Court went on to write that “under the Rules the trial judge must ensure

and Amsterdam Price Volatility: A Fractal Test of the Austrian Fractional-Reserve Banking Hypothesis, 12 PROCESOS DE MERCADO 13, 16 (2015) (Spain).

23. E.g., LUDWIG VON MISES, EPISTEMOLOGICAL PROBLEMS OF ECONOMICS, at v (George Reisman trans., D. Van Nostrand, Co. 1960) (1933) [hereinafter MISES, EPISTEMOLOGICAL PROBLEMS]; LUDWIG VON MISES, HUMAN ACTION 57 (Henry Regnery Co. 3d rev. ed. 1966) [hereinafter MISES, HUMAN ACTION]; Joseph T. Salerno, *Introduction to the Second Edition* of MURRAY N. ROTHBARD, MAN, ECONOMY, AND STATE WITH POWER AND MARKET, at xxiii (2d ed. 2009).

24. See JESÚS HUERTA DE SOTO, THE AUSTRIAN SCHOOL: MARKET ORDER AND ENTREPRENEURIAL CREATIVITY 95–100 (Edward Elgar Publ’g 2008) (2000) [hereinafter DE SOTO, THE AUSTRIAN SCHOOL].

25. E.g., BENOIT B. MANDELBROT & RICHARD L. HUDSON, THE (MIS)BEHAVIOR OF MARKETS: A FRACTAL VIEW OF RISK, RUIN, AND REWARD (2004); see LAURENT E. CALVET & ADLAI J. FISHER, MULTIFRACTAL VOLATILITY: THEORY, FORECASTING, AND PRICING (2008); EDGAR E. PETERS, FRACTAL MARKET ANALYSIS: APPLYING CHAOS THEORY TO INVESTMENT AND ECONOMICS (1994).

26. See Benoit B. Mandelbrot, *How Fractals Can Explain What’s Wrong with Wall Street*, SCI. AM. (Sept. 15, 2008), <http://www.scientificamerican.com/article/multifractals-explain-wall-street/> [https://perma.cc/X2J8-V7XF] [hereinafter Mandelbrot, *What’s Wrong with Wall Street*].

27. *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 594 (1993) (“[A] known technique which has been able to attract only minimal support within the community’ may properly be viewed with skepticism.” (quoting *United States v. Downing*, 753 F.2d 1224, 1238 (3d Cir. 1985))); Thomas G. Hungar & Ryan G. Koopmans, *Appellate Advocacy in Antitrust Cases: Lessons from the Supreme Court*, ANTITRUST, Spring 2009, at 53, 54 (writing that courts in antitrust cases prefer economic evidence based on consensus); see, e.g., *Weyerhaeuser Co. v. Ross-Simmons Hardwood Lumber Co.*, 549 U.S. 312, 323–26 (2007) (vacating a jury award where the district court admitted dueling experts and the weight of economic authority supported the theory relied upon by the defendant’s rather than the plaintiff’s expert); Alfred G. Wirth, *Opening Remarks by Alfred Wirth*, in 11 EXPLORATIONS IN AUSTRIAN ECONOMICS 7, 9 (Roger Koppl ed., 2008) (“As a competitor outside today’s mainstream, the Austrian School’s influence may seem somewhat marginal sometimes, but its work is certainly not second rate. And it remains a very important contributor to economic thought.”).

28. E.g., Chet K.W. Pager, *Blind Justice, Colored Truths and the Veil of Ignorance*, 41 WILLAMETTE L. REV. 373, 374 (2005) (“[A]scertaining truth is the very function of the trial and . . . [the rules of evidence] . . . ensure so far as possible that only relevant and accurate information affect the jury’s decision-making.”); see Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 296 (recognizing that, in addition to Rule 702, evidentiary rules dealing with relevance also affect the admissibility of economics expert testimony).

29. *Daubert*, 509 U.S. at 587 (quoting FED. R. EVID. 401–402).

that any and all scientific testimony or evidence admitted is not only relevant, but reliable.”³⁰

This admonition was not a mere formality. In fact, the Court had already recognized that econometric models are not automatically relevant: a footnote in the pre-*Daubert* case *Bazemore v. Friday*³¹ suggested that a model could be so incomplete as to be inadmissible as irrelevant.³² Courts continue to cite *Bazemore* when excluding model-based testimony.³³

The model’s inability to account for all variables means that it is false in the sense that it is incomplete and can never fully reveal the truth.³⁴ This inability therefore thwarts the primary purpose of the Federal Rules of Evidence: “ascertaining the truth.”³⁵ Accordingly, courts cannot base admissibility on consensus because the challenges leveled by heterodox economists, the limitations recognized by orthodox methodologists, and the potential shortcomings described by courts call the relevance and truth-seeking ability of models into doubt.

One takeaway would be to impose a high—if not insurmountable—admissibility threshold for all economics expert evidence.³⁶ Another, perhaps counterintuitive, response is to trust the jury by lowering the threshold for admitting economics expert testimony, regardless of whether that expert adheres to consensus or heterodox theories.³⁷ The judge approaches relevance not by objectively knowing the truth of any evidence or depending only upon a subjective gut feeling, but through a typological inquiry.³⁸ The inquiry is semi-objective because judges evaluate relevance via several

30. *Id.* at 589.

31. 478 U.S. 385 (1986) (per curiam).

32. *Bazemore*, 478 U.S. at 400 n.10 (Brennan, J., concurring).

33. See, e.g., *Morgan v. United Parcel Serv. of Am., Inc.*, 380 F.3d 459, 468–72 (8th Cir. 2004) (relying on *Bazemore* to justify excluding an expert in a workplace discrimination case in which the analyses did not contain explanatory variables about past pay and performance); *In re Live Concert Antitrust Litig.*, 863 F. Supp. 2d 966, 973, 978–79 (C.D. Cal. 2012) (looking to *Bazemore* to support granting a motion to exclude an economics expert in a concert ticket antitrust case in which the regression analysis did not account for artist quality and the rise of downloadable music before the alleged anticompetitive conduct).

34. E.g., Paul J. Heald, *Economics as One of the Humanities: An Ecumenical Response to Weisberg, West, and White*, 4 S. CAL. INTERDISC. L.J. 293, 308 (1995) (“Without accounting for all variables, economics can seldom prove to us what the right answer is.”); Uskali Mäki, *Reorienting the Assumptions Issue*, in NEW DEVELOPMENTS IN ECONOMIC METHODOLOGY 236, 243 (Roger Backhouse ed., 1994) [hereinafter Mäki, *Reorienting*] (writing that models are always incomplete and thus can never tell “the whole truth”).

35. FED. R. EVID. 102; Christopher P. Guzelian, *False Speech: Quagmire?*, 51 SAN DIEGO L. REV. 19, 21 (2014) (“The stated goal of the Federal Rules of Evidence is reaching the truth.”); see also *United States v. Lee*, 972 F. Supp. 1330, 1345 n.5 (D. Kan. 1997) (“The trial judge is properly governed by the interest of justice and truth . . .” (quoting *United States v. Liddy*, 509 F.2d 428, 438 (D.C. Cir. 1974))).

36. See *infra* notes 183–190 and accompanying text for a summary of arguments supporting higher admissibility standards.

37. See Rebecca Haw, *Adversarial Economics in Antitrust Litigation: Losing Academic Consensus in the Battle of the Experts*, 106 NW. U. L. REV. 1261, 1287–88 (2012) (proposing that, when dueling expert testimony is based upon both consensus and “nonconsensus” theories, the court admit both so that the jury can assess their credibility).

38. Christopher P. Guzelian, *Relevance*, 10 CHARLESTON L. REV. 159, 161–62, 167 (2016) [hereinafter Guzelian, *Relevance*].

shared extralegal “hunch-producers”—such as the nexus of U.S. laws and rules, the situational context, and the constitutional moral instinct.³⁹

These hunch-producers include a body of economic scholarship calling for more integration of the various camps of economics in general⁴⁰ and legal scholarship calling for acceptance of various camps of economics based on the context of a specific case.⁴¹ Other scholarship comments on the inherent risks of leaving technical decision-making up to the jury,⁴² especially considering that a jury may determine the truth by constructing its own story from its experiences outside of trial as well as conflicting strands of expert testimony.⁴³ The implication for economics expert testimony is that the remedy for the incompleteness or misuse of any one camp is not exclusion but inclusion: the judge should admit multiple—and even divergent—approaches to economics since each can contribute to the jury’s ascertainment of truth as relevant for trial.⁴⁴

This Article argues that all economics expert testimony should have a low admissibility threshold because the jury is tasked with deciding relevance in conjunction with deciding truth. Section I addresses the science and art of econometric modeling as used in litigation, the function of the judge as a gatekeeper under the *Daubert* trilogy, and the incoherent and inconsistent admissibility rulings resulting from application of the *Daubert* standards. Section II surveys the scholarly solutions by highlighting how they are incomplete and inconsistent with each other. It then closes with a consideration of how the debate among economics methodologists about models and their assumptions supports a low admissibility threshold. Section III extends the discussion of economics scholarship to heterodox voices, like the Austrian school and fractal economics, who challenge the function and value that methodologists ascribe to econometric models. Because heterodox economists raise questions not only regarding the reliability but also the relevance of expert testimony based upon models, Section IV summarizes the various legal standards for relevance before considering how judges use hunch-producers to reason about relevance. Section V integrates the previous discussions to explain why the implication for litigation is not a higher but a lower admissibility threshold.

39. *Id.* at 167–69.

40. See DONALD N. MCCLOSKEY, KNOWLEDGE AND PERSUASION IN ECONOMICS 42 (1994) (writing that economists understand phenomena via metaphors, and a “Marxist or institutionalist or Austrian . . . will see somewhat differently” than a “mainstream, neoclassical” economist) [hereinafter MCCLOSKEY, KNOWLEDGE]; Rojhat B. Avsar, *Mainstream Economic Rhetoric, Ideology and Institutions*, 45 J. ECON. ISSUES 137, 138 (2011) (claiming that “use of a particular economic language reinforces an associated worldview,” and there is an “element of ideology embedded in the language of economics”).

41. See Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 1020–21 (“The context of the particular case drives the economist’s choices, such as the appropriate underlying studies upon which to rely, the relevant variables to include or exclude, and the necessary simplifying assumptions.”).

42. Haw, *supra* note 37, at 1290–93.

43. E.g., Valerie P. Hans & Neil Vidmar, *The Verdict on Juries*, 91 JUDICATURE 226, 227 (2008) (writing that civil jurors “evaluate the testimony and form narrative accounts from the conflicting adversary presentation of evidence”); Kimberlianne Podlas, *Impact of Television on Cross-Examination and Juror “Truth,”* 14 WIDENER L. REV. 479, 481–82 (2009) (explaining how jurors construct a story from trial evidence—both direct and cross examination—and render a verdict that is “the jury’s truth”).

44. See *infra* Part V.B.

I. EXPERT TESTIMONY BASED ON ECONOMETRIC MODELS

The emergence of economics models in complex litigation occurred at the same time that the Supreme Court decided the *Daubert* trilogy.⁴⁵ As such, one can understand why courts and practitioners have primarily addressed reliability when questioning the admissibility of economics experts.⁴⁶ As this Section explains, the *Daubert* trilogy involved medical and technical experts and thus the hard sciences, but economic modeling is both science and art. Because opponents typically challenge the modeler's artistry,⁴⁷ courts have struggled to apply the *Daubert* factors consistently and to articulate coherent standards when evaluating econometric expert testimony. Part I.A describes how economic models are both science and art and how they help a party tell the story of the case. Part I.B explains how the judge acts as a gatekeeper who can exclude expert testimony from evidence if the testimony is found unreliable. Part I.C then summarizes the inconsistency and incoherence of judicial rulings on the reliability of model-based economics expert testimony.

A. *The Science and Art of Modeling: A Key Narrative in the Story of the Case*

Reflecting on the status of the field of economics in 1997, Nobel laureate Robert M. Solow wrote that “if you ask a mainstream economist a question about almost any aspect of economic life, the response will be: suppose we model that situation and see what happens.”⁴⁸ Yet when Solow entered college in the 1940s, entire semesters would go by without even a mention of building or testing models.⁴⁹ Indeed, as late as 1971, another Nobel laureate, Wassily Leontief, could claim only that “[t]he mathematical model-building industry has grown into *one of* the most prestigious, *possibly* the most prestigious branch of economics.”⁵⁰

This early work nevertheless led to the development of increasingly sophisticated statistical methods and a growing body of statistical data.⁵¹ Advances in electronic computing technology also helped to lower the cost of performing complex econometric

45. Andrew I. Gavil, *Defining Reliable Forensic Economics in the Post-Daubert/Kumho Tire Era: Case Studies from Antitrust*, 57 WASH. & LEE L. REV. 831, 835–36 (2000) [hereinafter Gavil, *Defining Reliable Forensic Economics*] (claiming that the increasing role of economic theory and economics experts in the 1970s caused antitrust litigation “to collide” with the evidentiary developments of the *Daubert* trilogy).

46. See, e.g., *LidoChem, Inc. v. Stoller Enters. Inc.*, No. 1:09-cv-204, 2013 WL 12224209, at *5 (W.D. Mich. May 7, 2013).

47. See Hill et al., *supra* note 7, at 331 n.253.

48. Solow, *supra* note 1, at 43; see also DEIRDRE N. MCCLOSKEY, *THE RHETORIC OF ECONOMICS* 139 (David J. Depew et al. eds., 2d ed. 1998) [hereinafter MCCLOSKEY, *RHETORIC*] (“Most journals of economics nowadays look like journals of applied mathematics or theoretical statistics.”).

49. Solow, *supra* note 1, at 43; see MCCLOSKEY, *RHETORIC*, *supra* note 48, at 139 (“*The American Economic Review* of the early 1930s . . . contained hardly an equation; . . . the fitting of a line to a scatter of points was rare.”); Morgan & Knuuttila, *supra* note 1, at 49 (“Models and modeling became the predominant epistemic genre in economic science only in the latter part of the twentieth century.”).

50. Wassily Leontief, President, Am. Econ. Ass’n, *Theoretical Assumptions and Nonobserved Facts*, Presidential Address at the 83rd meeting of The American Economic Association (Dec. 29, 1970), in 61 AM. ECON. REV. 1, 2 (1971) (emphasis added).

51. Franklin M. Fisher, *Multiple Regression in Legal Proceedings*, 80 COLUM. L. REV. 702, 702 (1980); Solow, *supra* note 1, at 47 (“[T]echnique and model-building came along with the expanding availability of data . . . [and] the development of new methods of data analysis and statistical inference.”).

analyses.⁵² By the 1980s, it therefore became much more practical for economists to study—and in turn, for parties in litigation to use—econometrics,⁵³ which is “the application of statistics to analyze economic data.”⁵⁴

This use corresponded with new trends in litigation. For example, in the 1970s and 1980s there was an “explosion of employment discrimination claims brought under Title VII of the 1964 Civil Rights Act.”⁵⁵ Further, a trilogy of Supreme Court cases from the late 1970s pushed antitrust litigation toward a new rule of reason that “also signaled increased reliance on economic concepts, such as market power, efficiency, and conditions of entry—all of which are best introduced into evidence through an economist.”⁵⁶ The changing nature of U.S. business to be more intellectual-capital intensive led to “complexities associated with estimating damages in civil litigation involving commerce.”⁵⁷ A sampling of recent cases reveals that econometrics continue to play an important role in litigation.⁵⁸

52. Jonathan B. Baker & Daniel L. Rubinfeld, *Empirical Methods in Antitrust Litigation: Review and Critique*, 1 AM. L. & ECON. REV. 386, 386–87 (1999) (“[T]he rapid improvement in computer technology has made empirical methodologies feasible and economical.”); Fisher, *supra* note 51, at 702 (attributing the growth of regression analysis “perhaps most of all to the development of the electronic computer”).

53. Gavil, *Defining Reliable Forensic Economics*, *supra* note 45, at 835 (noting the increased “supply” of economic consulting firms that provide expert testimony and heightened practicality of expert testimony because of lower costs, which are attributable to computers); Daniel L. Rubinfeld, *Econometrics in the Courtroom*, 85 COLUM. L. REV. 1048, 1048 (1985) [hereinafter Rubinfeld, *Econometrics*] (“The use of statistical methods for resolving disputes has found increasing acceptance within the adversary system.”); see MCCLOSKEY, RHETORIC, *supra* note 48, at 139–40 (surveying the 159 full-length papers published in *The American Economic Review* from 1981–1983 and concluding that two-thirds used mathematics explicitly and nearly a third used regression analysis); Solow, *supra* note 1, at 47 (calling econometrics “an essential part of a Ph.D. education”).

54. Todd, *Realistic Assumptions*, *supra* note 20, at 243.

55. Kaye, *The Dynamics of Daubert*, *supra* note 2, at 1986.

56. Gavil, *Defining Reliable Forensic Economics*, *supra* note 45, at 833–35; see *Broad. Music, Inc. v. CBS, Inc.*, 441 U.S. 1, 24–25 (1979) (holding that issuance of blanket licenses is not a form of price fixing and thus not per se unlawful); *Nat’l Soc’y of Prof’l Eng’rs v. United States*, 435 U.S. 679, 690 (1978) (holding that an antitrust inquiry is confined to considering the impact on competitive conditions, regardless of whether it is proceeding under a per se or rule of reason standard); *Cont’l T.V., Inc. v. GTE Sylvania Inc.*, 433 U.S. 36, 58 (1977) (overruling the use of the per se rule when based on formalistic line drawing and calling for judgment under the rule of reason standard).

57. Hill et al., *supra* note 7, at 298; see Rubinfeld, *Econometrics*, *supra* note 53, at 1048–49 (“[T]he most frequent uses of multiple regression have been in cases of sex and race discrimination and antitrust violation, [but] other applications have ranged across a wide variety of cases” (footnotes omitted)).

58. See, e.g., *In re Optical Disk Drive Prod. Antitrust Litig.*, 785 F. App’x 406, 407–08 (9th Cir. 2019) (affirming plaintiffs’ loss on summary judgment, despite economics expert testimony based on a regression analysis showing the pass-through of overcharges to consumers, because no evidence supported that a pass-through had actually occurred); *Yong Juan Zhao ex rel. Zhao v. United States*, 411 F. Supp. 3d 413, 440 (S.D. Ill. 2019) (testifying in a medical malpractice case on the value of plaintiff’s lifetime of lost earning potential), *aff’d*, 963 F.3d 692 (7th Cir. 2020); *Slaight v. Tata Consultancy Servs., Ltd.*, No. 15-cv-01696-YGR, 2019 WL 3934780, at *1, *3 (N.D. Cal. Aug. 20, 2019) (denying plaintiffs’ motion for a new trial in part because the defendant’s labor economics expert presented evidence that the rate of involuntary termination for persons of the plaintiffs’ race was lower than the national average); *Dover v. British Airways*, 254 F. Supp. 3d 455, 460–63 (E.D.N.Y. 2017) (admitting plaintiffs’ economics expert who calculated that defendant British Airways had imposed approximately \$150 million in improper fuel surcharges on its rewards program members).

Economic models remain vital because a party can use them to make sense of a massive body of evidence. After all, to prove causation and measure damages in complex cases, the plaintiff needs to account for multiple variables related to vast amounts of data and show a trend over time.⁵⁹ Discovery can include party and nonparty witness testimony, personnel records, and financial documents such as tax records and market data,⁶⁰ with business records going back years or even decades.⁶¹ To calculate damages, the expert has to measure past losses as well as future lost profits or diminished business value.⁶² Other variables like differences between parties, products, and markets, as well as changes in markets or the relevant law, can render the defendant's acts nonharmful, negate wrongful acts as the causes of harm, or affect the damages calculation.⁶³

To analyze this data, econometricians turn to regression analysis and similar statistical techniques.⁶⁴ The “outcome of interest” is the dependent variable, and regression analysis explains how one or more independent variables might produce changes in that dependent variable.⁶⁵ The expert aims to show a correlation—an association that is more than chance—between the dependent variable and the independent variables.⁶⁶ The economist can then infer from this correlation that the independent variables caused changes in the dependent variable.⁶⁷

Regression analysis is powerful because it also accounts for “noise”—the “nontrivial, residual element of unexplained effects on the variable of interest”—which is an inherent part of the data since the observations are taken from an economic system

59. Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 287; see Daniel M. Tracer, Note, *Overcharge but Don't Overestimate: Calculating Damages for Antitrust Injuries in Two-Sided Markets*, 33 CARDOZO L. REV. 807, 821 (2011) (“[C]alculating lost profits proves to be an incredibly complex calculation that requires many assumptions to be made about the plaintiff, the defendant, the markets in which they operate, and other related and uncertain future conditions.”).

60. E.g., Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 286; see 1 DOBBS, *supra* note 5, at 320–21 (writing that the “most persuasive evidence” to prove remedies often involves “detailed business statistics or marketing and production information, coupled with expert testimony” (footnote omitted)).

61. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 980.

62. See 1 DOBBS, *supra* note 5, at 293; Roger D. Blair & Amanda Kay Esquibel, *Yardstick Damages in Lost Profit Cases: An Econometric Approach*, 72 DENV. U. L. REV. 113, 115–16, 116 n.13, 123 & n.62 (1994).

63. Allen et al., *supra* note 5, at 432 (writing that the but-for scenario measures only those damages “caused by the harmful act” so the model must “exclude any change in the plaintiff’s value arising from other sources” (emphasis added)); Roger D. Blair & William H. Page, “Speculative” *Antitrust Damages*, 70 WASH. L. REV. 423, 435 (1995) (“Ideally, the only causal factor accounting for the difference between plaintiff’s actual experience in the damage period and its but-for experience should be the defendant’s illegal conduct.”); Lopatka & Page, *supra* note 4, at 687 (writing that the economic model should isolate the offense “as the single causal factor” so it “must account for other major causal factors”).

64. Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 287; see Allensworth, *supra* note 2, at 828 (calling models “mathematic abstractions used to predict or describe natural or market processes”).

65. Allensworth, *supra* note 2, at 836–37; see Daniel L. Rubinfeld, *Reference Guide on Multiple Regression*, in REFERENCE MANUAL ON SCIENTIFIC EVIDENCE, *supra* note 5, at 303, 305 [hereinafter Rubinfeld, *Reference Guide*]; Alan O. Sykes, *An Introduction to Regression Analysis*, in CHICAGO LECTURES IN LAW AND ECONOMICS 1, 1 (Eric A. Posner ed., 2000).

66. Rubinfeld, *Reference Guide*, *supra* note 65, at 309; see David H. Kaye & David A. Freedman, *Reference Guide on Statistics*, in REFERENCE MANUAL ON SCIENTIFIC EVIDENCE, *supra* note 5, at 211, 294 (“A regression model attempts to combine the values of certain variables (the independent or explanatory variables) in order to get expected values for another variable (the dependent variable).”).

67. Rubinfeld, *Reference Guide*, *supra* note 65, at 310; Sykes, *supra* note 65, at 1.

rather than a controlled experiment as in the hard sciences.⁶⁸ Regression analysis is thus “well suited to the analysis of data about competing theories for which there are several possible explanations for the relationships among a number of explanatory variables.”⁶⁹

The artistic side of econometrics requires connecting those statistics, the data, and the problem to be solved. While economists apply precise techniques like regression analysis “to make sense of data” or “to distill simple patterns and implications,”⁷⁰ the regression—or whatever statistical technique the modeler chooses—is merely a part of the model.⁷¹ The economist has to make numerous choices and assumptions to apply those statistical techniques to a data set drawn from a “chaotic reality” rather than from controlled experiments.⁷²

After all, models start with a hypothesis, which is an assumption, and then the modeler makes additional assumptions about the link between economic evidence and the theory of the case.⁷³ Such assumptions include that certain variables are necessary while others are nonessential, that prior theoretical and econometric models are useful because they are similar enough to the current model, and that businesses and markets will behave a certain way in the future or would have behaved differently in some counterfactual past but for the defendant’s wrongful conduct.⁷⁴ The goal is balance: to focus on the “salient features of reality” by abstracting or omitting details, but not so many details that the model “distort[s] reality.”⁷⁵

The artistry of economic modeling requires accounting for the rhetorical situation because the economist not only has to explain to the target audience how the model works but also persuade that audience that the model is realistic.⁷⁶ Statistical models are fact

68. Fisher, *supra* note 51, at 705–06.

69. Rubinfeld, *Reference Guide*, *supra* note 65, at 305.

70. Allensworth, *supra* note 2, at 862; see Klock, *supra* note 11, at 196 (writing that economists seek “to abstract the salient features of reality without becoming mired in minutiae”).

71. See James T. McKeown, *Statistics for Wage Discrimination Cases: Why the Statistical Models Used Cannot Prove or Disprove Sex Discrimination*, 67 IND. L.J. 633, 633–34 (1992) (urging courts to distinguish among economic theory, the model incorporating that theory, and the statistical methods used to analyze the data).

72. See Allensworth, *supra* note 2, at 829, 862; Kaye & Freedman, *supra* note 66, at 281 (writing that assumptions are made going into a model); Klock, *supra* note 11, at 197–98; Rubinfeld, *Reference Guide*, *supra* note 65, at 312 (writing that economists construct models with mathematical parameters that use data samples from the population).

73. Jonathan B. Baker & Timothy F. Bresnahan, *Economic Evidence in Antitrust: Defining Markets and Measuring Market Power*, in HANDBOOK OF ANTITRUST ECONOMICS 1, 4 (Paolo Buccirossi ed., 2008); Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 288–89; see JONATHAN SCHLEFER, THE ASSUMPTIONS ECONOMISTS MAKE 25 (2012) (“[Economists] make simplified assumptions about the economic world we inhabit and construct imaginary economies—in other words, models—based on those assumptions.”); Dau-Schmidt, *supra* note 11, at 184 (“[T]he true art of economic analysis lies in understanding the assumptions of the model and their implications for the analysis.”); McKeown, *supra* note 71, at 636 (calling regression nothing more than a tool and stating that regression results can be rejected not only because of statistical errors but also because of common sense in application).

74. See Todd, *Realistic Assumptions*, *supra* note 20, at 231–32.

75. Klock, *supra* note 11, at 196–97.

76. SCHLEFER, *supra* note 73, at 278 (“[Economists] need a sound argument for why [their] assumption is generally realistic.”); JOHN A. WEAVER, SCIENCE, DEMOCRACY, AND CURRICULUM STUDIES 75–76 (2018) (ebook) (claiming that economic arguments are often built upon a “rhetoric of data, models, and statistics”).

specific, so the realism of a model depends upon the circumstances of its use.⁷⁷ When those circumstances are litigation, the audience is frequently the jury.⁷⁸

In deciding questions like whether an injury occurred and what the damages are, the jury acts as fact finder, with power to determine how much weight to give to evidence entered at trial.⁷⁹ Sometimes lay witness testimony and the documents in evidence have gaps that limit the jurors' ability to construct a coherent narrative, thus diminishing the plausibility of a party's theory of the case.⁸⁰ Other times jurors understand individual facts but lack a "story line that makes sense of the evidence."⁸¹ Experts with specialized knowledge of the material can fill that gap or provide that story line by interpreting the meaning of the evidence for jurors.⁸²

Economics experts use regression analysis to tell a story that makes sense of data so that jurors can bridge gaps in other evidence and come to understand the plaintiff's theory of the case.⁸³ For example, the jury can construct a story of racial discrimination from record evidence and an econometrician's regression analysis that correlates race, rather than education or experience, with lower pay or a failure to promote.⁸⁴ In antitrust cases, a regression analysis can generate "plus factors" for circumstantial evidence—like differences in sales and revenues for the plaintiff and the defendants—that allow the jury to infer collusion rather than lawful business practices.⁸⁵

77. Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 289–90.

78. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 979; see Ellen E. Sward, *The Seventh Amendment and the Alchemy of Fact and Law*, 33 SETON HALL L. REV. 573, 583 (2003) (writing that the Seventh Amendment protects the jury's fact finding authority from review by the courts). The judge is also the audience for class certification under Federal Rule of Civil Procedure 23, under which experts use regression analysis to show that questions of law and fact common to the class predominate over individual members' claims. Christine P. Bartholomew, *Death by Daubert: The Continued Attack on Private Antitrust*, 35 CARDOZO L. REV. 2147, 2152–53 (2014) ("To prove predominance, plaintiffs rely heavily on economists to establish that the stated claims are sufficiently homogenous.").

79. Faigman et al., *Gatekeeping Science*, *supra* note 16, at 861 & n.1, 884; see Jennifer L. Mnookin, *Atomism, Holism, and the Judicial Assessment of Evidence*, 60 UCLA L. REV. 1524, 1540 (2013); Sward, *supra* note 78, at 589–91. The circuit courts also have pattern jury charges explaining the jury's role in evaluating witness credibility. See, e.g., COMM. ON PATTERN JURY INSTRUCTIONS, DIST. JUDGES ASSOC., FIFTH CIRCUIT, PATTERN JURY INSTRUCTIONS (CIVIL CASES) 32 (2014) ("You alone are to determine the questions of credibility or truthfulness of the witnesses.").

80. See Richard Lempert, *Experts, Stories, and Information*, 87 NW. U. L. REV. 1169, 1175–76 (1993); see also ROBERT P. BURNS, A THEORY OF THE TRIAL 37 (1999) (citing WILLIAM TWINING, RETHINKING EVIDENCE: EXPLORATORY ESSAYS 239 (1990)) (calling a party's theory of the case "a simple, plausible, coherent, legally sufficient narrative").

81. Lempert, *supra* note 80, at 1176–77.

82. *Id.* ("The jury has an array of facts before it, but without expert testimony the jurors will be unaware of one story line that makes sense of the evidence."); see Neil Vidmar & Shari Seidman Diamond, *Juries and Expert Evidence*, 66 BROOK. L. REV. 1121, 1132–34 (2001).

83. See Vidmar & Diamond, *supra* note 82, at 1137–38 (claiming that jurors integrate the various parts of trial evidence, including expert witness testimony, into stories).

84. Hersch & Bullock, *supra* note 3, at 2369, 2373; see William T. Bielby & Pamela Coukos, "Statistical Dueling" with Unconventional Weapons: What Courts Should Know About Experts in Employment Discrimination Class Actions, 56 EMORY L.J. 1563, 1564, 1571–72 (2007) (discussing the role of "anecdotal evidence" in proving that discrimination against members of the workforce is part of the defendant company's "standard operating procedure[s]" (citing *Int'l Bhd. of Teamsters v. United States*, 431 U.S. 324 (1977))).

85. Blair & Herndon, *supra* note 6, at 820–23.

To measure damages, the expert provides the final narrative thread by employing regression analysis to show a trend over time based on years of company records and other financial data; this gives the jury precise amounts for what business value and profits would have been in the past or could have been in the future but for the defendant's wrongful conduct.⁸⁶

B. The Judge as Gatekeeper: The Reliability of Expert Testimony

Before the jury can construct a story that includes the narrative of the economics expert, the judge must first determine whether to admit that testimony.⁸⁷ Rule 702 has long permitted the use of expert opinion testimony in federal trials.⁸⁸ Prior to 1993, however, most federal courts were guided by the U.S. Court Appeals for the District of Columbia Circuit case *Frye v. United States*⁸⁹ when applying Rule 702, even though that opinion predates the Federal Rules of Evidence.⁹⁰ *Frye* introduced the "general acceptance" standard, under which the key to admissibility was whether the expert's method was "sufficiently established" in her field.⁹¹ With statistics-based testimony, *Frye* did not present much of a barrier because courts typically made admissibility rulings without even mentioning the case.⁹²

The *Daubert* trilogy created a more demanding set of standards for admitting expert testimony. *Daubert* established the trial judge's role as a gatekeeper to ensure "that an expert's testimony both rests on a reliable foundation and is relevant to the task at hand. Pertinent evidence based on scientifically valid principles will satisfy those demands."⁹³ To be reliable, expert testimony must be grounded in the "methods and procedures" of the scientific method.⁹⁴ The expert must support the testimony with "appropriate validation" by having "'good grounds,' based on what is known."⁹⁵

The Court furnished a "flexible" and nonexhaustive list of factors that a trial judge can consider: whether the theory or technique "can be (and has been) tested"; "whether the theory or technique has been subjected to peer review"; whether there is an error rate and other professional standards associated with the theory or technique; and whether

86. Hill et al., *supra* note 7, at 333–34; Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 979–82.

87. Bruce Ching, *Narrative Implications of Evidentiary Rules*, 29 QUINNIPIAC L. REV. 971, 972 (2011) ("But during the trial, the evidence must be presented in a way that is admissible before the jurors can begin to piece together a story."); Lopatka & Page, *supra* note 4, at 624 ("Courts channel the construction and representation of a party's case theory by controlling the domain of the jury through a series of decisions . . . [like motions] . . . on admissibility [and sufficiency] of evidence" (footnote omitted)).

88. See FED. R. EVID. 702.

89. 293 F. 1013 (D.C. Cir. 1923).

90. Hill et al., *supra* note 7, at 302.

91. *Frye*, 293 F. at 1014 ("[T]he thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.").

92. See Kaye, *The Dynamics of Daubert*, *supra* note 2, at 1948–49 ("Traditionally, *Frye* simply was not perceived as a barrier to statistical testimony.").

93. 509 U.S. 579, 597 (1993); see Andrew Jurs, *Gatekeeper with a Gavel: A Survey Evaluating Judicial Management of Challenges to Expert Reliability and Their Relationship to Summary Judgment*, 83 MISS. L.J. 325, 326 (2014) (describing the gatekeeping authority granted by *Daubert* as giving judges considerable discretion to screen expert evidence).

94. *Daubert*, 509 U.S. at 589–90.

95. *Id.* at 590.

the theory or technique has “[w]idespread acceptance.”⁹⁶ These factors, however, are not a required test. In *Kumho Tire Co. v. Carmichael*,⁹⁷ the Supreme Court held that a trial court need only consider one or more of the *Daubert* factors to the extent “doing so will help determine that testimony’s reliability,” thus reinforcing the judge’s “broad latitude” in making admissibility decisions.⁹⁸ As the Court wrote in *Daubert*, “The inquiry envisioned by Rule 702 is . . . a flexible one.”⁹⁹

In *General Electric Co. v. Joiner*,¹⁰⁰ the Court held that *Daubert* does not limit the gatekeeping role to only the expert’s methodology.¹⁰¹

[C]onclusions and methodology are not entirely distinct from one another. Trained experts commonly extrapolate from existing data. But nothing in either *Daubert* or the Federal Rules of Evidence requires a district court to admit opinion evidence that is connected to existing data only by the *ipse dixit* of the expert. A court may conclude that there is simply too great an analytical gap between the data and the opinion proffered.¹⁰²

The Court then held that the trial court did not abuse its discretion in excluding the expert testimony on the grounds that the studies they relied on were insufficient to support their conclusions.¹⁰³

The Court in *Kumho* reinforced this, holding that reliability was not limited to only the reasonableness of the expert’s method.¹⁰⁴ “Rather, it was the reasonableness of using such an approach, along with [the expert’s] particular method of analyzing the data thereby obtained, to draw a conclusion regarding *the particular matter to which the expert testimony was directly relevant*.”¹⁰⁵

In both *Joiner* and *Kumho*, the Court directed judges to focus on the applicability of the testimony to the case at hand, rather than methodological validity in the abstract or “broad general principles and theories.”¹⁰⁶ In 2000, amendments were made to Rule 702 to incorporate and reinforce the *Daubert* trilogy, including the trial judge’s role as gatekeeper, the flexibility of the *Daubert* factors, and the need for the expert’s analysis and conclusions to relate to the particular case.¹⁰⁷

96. *Id.* at 592–95.

97. 526 U.S. 137 (1999).

98. *Kumho*, 526 U.S. at 141–42; see Green & Sanders, *Admissibility Versus Sufficiency*, *supra* note 15, at 1076–77 (“[T]he *Daubert* factors seem to play less and less of a role, and are supplanted by an increasing focus on fit and the existence of large analytical gaps in reasoning.”).

99. 509 U.S. at 594–95.

100. 522 U.S. 136 (1997).

101. *Joiner*, 522 U.S. at 146.

102. *Id.* (citing *Turpin v. Merrell Dow Pharm., Inc.*, 959 F.2d 1349, 1360 (6th Cir. 1992)).

103. *Id.* at 146–47.

104. 526 U.S. 137, 153–54 (1999).

105. *Id.* at 154; see Lopatka & Page, *supra* note 4, at 646 (writing that *Kumho* requires courts to scrutinize the methodology of the expert).

106. Green & Sanders, *Admissibility Versus Sufficiency*, *supra* note 15, at 1076; see Faigman et al., *Gatekeeping Science*, *supra* note 16, at 872–73.

107. FED. R. EVID. 702 advisory committee’s note to 2000 amendment; see Lopatka & Page, *supra* note 4, at 629.

C. *Inconsistency and Incoherence in Admitting Model-Based Economics Expert Testimony*

For cases that involve economics experts, the parties' first fight is not about the substantive merits but instead about the admissibility of the expert's testimony. Defendants often win this fight when an expert provides the only proof of a key element of a plaintiff's case.¹⁰⁸

If the defendant prevails in a *Daubert* motion, the defendant often wins summary judgment since the plaintiff can no longer meet its burden.¹⁰⁹ Although defendants do not always win full exclusion, they often win partial exclusion. For example, defendants win partial exclusion of an expert—often an economics expert—fifty-nine percent of the time in antitrust litigation.¹¹⁰ This partial exclusion can devastate a case by limiting relief to an injunction, allowing monetary recovery against only one set of defendants, or simply allowing one party's expert to look more persuasive by comparison.¹¹¹

The court's mere doubt about an expert may affect how the parties proceed. Consider *Dover v. British Airways, PLC*¹¹²: after five years of "contentious litigation," the parties settled their class action lawsuit.¹¹³ This settlement occurred after the court admitted the plaintiffs' expert but set a hearing for defendant British Airways' expert because of questions about his methodology.¹¹⁴ Given that exclusion of economics expert evidence can be outcome determinative, it is essential for courts to base their analyses and decisions on coherent standards so that they issue consistent rulings in similar cases. Unfortunately, they do not.¹¹⁵

Part of the lack of coherence and consistency results from the inaptness of the *Daubert* standards for econometric expert testimony. The rationale for making judges

108. Cf. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 995–96 (discussing that exclusion of a plaintiff's expert testimony is often fatal to the plaintiff's case).

109. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 996 (first citing *Lippe v. Bairnco Corp.*, 99 Fed. App'x. 274, 277–78 (2d Cir. 2004); then citing *Target Mkt. Publ'g, Inc. v. ADO, Inc.*, 136 F.3d 1139, 1141–42 (7th Cir. 1998); then citing *In re Live Concert Antitrust Litig.*, 863 F. Supp. 2d 966, 970, 972–81 (C.D. Cal. 2012); then citing *In re REMEC Inc. Sec. Litig.*, 702 F. Supp. 2d 1202, 1211–16, 1219–20, 1228 (S.D. Cal. 2010); then citing *Chemipal Ltd. v. Slim-Fast Nutritional Foods Int'l, Inc.*, 350 F. Supp. 2d 582, 587–97 (D. Del. 2004); then citing *Am. Booksellers Ass'n v. Barnes & Noble, Inc.*, 135 F. Supp. 2d 1031, 1037–42 (N.D. Cal. 2001); then citing *Johnson Elect. N. Am. Inc. v. Marbuchi Motor Am. Corp.*, 103 F. Supp. 2d 268, 282–87 (S.D.N.Y. 2000); then citing *Lithuanian Commerce Corp. v. Sara Lee Hosiery*, 179 F.R.D. 450, 455 (D.N.J. 1998); and then citing *Three Crowns Ltd. P'ship v. Salomon Bros., Inc.*, 906 F. Supp. 876, 893–94 (S.D.N.Y. 1995)).

110. James C. Cooper, *Information and Settlement: Empirical Evidence on Daubert Rulings and Settlement Rates*, 51 INT'L REV. L. & ECON. 1, 3–4, 4 tbls.3 & 4 (2017).

111. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 996–97; see *In re Nat'l Collegiate Athletic Ass'n Athletic Grant-in-Aid Cap Antitrust Litig.*, 375 F. Supp. 3d 1058, 1100 (N.D. Cal. 2019) (excluding part of the defendant's economics expert testimony and finding the plaintiff's expert more persuasive); *Am. Booksellers Ass'n*, 135 F. Supp. 2d at 1042–43 (ruling plaintiff's expert admissible for injunctive relief but not money damages and that certain defendants would have nevertheless been entitled to summary judgment because the model did not account for them).

112. 323 F. Supp. 3d 338 (E.D.N.Y. 2018).

113. *Dover*, 323 F. Supp. 3d at 339–40.

114. *Dover v. British Airways, PLC*, 254 F. Supp. 3d 455, 458–65 (E.D.N.Y. 2017); see also Faulkner, *supra* note 21, *passim* (examining the admissibility rulings in *Dover*).

115. See Allensworth, *supra* note 2, at 861–62.

the gatekeepers of reliability was that the admission of too much “junk science” was misleading “scientifically naïve” jurors.¹¹⁶ The *Daubert* trilogy involved medical or engineering experts—the experts in *Daubert* and *Joiner* engaged in the hard sciences, where studies are based upon controlled experiments conducted in laboratories,¹¹⁷ while the expert in *Kumho* was an engineer who relied upon measurement and inspection of the allegedly defective tire.¹¹⁸

In cases such as toxic torts, scientific experts sometimes rely upon studies of animals that were given hundreds or even thousands of times the dose that a human would take, or upon studies on humans in which the subjects suffered strokes but only one had taken the drug alleged to have caused such strokes.¹¹⁹ The *Daubert* factors, the *Joiner* warning against an analytical gap, and the *Kumho* requirement that the expert’s methods apply to the case at hand therefore help exclude scientific experts who do not rely upon these types of studies or methods outside of litigation.¹²⁰

In situations where opponents challenge the science of the econometrician, these *Daubert* considerations seem to make sense. After all, the jury’s collective view and social values offer nothing that can lead to better reliability judgments about the statistical aspects of the economic model,¹²¹ while the judge is typically better educated than most jurors and has the benefit of repeated exposure to similar cases and thus to similar econometric evidence.¹²²

Accordingly, the judge should verify econometric assumptions and ensure that observed data come from a normal distribution for accuracy in the context of the model. If an assumption cannot be verified empirically, then the model should be tested for its sensitivity to that assumption.¹²³ However, weak statistical assumptions should not necessarily lead to the exclusion of model-based testimony. For example, many statistical errors can be corrected.¹²⁴ Plus, errors like omitted variable bias—which merely

116. Mnookin, *supra* note 79, at 1570, 1579; *see also* David E. Bernstein, *The Misbegotten Judicial Resistance to the Daubert Revolution*, 89 NOTRE DAME L. REV. 27, 31 (2013) (recognizing the problem of letting the jurors hear too much “junk science”).

117. *Gen. Elec. Co. v. Joiner*, 522 U.S. 136, 143–46 (1997) (proposing expert testimony based upon studies of animals exposed to polychlorinated biphenyls and epidemiological studies); *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 583 (1993) (proposing experts to testify based upon in vitro and in vivo animal studies, pharmacological reports, and reanalysis of epidemiological studies); *see* Coate & Fischer, *supra* note 17, at 151 (contrasting economics with hard sciences because the former relies upon observations of reality rather than controlled experiments).

118. *Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S. 137, 142–45, 153 (1999).

119. Twerski & Sapir, *supra* note 10, at 657–59.

120. *See id.* at 650 (calling the *Daubert* trilogy a screen primarily in toxic tort cases); Green & Sanders, *Admissibility Versus Sufficiency*, *supra* note 15, at 1068–74 (assessing judicial treatment of the *Daubert* factors in toxic tort litigation).

121. *See* Allensworth, *supra* note 2, at 848–50.

122. *Id.* at 830; *see* Kaye, *The Dynamics of Daubert*, *supra* note 2, at 1975; Lopatka & Page, *supra* note 4, at 694–95.

123. Allensworth, *supra* note 2, at 844–45.

124. *See, e.g.,* Kaye, *The Dynamics of Daubert*, *supra* note 2, at 2012–13 (arguing that courts should not exclude economics expert testimony based on correctable statistical errors).

decreases the goodness of fit between the independent and dependent variables—do not render the regression invalid and thus unreliable.¹²⁵

More importantly, the *Daubert* factors have limited applicability to the modeler's artistry, which deals with reasoning, intuition, plausibility, and persuasion rather than mathematics and statistics that can be tested empirically for validity.¹²⁶ For instance, opponents might argue that a model is flawed for not including certain explanatory variables that are relevant to the dispute.¹²⁷ This situation does not relate to the statistical issue of omitted variable bias but instead to the modeler's choice to omit certain variables, a choice that might allow for better understanding by focusing on the salient features under consideration—or that might distort reality to the point that the conclusions bear no resemblance to the world as we know it.¹²⁸

Sometimes the economist employs a technique in a way that has not been applied before,¹²⁹ or she assumes that a study from one product, business, or market can inform the product, business, or market at issue in the case.¹³⁰ Economists often construct new models from old models (including constructing applied models using theoretical models), so this is not necessarily problematic¹³¹—unless crucial assumptions are overlooked or downplayed.¹³² The economist may assume that a new business would have grown or would have attracted a certain number of customers.¹³³

The judge can rightly exclude such testimony if controverted by the evidence, but often there is simply no evidence.¹³⁴ After all, calculating damages requires constructing

125. See Rubinfeld, *Reference Guide*, *supra* note 65, at 322; Sykes, *supra* note 65, at 20–21.

126. See SCHLEFER, *supra* note 73, at 278 (writing that an economist needs “a sound argument for why [his] assumption is generally realistic”); Baker & Bresnahan, *supra* note 73, at 4 (writing that economic reasoning lays bare assumptions so that they can be evaluated for plausibility); Klock, *supra* note 11, at 202 (writing that conclusions are likely to be misleading if the modeler's assumptions are unreasonable).

127. See McAllister, *supra* note 3, at 1080–81 (explaining that plaintiffs bringing claims under the Age Discrimination in Employment Act of 1967 have lost for “failing to control for key variables” in their evidence of statistical disparity).

128. Klock, *supra* note 11, at 197; Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 289–90; see Sarah B. Lawskey, *How Tax Models Work*, 53 B.C. L. REV. 1657, 1668 (2012) (writing that a common complaint about economic models is that they are unrealistic).

129. E.g., D.H. Kaye, *Adversarial Econometrics in United States Tobacco Co. v. Conwood Co.*, 43 JURIMETRICS J. 343, 344 (2003) [hereinafter Kaye, *Adversarial Econometrics*] (“[T]he district court allowed plaintiff's expert to estimate lost profits on the basis of a novel theory implemented in the form of a standard statistical technique known as ‘regression.’”).

130. E.g., *Lithuanian Commerce Corp. v. Sara Lee Hosiery*, 179 F.R.D. 450, 460–61 (D.N.J. 1998) (using study of U.S. consumers' purchases of pantyhose to calculate damages from lost sales in Baltic nations).

131. See Itzhak Gilboa, Andrew Postlewaite, Larry Samuelson & David Schmeidler, *Economic Models as Analogies*, 124 ECON. J. F513, F513–18 (2014).

132. See Paul Pfleiderer, *Camaleones: El Mal Uso de Modelos Teóricos en Finanzas y Economía* [*Chameleons: The Misuse of Theoretical Models in Finance and Economics*], 16 REVISTA DE ECONOMÍA INSTITUCIONAL 23, 54 (2014) (Colom.); Jonathan B. Baker, *Contemporary Empirical Merger Analysis*, 5 GEO. MASON L. REV. 347, 356–57 (1997) (arguing that assumptions about substitutability among products in a merger analysis “should be suggested by non-statistical evidence, as from marketing documents”).

133. See, e.g., *Schonfeld v. Hilliard*, 218 F.3d 164, 171, 173–74 (2d Cir. 2000) (discussing an expert's projection that a new business venture that would use British programming in the U.S. television market would see profits between \$112 and \$296 million).

134. See *Lithuanian Commerce Corp.*, 179 F.R.D. at 462.

an “alternate reality,” if not a hypothetical market in which the defendant did not engage in wrongful acts.¹³⁵

Opponents in litigation challenge these omissions, judgments, and idealizations more than they do the statistical analyses or data-gathering methods.¹³⁶ Courts, having only inapt standards to rely on, make inconsistent rulings by sending some testimony based upon suspect models to the jury to evaluate credibility, while excluding other testimony based upon sound but questionable models from evidence.¹³⁷

The courts often give poor reasons for their decisions and sometimes offer no explanation at all.¹³⁸ For example, the court in *Polymer Dynamics, Inc. v. Bayer Corp.*¹³⁹ admitted the plaintiff’s damages expert, who assumed that the business would have expanded, because the “likelihood and extent” of business expansion were jury issues.¹⁴⁰ Meanwhile, the court in *Nebraska Plastics, Inc. v. Holland Colors Americas, Inc.*¹⁴¹ refused to admit an expert who assumed that, because all of the defendant’s siding panels would fade, they would all be subject to warranty claims.¹⁴² The court declined to admit this testimony even though jurors could seemingly evaluate the “likelihood and extent” of customers filing warranty claims.¹⁴³

When the evidence controverts some crucial assumption, courts are justified in treating its results as suspect and excluding it from evidence.¹⁴⁴ Sometimes, however, courts exclude an expert whose model is merely questionable though not fatally flawed,¹⁴⁵ leaving future litigants puzzled over blurred lines. Between the eighteen different problems with the expert’s analysis that rendered the testimony inadmissible in *Lippe v. Bairnco Corp.*¹⁴⁶ and the four questionable assumptions that were not enough to keep the testimony out in *Conwood Co. v. United States Tobacco Co.*,¹⁴⁷ is there a magic number that is acceptable? Rejecting an expert who has only one or two

135. Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 285–86, 313–14; *see* 1 DOBBS, *supra* note 5, at 324–25 (writing that plaintiffs must construct hypothetical markets to determine damages related to unique assets); Blair & Page, *supra* note 63, at 429 (calling the but-for condition a “hypothetical world”).

136. *See* Hill et al., *supra* note 7, at 330–32, 331 n.253.

137. Allensworth, *supra* note 2, at 863–64.

138. *Id.* at 863–65.

139. No. Civ.A.99-4040, 2005 WL 1041197 (E.D. Pa. May 4, 2005), *aff’d in part, vacated in part*, 341 F. App’x 771 (3d Cir. 2009).

140. *Polymer Dynamics*, 2005 WL 1041197, at *2.

141. 408 F.3d 410 (8th Cir. 2005).

142. *Nebraska Plastics*, 408 F.3d at 415–16, 416 n.2.

143. Todd, *Realistic Assumptions*, *supra* note 20, at 236 (reasoning that, without more explanation, the “likelihood and extent” of warranty claims seems as much of a jury issue as the “likelihood and extent” of business growth).

144. *See* Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 282–83 (quoting Robert M. Solow, *A Contribution to the Theory of Economic Growth*, 70 Q.J. ECON. 65, 65 (1956)).

145. *See* Allensworth, *supra* note 2, at 864.

146. 99 Fed. App’x. 274, 278–79 (2d Cir. 2004).

147. *See* 290 F.3d 768, 791–94 (6th Cir. 2002); *see also* Kaye, *The Dynamics of Daubert*, *supra* note 2, at 2002–04 (criticizing the expert’s study, in particular the “mayhem” of the regression analysis of damages, for omitting variables on the effect of the anticompetitive practices, not considering patterns and trends in market share growth adequately, assuming that states where plaintiff had a high share of the market were unaffected by the anticompetitive practices, and assuming what plaintiff’s market share would have been but not accounting for what plaintiff’s experiences actually were).

questionable assumptions—such as assuming elasticity by comparing one product, business, or market to another that is slightly different—is even less supportable.¹⁴⁸

Another problem relates to how courts treat the expert's choice of statistics. For example, in calculating damages some courts have held that the expert's choice of valuation methodology goes to weight rather than admissibility, so this choice is a question of fact.¹⁴⁹ Further, some courts exclude evidence that does not include certain expected types of valuation methodologies for particular types of cases, such as statistical event studies in securities litigation.¹⁵⁰ Meanwhile, other courts admit the expert's testimony without more than a surface inquiry if she uses a common valuation technique or an accepted statistical technique like regression analysis—even though some types of statistics may not be appropriate or applicable to the situation.¹⁵¹ Still others “lump[] together . . . flaws related to valuation method, mathematical errors, and the modeler's choices in constructing the model.”¹⁵²

By failing to distinguish between the scientific and artistic, courts might keep reliable expert testimony from the jury or, at the very least, perpetuate the confusion surrounding admissibility by justifying a ruling with poor reasoning. *In re Live Concert Antitrust Litigation*¹⁵³ is illustrative of this point. In this case, the court declined to admit testimony because the expert omitted certain factors—which is an artistic choice of which variables to include.¹⁵⁴ The court then referred to omitted variable bias but did not analyze the evidence as a statistical problem, which could have taken the form of referencing “how the omitted variables affected the statistics, . . . the robustness of the regression analysis, or . . . other statistical tools [that] the expert applied to fix the problems.”¹⁵⁵

148. See Baker & Bresnahan, *supra* note 73, at 1 (“[G]eneralizations across closely related industries . . . can be exploited to help evaluate evidence and resolve cases.”); Marc Chase McAllister, *Compare This: How Employers Use Comparator Evidence to Defeat Employment Discrimination Claims*, 2020 MICH. ST. L. REV. (forthcoming 2020) (writing that plaintiffs often must prove employment discrimination cases by using comparators to argue differential treatment); Jeff Todd & R. Todd Jewell, *A 2016 Copa America Bump for Major League Soccer? Strengthening the Case for Legal Action Arising from the Corrupted 2022 World Cup Bid*, 9 WM. & MARY BUS. L. REV. 619, 644–45 (2018) [hereinafter Todd & Jewell, *Major League Soccer*] (arguing that courts should not automatically reject expert reliance on models that relate to different products and markets).

149. Hill et al., *supra* note 7, at 313 (first citing, *inter alia*, Gross v. Comm’r, 272 F.3d 333, 343 (6th Cir. 2000); and then citing Popham v. Popham, 607 S.E.2d 575, 576 (Ga. 2005)).

150. *Id.* at 315 (citing *In re Exec. Telecard Ltd. Sec. Litig.*, 979 F. Supp. 1021 (S.D.N.Y. 1997)); see Molly L. Zohn, Note, *How Antitrust Damages Measure Up with Respect to the Daubert Factors*, 13 GEO. MASON L. REV. 697, 727–28 (2005) (discussing how courts have long recognized regression analysis as a reliable technique but that “courts should be open to the use of other techniques”).

151. Allensworth, *supra* note 2, at 863–64; see Gelbach, *supra* note 17, at 609 (calling a statistical expert's testimony unreliable if that expert “used a statistical model unrelated to the fact in question”); Rubinfeld, *Reference Guide*, *supra* note 65, at 308–09 (“Because multiple regression is a well-accepted scientific methodology, courts have frequently admitted testimony based on multiple regression studies, in some cases over the strong objection of one of the parties.”).

152. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 989.

153. 863 F. Supp. 2d 966 (C.D. Cal. 2012).

154. See *Live Concert*, 863 F. Supp. 2d. at 978.

155. Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 315 (writing that the model in *Live Concert* was contradicted by the record so that its “problems related to poor argumentation and poor evidentiary support”); see also *Live Concert*, 863 F. Supp. 2d. at 974 (quoting 2A PHILLIP E. AREEDA & HERBERT

The Court in *Daubert* recognized that, even if the judge admits the expert testimony, the jury might still never consider it because the judge may need to rule on its sufficiency.¹⁵⁶ However, given that Rule 702 lists whether “the testimony is based on sufficient facts or data” as a factor for admissibility,¹⁵⁷ courts sometimes blur the distinction between admissibility and sufficiency.¹⁵⁸

The sufficiency analysis arises under Federal Rule of Evidence 104(b),¹⁵⁹ which is a minimal standard because it limits the judge’s examination to whether a reasonable trier of fact could find the fact to be true.¹⁶⁰ If a reasonable inference can be drawn from the evidence, then the issue is for the jury; if the evidence is so weak that it is no more than speculation, then the court is justified in keeping it from the jury.¹⁶¹ In its analysis, the court must not address “questions of credibility and choice among competing inferences,” which go to weight and are thus for the jury.¹⁶² Yet courts sometimes exclude experts whose models are reliable because those models have weak but not fatally flawed data inputs.¹⁶³ Rebecca Haw Allensworth characterizes this phenomenon as “letting the perfect be the enemy of the good.”¹⁶⁴

Another example of inconsistency is how courts bend or distort the *Daubert* criteria when faced with opposing experts, which has the potential to obscure academic consensus and thereby allow for the admission of outlier or maverick economic theories.¹⁶⁵ For example, they might require that the expert’s opinion have been subject to validation and peer review even though “[d]ata and conclusions prepared for litigation are unlikely to be published and so in most cases will not have been subjected to peer review or replicated and verified by other economists.”¹⁶⁶ Alternatively, they might “exclude[] an expert’s testimony based not on faulty methodology, but rather on faulty use of a legitimate methodology. . . . [O]ften this kind of analysis is actually substantive disagreement dressed up as a methodological critique.”¹⁶⁷

Other courts justify admitting the testimony precisely because expert opinions diverge: they let the jury decide between the experts or “use the jurors to triangulate a

HOVENKAMP, ANTITRUST LAW: AN ANALYSIS OF ANTITRUST PRINCIPLES AND THEIR APPLICATION ¶ 399(c)(2), at 447 (3d ed. 2006)).

156. 509 U.S. 579, 596 (1993).

157. FED. R. EVID. 702(b).

158. See Green & Sanders, *Admissibility Versus Sufficiency*, *supra* note 15, at 1079 (“[S]ome courts are examining the sufficiency of the scientific evidence rather than the methodology of the expert.”).

159. FED. R. EVID. 104(b).

160. David L. Faigman, Elise Porter & Michael J. Saks, *Check Your Crystal Ball at the Courthouse Door, Please: Exploring the Past, Understanding the Present, and Worrying About the Future of Scientific Evidence*, 15 CARDOZO L. REV. 1799, 1817 (1994).

161. Michael D. Green & Joseph Sanders, *In Defense of Sufficiency: A Reply to Professor Twerski and Mr. Sapir*, 23 WIDENER L.J. 663, 670 (2014); Twerski & Sapir, *supra* note 10, at 647–48.

162. GEOFFREY C. HAZARD, JR., JOHN LEUBSDORF & DEBRA LYN BASSETT, CIVIL PROCEDURE 485 (6th ed. 2011).

163. See Allensworth, *supra* note 2, at 864.

164. *Id.*

165. Haw, *supra* note 37, at 1284–85.

166. *Id.* at 1285.

167. *Id.* at 1286.

consensus position.”¹⁶⁸ Consider *In re Scrap Metal Antitrust Litigation*,¹⁶⁹ a case in which the Sixth Circuit affirmed the admissibility of expert testimony in part because the “calculations were tested on cross-examination and subjected to further scrutiny and criticism by [d]efendants’ own expert.”¹⁷⁰ As such, the jury was free to give this testimony little or no weight and to credit the defendants’ attacks on it.¹⁷¹

This approach comports with *Daubert* because the court reasoned that having opposing witnesses, each of whom was subjected to vigorous cross-examination, could help control dubious testimony.¹⁷² Some critics, however, argue that “prolonged argumentation” about model choice and “the rancor of cross-examination” confuse rather than assist juries.¹⁷³

II. THE SCHOLARLY RESPONSES: CROUCHING TOWARD WORKABLE SOLUTIONS

A subset of scholarly commentary on *Daubert* has addressed the admissibility of economics expert testimony. Part II.A explains that several commentators have identified the distinctions between the scientific and artistic aspects of economic modeling,¹⁷⁴ and they have explained the scientific method, statistics, and regression analysis for courts and practitioners.¹⁷⁵ Further, this work succeeds in identifying and explaining the problems that courts have in evaluating the reliability of this testimony.¹⁷⁶ Where the scholarship falls short, however, is in crafting a clear delineation of the roles of gatekeeper and factfinder.¹⁷⁷ Part II.B therefore summarizes a multidecade debate among economics methodologists that supports a lower admissibility threshold so that the jury can evaluate the credibility of model-based expert testimony.

168. *Id.* at 1290; see Allensworth, *supra* note 2, at 864–65 (“[A] judge may point out room for disagreement about a model, without sketching the terms of that disagreement or its stakes, before summarily admitting the evidence as reliable.”).

169. 527 F.3d 517 (6th Cir. 2008).

170. *Scrap Metal*, 527 F.3d at 531.

171. *Id.*

172. *Id.* at 531–32 (“[The expert’s] calculations were tested on cross-examination and subjected to further scrutiny and criticism by Defendants’ own expert.” (citing *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 593 (1993))).

173. Hill et al., *supra* note 7, at 375.

174. See, e.g., Allensworth, *supra* note 2, at 828–29; Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 288.

175. For example, the Federal Judicial Center regularly updates a handbook about scientific evidence that includes chapters relevant to economics expert testimony like statistics, regression analysis, and calculating damages. See, e.g., Allen et al., *supra* note 5, *passim*; Kaye & Freeman, *supra* note 66, *passim*; Rubinfeld, *Reference Guide*, *supra* note 65, *passim*; see also Sykes, *supra* note 65, *passim* (introducing regression analysis).

176. See Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 1002 (“[Scholarship] contribut[es] to increasing our understanding of economists, economic models, and the admissibility of economics expert testimony.”).

177. See Faigman et al., *Gatekeeping Science*, *supra* note 16, at 874 (chastising the Supreme Court, Federal Rules, and commentators for not offering “a clear conceptual basis for making the necessary distinctions” between admissibility and weight).

A. *Inconsistency Among Commentators*

Jeff Todd and R. Todd Jewell sample cases to identify three types of assumptions that courts have found “dubious.”¹⁷⁸ They conclude that courts exclude testimony where the economist has “(1) unreasonable comparisons among businesses, products, and/or markets; (2) unfounded simplifications and excluded variables that the record suggests are necessary; and (3) unrealistic scenarios about what parties or markets would have done but for the defendant’s unlawful act.”¹⁷⁹

From this, they recommend that courts admit testimony based upon models when the models make comparisons to similar products and markets, when facts and data in evidence support assumptions, or when assumptions about future actions or a counterfactual past are not controverted by the record.¹⁸⁰ Because their analysis looks at how courts have ruled instead of how courts should rule, the authors concede that their conclusions are positive rather than normative.¹⁸¹ In a later article, the authors question whether courts should exclude testimony based upon the reasonableness of comparisons to different parties, markets, and products.¹⁸²

While Todd and Jewell suggest that a lower threshold for admitting economics expert testimony may be warranted, others argue that judges should be stricter gatekeepers.¹⁸³ These commentators suggest treating economics experts no differently than those in medicine or the hard sciences.¹⁸⁴ As a result, judges would exclude more economics expert testimony to prevent juries from being “bamboozled.”¹⁸⁵ For example, Robert M. Lloyd proposes that, before the court admit a damages expert, it should determine the expert’s qualification to perform the analysis, the reliability of the underlying data, the support in the record for assumptions, the adequacy with which the expert deals with facts inconsistent with his theory, and the consideration of alternative scenarios.¹⁸⁶ Except for the first consideration, these can sometimes pertain to credibility rather than admissibility and thus cross into the province of the jury.

For instance, he explains that courts have rejected assumptions that lack support in the record, including that a trend of increasing sales or profits would continue, that a terminable contract would not be terminated, and that competitors would not enter a

178. Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 297–310.

179. *Id.* at 284.

180. *See id.* at 298–99, 301, 305–06.

181. *Id.* at 319.

182. Todd & Jewell, *Major League Soccer*, *supra* note 148, at 670–71.

183. *See, e.g.*, Faigman et al., *Gatekeeping Science*, *supra* note 16, at 864–66.

184. *Id.* (lumping experts in medicine, genetics, and economics together).

185. *E.g.*, Kaye, *Adversarial Econometrics*, *supra* note 129, at 350 (explaining that the “clear message” of the *Daubert* trilogy is that “federal courts must exercise independent and careful judgment before admitting expert testimony that is challenged as ‘junk science,’” rather than just assuming that juries will “get it right”); Lloyd, *supra* note 18, at 380–81, 384 (claiming that courts have too often admitted “misleading testimony” and cross-examination is ineffective so the “juries were taken in”—even “bamboozled”—by well-credentialed business and economics experts); *see* SmithKline Beecham Corp. v. Apotex Corp., 247 F. Supp. 2d 1011, 1042 (N.D. Ill. 2003) (explaining that the purpose of *Daubert* “to protect juries from being bamboozled by technical evidence of dubious merit” (citing *Seaboard Lumber Co. v. United States*, 308 F.3d 1283, 1301–02 (Fed. Cir. 2002))).

186. Lloyd, *supra* note 18, at 380.

market.¹⁸⁷ Given that Federal Rule of Evidence 703 permits experts to testify based upon facts not in the record, if the record merely fails to support rather than contradict these assumptions, each assumption seems like something a jury—a mix of people who are buyers and sellers, parties to contracts, and business owners—might find reasonable.¹⁸⁸

He also argues that courts should not admit testimony where facts are inconsistent with the expert's theory or model unless the expert makes a "reasonable argument" that the contrary data is wrong or does not apply.¹⁸⁹ While the court may be justified in excluding such testimony when the expert lacks an argument, the reasonableness of that argument goes to credibility, which is a question for the fact finder.¹⁹⁰

One potential solution is to establish whether model-based expert testimony should be treated as a question of law—which supports the judge as a strict gatekeeper—or of fact, which would result in submitting more of this testimony to the jury. With regard to treating the testimony as a question of law, Allensworth urges judges to approach models as mixed questions of law and fact, which results in taking most issues away from the jury so that they are decided by a judge.¹⁹¹ Given that the results of a model are "inextricable" from the choices and assumptions that go into its construction,¹⁹² judges are better suited than the jury to evaluate models because they are "more educated than juries and repeat players."¹⁹³

Allensworth argues that "models and their results should not be treated like facts"¹⁹⁴ in part because the traditional reasons for having juries serve as fact finders are absent: models do not present issues that require the estimation of social norms or judgments about fairness, nor do models present issues of relevance that are unique to the case at hand.¹⁹⁵ To the second point, she concedes that modeling choices are "highly fact-specific," but "[p]roblems such as small sample sizes, uncertainty about functional form, and the appropriateness of simplifying assumptions recur."¹⁹⁶ If courts reason about admissibility and provide a written decision, their analysis can aid the evaluation of similar models in later cases.¹⁹⁷

Anthony J. Casey and Julia Simon-Kerr take the opposite position, calling the distinction between lay and expert witness testimony "false" and arguing that courts

187. *Id.* at 404–05.

188. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 1023–24; *see* FED. R. EVID. 703.

189. Lloyd, *supra* note 18, at 410–11.

190. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 1024.

191. Allensworth, *supra* note 2, at 830–31, 851–52; *see id.* at 841–46 (listing four criteria for judges to use when evaluating models).

192. *Id.* at 828, 860–61.

193. *Id.* at 830.

194. *Id.* at 828.

195. *Id.* at 848–50.

196. *Id.* at 854.

197. *Id.* at 830; *see* Lopatka & Page, *supra* note 4, at 694–95 (recognizing the need—at least in antitrust litigation—to create "a coherent system of law" by having courts determine admissibility and sufficiency by relying upon economic authority rather than allowing the piecemeal development of the law through jury decisions).

should approach complex valuation as “run-of-the-mill” fact finding.¹⁹⁸ Although “what a valuation model needs to prove in order to satisfy a legal claim is a question of law,” they argue that “the operation of that model and its technical ability to make that showing are questions of fact.”¹⁹⁹ The fact finder must make “credibility judgments about everything from the expert’s demeanor to her methodology, her choice of variables, and the way in which she combines those variables.”²⁰⁰ Accordingly, “credibility judgments about the expert testimony on the variables and the model itself cannot be separated—at least in the absence of a clear error—from the ultimate conclusion about whether the model offers a legally relevant fact.”²⁰¹ In short, the law-versus-fact scholarship is unlikely to make admissibility rulings more consistent because scholars disagree on whether models present issues of law or fact.

Even if courts were to choose one or the other, they would still face challenges when confronted with a battle of the experts because, again, the solutions fall short. For example, John W. Hill and colleagues propose a two-step process in which the parties have to agree on a single model (or have one imposed upon them), and then the opposing experts input data and arrive at results.²⁰² This imposition ignores the inherent differences in the artistry of economic modeling: new models are constructed from existing ones, and the modeler uses her skill and judgment to choose from an array of potentially appropriate methods.²⁰³ Therefore, imposing a model cuts against this artistry and the expert’s opportunity to justify the choice of an alternate.²⁰⁴

Rebecca Haw likewise criticizes several proposals that would make use of disinterested experts.²⁰⁵ For example, although allowing a judge to choose experts under Federal Rule of Evidence 706 reduces partisanship, the judge would instead substitute her ideological bias, would have difficulty identifying the “majority view” of the field, and would invite logistical problems like finding reliable experts and imposing costs.²⁰⁶ Moreover, the idea of having two experts agree on a third—as is common for arbitration

198. Casey & Simon-Kerr, *supra* note 17, at 1181–82. Although most of their article focuses on the judge as fact finder, they argue that their reasoning applies equally to juries and thus to questions of admissibility. See *id.* at 1217.

199. *Id.* at 1187.

200. *Id.*

201. *Id.* In an article about game theoretic models in antitrust litigation, Coate and Fischer suggest a low admissibility threshold, thus leaving credibility judgments for the jury. Coate & Fischer, *supra* note 17, at 151 (“Expert evidence is admissible if (1) it is scientific (falsifiable in theory), (2) it has survived some *minimal* level of scientific testing, and (3) it offers *some ability* to resolve the question in dispute. Expert evidence fails when it is metaphysical opinion, *totally unsubstantiated*, or *devoid* of causal content.” (emphasis added)).

202. Hill et al., *supra* note 7, at 375–80.

203. See Gilboa et al., *supra* note 131, at F518.

204. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 1021–22 (“Economics scholars recognize that disagreement and differences are part of modeling . . .”).

205. Haw, *supra* note 37, at 1294–95.

206. *Id.* (first citing, *inter alia*, 2 PHILLIP E. AREEDA & HERBERT HOVENKAMP, ANTITRUST LAW: AN ANALYSIS OF ANTITRUST PRINCIPLES AND THEIR APPLICATION ¶ 309, at 165–66 (3d ed. 2007); then citing Karen Butler Reisinger, Note, *Court-Appointed Expert Panels: A Comparison of Two Models*, 32 IND. L. REV. 225, 238 (1998); and then citing *Interview with Judge Vaughn Walker*, ANTITRUST, Spring 2003, at 26, 28)); see FED. R. EVID. 706.

panels—might lead to an impasse where one of the experts holding a key belief refuses to agree to any expert who does not share it.²⁰⁷

B. The “Knowledge and Experience” of the Field: Drawing on Economics Methodologists To Craft Admissibility Guidelines

In an effort to bring more coherence to the understanding of models and modelers, Todd, in a pair of articles, surveyed and synthesized scholarship from economics methodologists to argue for more relaxed admissibility standards.²⁰⁸ This interdisciplinary approach was spurred by comments from Rule 702 and language in the *Daubert* trilogy, which urged courts to consider the standards of the expert’s field because not all disciplines follow the scientific method.²⁰⁹ The comments specifically mention economics as an example of a field with different standards.²¹⁰

In his 1953 essay, *The Methodology of Positive Economics*, Milton Friedman argued that economics is a science like physics, and a model’s efficacy should be based on its predictive ability rather than its realism.²¹¹ This essay triggered a debate among scholars, including Nobel laureates, about what models are and how they function.²¹²

207. *Id.* at 1296–97 (citing Richard A. Posner, *An Economic Approach to the Law of Evidence*, 51 STAN. L. REV. 1477, 1539 (1999)). Haw also critiques a proposal for a double-blind procedure for parties to solicit expert opinion as too costly. *Id.* at 1297–99 (citing Christopher Tarver Robertson, *Blind Expertise*, 85 N.Y.U. L. REV. 174 (2010)).

208. Todd, *An Interdisciplinary Perspective*, *supra* note 6; Todd, *Realistic Assumptions*, *supra* note 20.

209. FED. R. EVID. 702 advisory committee’s note to 2000 amendment; *see* Kumho Tire Co., Ltd. v. Carmichael, 526 U.S. 137, 150 (1999) (recognizing that application of the *Daubert* factors depends in part upon “the expert’s particular expertise” and “the subject of his testimony” (quoting Brief for United States as Amicus Curiae Supporting Petitioners at 19, *Kumho*, 526 U.S. 137 (No. 97-1709))); *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 592–94 (1993) (listing as admissibility factors whether there are standards that control the operation of a particular technique and whether a theory or technique enjoys acceptance within a “relevant scientific community” (quoting *United States v. Downing*, 753 F.2d 1224, 1238 (3d Cir. 1985))).

210. FED. R. EVID. 702 advisory committee’s note to 2000 amendment (“[W]hether the testimony concerns economic principles, accounting standards, property valuation or other non-scientific subjects, it should be evaluated by reference to the ‘knowledge and experience’ of that particular field.” (alteration in original) (quoting Am. Coll. of Trial Lawyers, *supra* note 19, at 579)); *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 (1997) (“[F]ew economic techniques of the ilk utilized in antitrust litigation could be ‘tested’ in the sense contemplated by *Daubert*, i.e., falsified. In part, the problem flows from the way in which economic knowledge is acquired. Rarely is economic technique amenable to laboratory-type experimentation under controlled conditions.” (footnote omitted)).

211. MILTON FRIEDMAN, *The Methodology of Positive Economics*, in ESSAYS IN POSITIVE ECONOMICS 3, 4–5 (1953).

212. *See* Uskali Mäki, *Reading the Methodological Essay in Twentieth-Century Economics: Map of Multiple Perspectives*, in THE METHODOLOGY OF POSITIVE ECONOMICS: REFLECTIONS ON THE MILTON FRIEDMAN LEGACY 47, 47 (Uskali Mäki ed., 2009) (calling Friedman’s essay “the most cited, the most influential, and the most controversial piece of methodological writing in twentieth-century economics”). In addition to Friedman, other Nobel laureates who have published on the artistry of modeling include Tjalling C. Koopmans, Wassily Leontief, Paul Samuelson, and Robert M. Solow. *E.g.*, TJALLING C. KOOPMANS, *The Construction of Economic Knowledge*, in THREE ESSAYS ON THE STATE OF ECONOMIC SCIENCE 127 (1957); THE CONSEQUENCES OF ECONOMIC RHETORIC (Arjo Klammer, Donald N. McCloskey & Robert M. Solow, 1988); G.C. Archibald, Herbert A. Simon & Paul A. Samuelson, Discussion, *Problems of Methodology*, in 53 AM. ECON. REV. 227 (1963); Leontief, *supra* note 50; *see All Prizes in Economic Sciences, THE NOBEL PRIZE*, http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/ [<https://perma.cc/C977-J3DC>] (last

Enough points of agreement have emerged from this debate to furnish the theoretical backing for guidelines that can lead to more informed—and thus, more consistent—admissibility decisions.

Models are tropes and modelers are storytellers.²¹³ The common tropes of metaphor and its cousin simile work by comparing two seemingly unlike things that nevertheless have some key similarity.²¹⁴ Other tropes include metonymy, which uses a concrete concept to make sense of the abstract, and synecdoche, which represents a larger whole via one component part.²¹⁵ Models, like metonymics, allow for comparisons with the real world via empirical mathematics in an effort to give structure to abstract theory.²¹⁶ Like synecdoches, models isolate one part of a more complex system to explain the essential aspects of the whole.²¹⁷ Like a trope, the model helps the audience come to a new understanding of the phenomena under investigation but only if the audience accepts the analogy as a credible comparison to some aspect of the real world.²¹⁸

Tropes do not stand alone but are embedded in a larger narrative. The model and its statistics make sense only as part of the modeler's story about artistic choices, like the omission of factors that are irrelevant and the idealization of factors that are unknown. These choices determine whether the model is a "credible world"—one that is not the real world but that has sufficient "truthlikeness" or "verisimilitude" to convey some understanding.²¹⁹

visited Nov. 1, 2020) (listing Friedman, Koopmans, Leontief, Samuelson, and Solow as winners of the Nobel Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel).

213. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 1004–08; *see, e.g.*, Donald N. McCloskey, *Storytelling in Economics*, in *ECONOMICS & HERMENEUTICS* 59–60 (Don Lavoie ed., Taylor & Francis e-Library 2005) (ebook) [hereinafter McCloskey, *Storytelling*] (writing that models look to the future by predicting, while stories look to the past to tell what happened); Mary S. Morgan, *Models, Stories and the Economic World*, 8 J. ECON. METHODOLOGY 361, 365–66, 369 (2001) (discussing the complementary relationship between metaphor and story).

214. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 1015–16.

215. *Id.*; *see, e.g.*, MCCLOSKEY, *RHETORIC*, *supra* note 48, at 48–51 (applying the four master tropes of metaphor, metonymy, synecdoche, and irony to explicate an economic model).

216. *See* Margaret Morrison & Mary S. Morgan, *Models as Mediating Instruments*, in *MODELS AS MEDIATORS: PERSPECTIVES ON NATURAL AND SOCIAL SCIENCE* 10, 26–27 (Mary S. Morgan & Margaret Morrison eds., 1999).

217. *E.g., id.* (discussing how models are a reduction); *see also* Till Grüne-Yanoff & Paul Schweinzer, *The Roles of Stories in Applying Game Theory*, 15 J. ECON. METHODOLOGY 131, 134–48 (2008) (describing how models provide an empirical structure for abstract economic theory); Fritz Machlup, *Operational Concepts and Mental Constructs in Model and Theory Formation*, 19 *GIORNALE DEGLI ECONOMISTI E ANNALI DI ECONOMIA* 553, 579–80 (1960) (It.) (calling models analogies).

218. Uskali Mäki, *MISSing the World. Models as Isolations and Credible Surrogate Systems*, 70 *ERKENNTNIS* 29, 41 (2009); *see* Gilboa et al., *supra* note 131, at F515–18 (claiming that economic modeling depends upon case-based reasoning and requires judgments because the audience must agree that the model is similar to the real world).

219. Robert Sugden, *Credible Worlds, Capacities and Mechanisms*, 70 *ERKENNTNIS* 3, 17–18 (2009) [hereinafter Sugden, *Capacities and Mechanisms*]; *see* Uskali Mäki, *Contested Modeling: The Case of Economics*, in *MODELS, SIMULATIONS, AND THE REDUCTION OF COMPLEXITY* 87, 92–93 (Ulrich Gähde et al. eds., 2013) [hereinafter Mäki, *Contested Modeling*] (“A model that relevantly resembles a target, resembles it in a specifically limited way that serves a purpose and helps to reach an intended audience.”).

Many of the assumptions in econometric models, like whether a business would have succeeded or whether one product is like another, are easily understood by jurors.²²⁰ Because the credibility of the model depends upon the modeler's story and the jury evaluates the credibility of model-based economics expert testimony in litigation, Todd argues for a low admissibility threshold.²²¹

The rhetorical function of the modeler's story is particularly relevant to whether the model's assumptions are realistic. All models have first-order assumptions that are false, like assuming that the government's budget is balanced, but that falsity is not necessarily problematic if the modeler has a realistic second-order explanation for it. Perhaps the budget is known to be unbalanced but that lack of balance has a negligible effect on the model's operation, or perhaps the model applies only in domains where the budget is balanced, or perhaps an issue of empirical tractability means that there is insufficient evidence to determine whether the budget is balanced.²²² All models are false in the sense of incomplete, but such reduction is necessary for models—the focus on certain relevant factors allows for better insight or attainment of the “truth” with regard to those factors.²²³

In litigation, more pertinent questions about “realisticness” relate to plausibility and disconfirmation by the evidence.²²⁴ If the modeler has a second-order explanation for why a variable was excluded as negligible, how a prior study fits into the current model, or why the model requires an idealization about growth or revenues because the data does not exist (such as when measuring damages by considering what profits would have been but for the acts of the defendant), then the judge should typically admit this testimony for the jury to evaluate credibility.²²⁵ But if the expert has no story, prior studies that are incorporated into the present model do not work in the domain of the

220. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 1023–24 (asserting that jurors are “buyers and sellers, parties to contracts, and business owners”).

221. *Id.* at 1025–26; see Uskali Mäki, *On the Method of Isolation in Economics*, 26 POZNAN STUD. PHIL. SCI. & HUMAN. 317, 330–31 (1992) (Pol.) (calling the model a “skeleton” and the story a commentary that “gives it flesh” and can vary from audience to audience).

222. Alan Musgrave, ‘Unreal Assumptions’ in *Economic Theory: The F-Twist Untwisted*, 34 KYKLOS 377, 385–86 (1981) (Switz.) (proposing a typology of three different types of assumptions, including the example about the government's budget being balanced); see also Frank A. Hindriks, *Tractability Assumptions and the Musgrave-Mäki Typology*, 13 J. ECON. METHODOLOGY 401 *passim* (2006) (explaining first- and second-order assumptions and categorizing the second-order assumptions as negligibility, applicability, and tractability); Uskali Mäki, *Kinds of Assumptions and Their Truth: Shaking an Untwisted F-Twist*, 53 KYKLOS 317 *passim* (2000) (Switz.) [hereinafter Mäki, *Kinds of Assumptions*] (building upon and explaining Musgrave's typology of assumptions).

223. Uskali Mäki, *Aspects of Realism about Economics*, 13 THEORIA 301, 311, 314 (1998) (Swed.) [hereinafter Mäki, *Aspects of Realism*]; see Machlup, *supra* note 217, at 581 (writing that a model should exhibit only the relevant variables and relations); Jack Melitz, *Friedman and Machlup on the Significance of Testing Economic Assumptions*, 73 J. POLITICAL ECON. 37, 41 (1965) (describing abstraction as an instrument for achieving scope without sacrificing accuracy and thus facilitating the attainment of truth).

224. Mäki, *Aspects of Realism*, *supra* note 223, at 304–05.

225. Todd, *Realistic Assumptions*, *supra* note 20, at 282–83; 285–87; see Mäki, *Reorienting*, *supra* note 34, 241–43 (explaining different meanings for “realistic” and “unrealistic,” including true and false, confirmed or disconfirmed by evidence, plausible or implausible, and complete or incomplete).

case, or the evidence in the record controverts the assumption, then the judge is justified in denying admissibility.²²⁶

While an interdisciplinary approach can provide answers about the *Daubert* reliability of model-based expert testimony,²²⁷ drawing from the “knowledge and experience” of economics also raises new questions. The methodological scholarship deals only with economic models,²²⁸ yet some economists use models in a different way than econometricians—or eschew them altogether as incapable of revealing the truth.²²⁹ As discussed in the next Section, these heterodox voices raise questions not only about the reliability of econometric models but also (and more fundamentally) their relevance and capacity to ascertain the truth.

III. ALTERNATIVE VOICES: ECONOMICS SCHOLARSHIP THAT QUESTIONS ECONOMETRIC MODELS

There has been much nuanced discussion about econometrics and its admissibility in court. This Article’s cursory review of the legal and economic literature illustrates this. However, not all economists subscribe to the econometric methodology. There are numerous camps of so-called heterodox economists²³⁰ (economics being the supposed “orthodoxy”). Many of these economists are not ignorant of econometric methods.²³¹ As this Section explains, the heterodox economists believe that econometric methods, even if done “properly” by delineating first- and second-order assumptions, are fatally flawed.

While there are truly countless camps of heterodox economists, this Article focuses on two sizeable ones that have gained a number of adherents: the Austrian school²³² and fractal economics.²³³ This Article does not make this selection to proclaim that these camps are “correct” in their pursuit of economic truths and therefore econometrics is entirely wrong. Rather, this Article shows that the challenges these heterodox economists raise as to the validity of econometric methods are not wild crackpot accusations, but instead are soundly grounded in concerns about finding economic truth. Ignoring their economic studies may make the field of economic study weaker. Moreover, the exclusion of heterodox testimony in the courtroom means that econometrics has become the darling of courts simply based on its entrenched status as such, rather than as necessarily the sole method for eliciting economic truth.

226. See Todd, *Realistic Assumptions*, *supra* note 20, at 282–91.

227. See Faulkner, *supra* note 21 (manuscript at 41–53) (applying Todd’s framework to critique a court’s admissibility ruling and concluding that the guidelines can bring better understanding and clarity to artistic elements of the model).

228. See Machlup, *supra* note 217, at 569 (calling the word “model” a methodological term).

229. MCCLOSKEY, KNOWLEDGE, *supra* note 40, at 42 (writing that economists understand phenomena via metaphors, and a “Marxist or institutionalist or Austrian . . . will see somewhat differently” than a “mainstream, neoclassical” economist).

230. See *infra* Parts III.A, III.B.

231. See, e.g., Mandelbrot, *What’s Wrong with Wall Street*, *supra* note 26.

232. See *infra* Part III.A.

233. See *infra* Part III.B.

A. *The Epistemology of Austrian Economics*

Unlike econometrics, the Austrian school of economics—whose notable proponents included Ludwig Mises, Murray Rothbard, Friedrich Hayek, and current scholar Jesús Huerta de Soto—fashioned itself entirely differently in its approach to economics throughout the twentieth century.²³⁴ This distinction was true both in purpose and in methodology.²³⁵

The purpose of economics, Mises and Rothbard stated, is to *explain* economic phenomena but emphatically not to *predict* them.²³⁶ Indeed, Hayek claimed that Milton Friedman's positivist economics, founded on a principle of prediction, was one of the "most dangerous" innovations of the twentieth century²³⁷ because it represented economics as able to do something it simply could not do.²³⁸ To the casual observer, the distinction between "explanation" and "prediction" may seem mere semantics. But a chasm that is not easily spanned underlies the words. "Explanation," as Austrians term it, is a verbal description of an economic phenomenon, grounded not in "theory" or "inferences" derived from *inductive* data methods like econometrics but rather as a postulate derived *deductively* in a chain from an original supposition, or axiom, that the Austrians claim to be applicable in a given economic circumstance.²³⁹

The core concept for Austrians is that "humans act."²⁴⁰ Austrians justify this claim by the obvious fact that human action is observable through the rational senses.²⁴¹ But they also consider it "an ultimate given" because humans all have the ability to introspect, and from that introspection, it is self-evident that people act.²⁴² For that reason, Austrians say, although the "ultimate given" of "humans act" is similar to a mathematical axiom

234. See generally HUERTA DE SOTO, *THE AUSTRIAN SCHOOL*, *supra* note 24 (detailing the Austrian school's theory on economic science in the context of market order and entrepreneurial creativity).

235. See generally *id.*

236. See Guzelian, *Testing*, *supra* note 22, at 303–06 (first citing MISES, *HUMAN ACTION*, *supra* note 23; and then citing Murray N. Rothbard, *Praxeology: A Reply to Mr. Schuller*, 41 AM. ECON. REV. 943, 943 (1951) [hereinafter Rothbard, *Praxeology*]).

237. DE SOTO, *THE AUSTRIAN SCHOOL*, *supra* note 24, at 76 ("Hayek even stated that after Keynes's *General Theory*, the most dangerous book for economics was *Essays in Positive Economics* by Milton Friedman."); see also FRIEDMAN, *supra* note 211.

238. The foreword contributor to Murray Rothbard's treatise explains this difference:

By the advent of the 1970s, however, mainstream economic theory had sunk to almost unfathomable depths, degenerating into a series of loosely related mathematical models which had little contact with reality. Following the prevailing Friedmanite-positivist methodology, the tentative "validity"—never the truth—of these models was putatively established by empirically testing their ability to predict or, more accurately, "retrodict" using the methods of econometrics. The last vestiges of the Mengerian approach thus disappeared from the curricula of graduate economics programs and causal-realist theoretical research was now completely banished from academic journals, which had become the main, if not the only, research outlet for mainstream economics.

Salerno, *supra* note 23, at xlv.

239. See Guzelian, *Testing*, *supra* note 22, *passim*.

240. *Id.* at 304 (citing Rothbard, *Praxeology*, *supra* note 236, at 943).

241. See Rothbard, *Praxeology*, *supra* note 236, at 943.

242. MISES, *HUMAN ACTION*, *supra* note 23, at 17–19.

(like Peano's foundational axioms), it is something more than that.²⁴³ It exists not just in an abstract space but rather in both human observation and introspection.²⁴⁴ It is therefore an irreducible claim, one not allowing itself to be subject to further dissection.²⁴⁵

Once a founding principle that "humans act" is in place, Austrians then proceed to use what they term "logico-deductive" methods (or "praxeology") to make further claims.²⁴⁶ Austrians say that praxeology is the verbal equivalent of stating and then proving mathematical theorems.²⁴⁷ Starting with the axiom "humans act," further conclusions follow from logical deduction and appeal to everyday instincts about behavior. For example, if "humans act," then there could be *multiple* "humans acting." Moreover, multiperson action could be *coordinated*. The imaginable fact that not everyone in a town is gathering berries and nuts on a given day but rather some are teaching, mowing lawns, and working in hair salons, leads to the deduced economic principle of "division of labor."²⁴⁸ From there, countless Austrian postulates follow into areas of economics as diverse as antitrust, banking, insurance, monetary policy, and economic theories of war.²⁴⁹ Modern Austrians labor to add to the body of stated results using the "praxeological method."²⁵⁰ However, debates occur with frequency among Austrians as to whether a scholar's derivation of a particular theorem has made proper use of praxeology.²⁵¹

Foundational treatises in Austrian economics, notably, Mises' *Human Action*²⁵² and Rothbard's *Man, Economy, and State*,²⁵³ provide voluminous treatment of how praxeology properly occurs—that is, by which methods an economist may properly deduce further theorems from previous axioms, postulates, and statements.²⁵⁴ Their explanations need not be repeated here for the sake of brevity, but what is important to

243. Guzelian, *Testing*, *supra* note 22, at 304–05 (first citing Rothbard, *Praxeology*, *supra* note 236, at 943; and then citing MISES, HUMAN ACTION, *supra* note 23, at 17–18).

244. *Id.* at 306.

245. Mises did acknowledge that the reasons underlying why humans act could someday perhaps be reduced to neuroscience. Although great progress has been made in the neurosciences, Austrians claim they are still incapable of providing full, robust explanations of individual human behavior. See MISES, HUMAN ACTION, *supra* note 23, at 17–18. Indeed, even within neuroscience come empirical validations that there is a spiritual realm that interfaces with the brain and complicates any attempt to reduce behavioral explanations to mere molecular interactions. See generally RICK STRASSMAN, DMT AND THE SOUL OF PROPHECY: A NEW SCIENCE OF SPIRITUAL REVELATION IN THE HEBREW BIBLE (2014). One Soviet-era Christian economist, Sergei Bulgakov, likewise contended that such a scientific breakthrough will never happen because "Sophia"—the invisible spirit of knowledge and wisdom—pervades both nature and mankind's internal life and is what alone enables human identification of truth. Catherine Evtuhov, *Introduction* to SERGEI BULGAKOV, PHILOSOPHY OF ECONOMY: THE WORLD AS HOUSEHOLD 1, 10–13 (Catherine Evtuhov ed. & trans., 2000).

246. Guzelian, *Testing*, *supra* note 22, at 304.

247. *Id.*

248. MISES, HUMAN ACTION, *supra* note 23, at 157–58.

249. *Id.* at xxvii–xxxvii.

250. See Rothbard, *Praxeology*, *supra* note 236, *passim*.

251. See, e.g., Robert P. Murphy, *More than Quibbles: Problems with the Theory and History of Fractional Reserve Free Banking*, 22 Q.J. AUSTRIAN ECON. 3 (2019) (cataloging debates about fractional reserve free banking).

252. MISES, HUMAN ACTION, *supra* note 23.

253. MAN, ECONOMY, AND STATE WITH POWER AND MARKET, *supra* note 23.

254. See *id.* *passim*.

recognize for this Article's purposes is that certain professors of economics—considered luminaries by all cadres of Austrian economists—have provided considerable thought about praxeology. They have claimed it as the exclusive methodology for gaining economic knowledge.²⁵⁵ In other words, to Austrians, praxeology *is* economics. The only epistemology of economics is achieved through deductive praxeology.²⁵⁶ No inductive method (like econometrics) suffices.²⁵⁷

Indeed, Mises specifically excluded from economics the use of empirical data, stating, “It is impossible to reform the sciences of human action according to the pattern of physics and the other natural sciences.”²⁵⁸ Mises believed that economics is nonrepeating and nonexperimental, whereas physics is experimental, repeatable, and testable.²⁵⁹ As Christopher Guzelian has summarized elsewhere: “To Austrians, praxeology can ‘*explain*’ particular historical data, but conversely, data cannot inform the truth or falsity of apodictic economic theorems/propositions, nor lead to the discovery of additional economic theorems. To Austrians, only praxeology produces economic theory and knowledge.”²⁶⁰

Rothbard too believed that while praxeologically derived theory can be used to glean corroborative evidence from the mass of historical data, historical data cannot inform or modify economic theory:

[H]istorical facts are complex and cannot, like the controlled and isolable physical facts of the scientific laboratory, be used to test theory. There are always many causal factors impinging on each other to form historical facts. Only causal theories *a priori* to these facts can be used to isolate and identify the causal strands.²⁶¹

Austrians therefore frequently harbor a certain self-righteousness that they are espousing economic “truths” when they give explanations based on *a priori* theorems.²⁶² Once someone reaches for an econometric model to counter that truth, Austrians are apt to leave the room.

Guzelian has previously contended, however, that the Austrians have left unanalyzed what happens when historical facts do not support praxeology's “causal strands.”²⁶³ He asserted that someone must make a judgment of the praxeological causal strand's empirical relevance.²⁶⁴ An example from the physical sciences develops this point further:

Let us take an analogy from the realm of the physical sciences, as Austrian philosopher Long does, to address this point. Suppose we somehow knew, *a priori*, gravity to be a true force of -9.8 m/sec^2 . (Obviously scientific theories

255. Guzelian, *Testing*, *supra* note 22, at 305–06.

256. *Id.* at 303–06.

257. *Id.*

258. MISES, HUMAN ACTION, *supra* note 23, at 31.

259. *Id.*

260. Guzelian, *Testing*, *supra* note 22, at 305.

261. MURRAY N. ROTHBARD, AMERICA'S GREAT DEPRESSION, at xxxix (5th ed. 2000) [hereinafter ROTHBARD, GREAT DEPRESSION].

262. See, e.g., MISES, HUMAN ACTION, *supra* note 23, at 30–32.

263. Guzelian & Mulligan, *supra* note 22, at 16–17.

264. *Id.* at 18.

are in part empirically inferred, so this analogy is not perfect—we are assuming someone could praxeologically “deduce” gravity without actually observing empirical events first.) If we have a ball and drop it from a certain height, it should fall 9.8 meters in the first second. In other words, our *a priori* expectation leads to a logical causal prediction.

But what if the ball levitates? Is gravity then false? We might then look for other historical facts to explain why this happened. Say, for instance, we discover that there was a repulsion magnet on the ground and that the ball is likewise magnetic. Assume we also somehow knew *a priori* that repulsion magnets exert repulsive forces on magnetic objects. This additional fact permits us to say that the ball hovers, because the forces of gravity and the opposing magnetic field cancel each other for that specific weight of the ball at that specific height.

Long says the correct epistemological view is that gravity has not been disproven by the lack of corroborative empirical evidence, because “whatever other forces may be acting on the object, we can still predict the object will end up [9.8] [meters] further downward that [sic] it would have if gravity had not been acting on it.” In other words, just because historical facts in the *real* world do not permit us to see the *isolated* causal effect of gravity (e.g. the ball that never fell because of a magnet lying on the ground), there is an *imagined yet realistically possible* world in which the ball would have fallen to the ground, if only the magnet were not there, or if only the ball had been made of (non-magnetic) rubber rather than iron. Gravity was still acting in the real world. Its effects were obscured by the complexity of reality that involved a magnet.²⁶⁵

This gravity-magnet analogy leads to the Austrian fractional-reserve hypothesis and takes it, derived praxeologically, as the economic equivalent of gravity. According to this hypothesis, “commodity price and interest rate volatility [are] harmful symptom[s] of the undesirable malinvestment occurring during the fractional-reserve business cycle.”²⁶⁶ Rather than just one of many nondescript Austrian praxeological conclusions, fractional-reserve banking is one of the fundamental principles of the Austrian school, “touted . . . as a, if not *the*, primary ill of the modern economy.”²⁶⁷ Consider Rothbard, who wrote with a deterministic air about the Great Depression when he proclaimed that “credit-expansion, with resulting accumulation of *malinvested* capital, lead[s] finally and *inevitably* to economic crisis.”²⁶⁸

The same Austrians who tout the “inevitability” of price volatility whenever fractional-reserve banking is present do not naively ignore the fact that counteracting causes can exist in reality. For example, praxeology indicates that improvements in

265. *Id.* at 16–17 (first alteration in original) (citations omitted) (quoting Roderick T. Long, *Realism and Abstraction in Economics: Aristotle and Mises Versus Friedman*, 9 Q.J. AUSTRIAN ECON. 3, 13 (2006)).

266. *Id.* at 17.

267. *Id.*; see, e.g., Jesús Huerta de Soto, *A Critical Analysis of Central Banks and Fractional-Reserve Free Banking from the Austrian School Perspective*, 8 REV. AUSTRIAN ECON. 25, 25–26 (1995) (describing the “systematic coercion” of central banks as “damaging and prejudicial” and claiming that such erroneous approaches to money and banking lead “inexorably” to recession).

268. ROTHBARD, GREAT DEPRESSION, *supra* note 261, at xlii.

innovation and technology also cause natural price fluctuations;²⁶⁹ however, Austrians say such empirically indistinguishable price fluctuations are desirable when contrasted with the “undesirable” price volatility inherent to the fractional-reserve business cycle.²⁷⁰ In terms of the analogy to gravity, “if monetary expansion is ‘gravity,’ then technological improvement and innovation could be a ‘magnet’ capable of either offsetting or amplifying the volatility attributable to fractional-reserve banking.”²⁷¹

Even thinking praxeologically, one cannot immediately conclude (as even prominent Austrians like Rothbard have) that economic crisis becomes inevitable where price volatility and fractional-reserve banking coexist. One must instead look to the historical record to see what happened.²⁷² For example, Mises recognized that once one seeks empirical confirmation of praxeological theorems, praxeology’s comfortable objectivity is lost:

[T]here necessarily enters into [factual] understanding an element of subjectivity. . . .

. . . .

. . . Two historians . . . may fully agree in establishing that the factors *a*, *b*, and *c* worked together in producing the effect *P*; nonetheless they can widely disagree with regard to the relevance of the respective contributions of *a*, *b*, and *c* to the final outcome. . . . [T]hese are not judgments of value, they do not express preferences of the historian. They are judgments of relevance.

. . . [A]s far as historians disagree with regard to judgments of relevance it is impossible to find a solution which all sane men must accept.²⁷³

Guzelian and Mulligan, drawing on this statement from Mises ask us to

consider the following: an Austrian and a non-Austrian each look at historical data of price fluctuations in countries that [engaged in] fractional-reserve bank[ing] stretching back to time immemorial. The Austrian will point to price fluctuations and emphasize the *primacy* of fractional-reserve banking’s effects on price fluctuations in each case and that imperfect goods-market arbitrage (also a legitimate explanation, per praxeology) was often only a secondary factor. Conversely, the non-Austrian may describe imperfect arbitrage and not even mention fractional-reserve banking [because he] consider[s] it only a *de minimis* contributory force. And Mises himself contends there is no way to sort out which story is the better one. One can legitimately question (and, per Mises, such scrutiny supposedly cannot be objectively dismissed) the *primacy of relevance*. The Austrian Hypothesis, although praxeologically true, may have only tertiary or quaternary empirical relevance or causal significance, and may not even be worthy of mention, perhaps being only a comparatively weak force behind historical business cycles, rather than the “root cause.”²⁷⁴

269. See Gottfried Haberler, *Money and the Business Cycle*, in *THE AUSTRIAN THEORY OF THE TRADE CYCLE AND OTHER ESSAYS* 37, 47 (Richard M. Ebeling ed., 1996).

270. Guzelian & Mulligan, *supra* note 22, at 18.

271. *Id.*

272. *Id.*

273. MISES, *HUMAN ACTION*, *supra* note 23, at 57–58.

274. Guzelian & Mulligan, *supra* note 22, at 18–19 (footnotes omitted) (first citing Kenneth Rogoff, Kenneth A. Froot & Michael Kim, *The Law of One Price over 700 Years* 4–5 (Int’l Monetary Fund, Working

Indeed, Mises' quote on relevance is a trenchant insight that the seminal founder of the Austrian school recognized the incompleteness of praxeological "explanation" of economic realities. Instead, he implicitly recognized the need, beyond mere praxeology, for a judgment of relevance in order to speak meaningfully to any real-world economic event. However, Mises simultaneously dismissed any attempt to objectively ascertain relevance as a fool's errand.

Perhaps entertaining that errand, in a previous publication, Guzelian attempted to provide a "relevance" methodology to broach the gap between Austrian explanation and positivist prediction in economics.²⁷⁵ The details of how that could be done are not relevant to this Article, but what is insightful is how vociferous Austrian opposition is to any opinion that economics could be studied using a method other than praxeology in order to create explanations. In an anonymous peer review of another paper by Guzelian, a committed Austrian economist sharply commented: "The author wants to synthesize praxeology and empiricism, but this is impossible. Praxeology and empiricism are logically incompatible. One accepts and one rejects synthetic a priori knowledge. The author must choose between praxeology and empiricism; there is no middle way."²⁷⁶

B. *The Epistemological Doubt of Fractal Economics*

Most econometric models assume constant relationships between exogenous and endogenous variables.²⁷⁷ As noted in Part II.A, the models are an attempt to estimate the magnitude and nature of the causal relationships between various factors. This is done in the vein of positivist economics, in the hope of creating predictable estimates of future occurrences involving those variables. Theory is built and based around these estimates.

In modern finance theory, a hallmark of causal knowledge is the modern portfolio theory (MPT), first put forth in 1952 in Harry Markowitz's Nobel Prize-winning essay.²⁷⁸ The concept is that diversification of one's investment assets reduces the overall risk of one's investment.²⁷⁹ The theory formulaically allows for the calculation of the expected maximized profit return on the entire portfolio to an investor, taking into account the expected average returns on individual assets and the proportion of those assets to the entire portfolio.²⁸⁰ The theory also allows for calculation of the variances of returns.²⁸¹ In other words, MPT purports to calculate not only optimized average returns on investment but also the volatility (i.e., "risk") in achieving the expected returns.

Yet shortly after MPT's development, French mathematician Benoit Mandelbrot began to cast doubt on the validity of MPT. Developing a theory of variance and volatility measurement called "fractal" analysis, Mandelbrot concluded that economists'

Paper No. 01/174, 2001); and then citing Jörg Guido Hülsmann, Book Review, 3 Q.J. AUSTRIAN ECON. 85 (2000) (reviewing JESÚS HUERTA DE SOTO, *MONEY, BANK CREDIT, AND BUSINESS CYCLES* (1998))).

275. Guzelian, *Relevance*, *supra* note 38, *passim*.

276. Guzelian, *Testing*, *supra* note 22, at 306 n.6.

277. See Friedrich August von Hayek, Nobel Memorial Lecture on the Pretence of Knowledge in Salzburg, Austria (Dec. 11, 1974), in *NOBEL LECTURES IN ECONOMIC SCIENCES, 1969-1980*, at 179-80 (Assar Lindbeck ed., 1992).

278. Harry Markowitz, *Portfolio Selection*, 7 J. FIN. 77 (1952).

279. *Id.* at 77.

280. *Id.* at 79.

281. *Id.*

understandings of how markets move (and thus predictions about those markets) were highly flawed.²⁸² In a later essay, he wrote:

A cornerstone of finance is modern portfolio theory, which tries to maximize returns for a given level of risk. The mathematics underlying portfolio theory handles extreme situations with benign neglect: it regards large market shifts as too unlikely to matter or as impossible to take into account. It is true that portfolio theory may account for what occurs 95 percent of the time in the market. But the picture it presents does not reflect reality, if one agrees that major events are part of the remaining 5 percent. An inescapable analogy is that of a sailor at sea. If the weather is moderate 95 percent of the time, can the mariner afford to ignore the possibility of a typhoon?

The risk-reducing formulas behind portfolio theory rely on a number of demanding and ultimately unfounded premises. First, they suggest that price changes are statistically independent of one another: for example, that today's price has no influence on the changes between the current price and tomorrow's. As a result, predictions of future market movements become impossible. The second presumption is that all price changes are distributed in a pattern that conforms to the standard bell curve. The width of the bell shape (as measured by its sigma, or standard deviation) depicts how far price changes diverge from the mean; events at the extremes are considered extremely rare. Typhoons are, in effect, defined out of existence.

Do financial data neatly conform to such assumptions? Of course, they never do. . . .

According to portfolio theory, the probability of . . . large fluctuations would be a few millionths of a millionth of a millionth of a millionth. (The fluctuations are greater than 10 standard deviations.) But in fact, one observes spikes on a regular basis—as often as every month—and their probability amounts to a few hundredths. Granted, the bell curve is often described as normal—or, more precisely, as the normal distribution. But should financial markets then be described as abnormal? Of course not—they are what they are, and it is portfolio theory that is flawed. . . .

. . . .

. . . It is much like a theory of sea waves that forbids their swells to exceed six feet.²⁸³

Enter the theory of fractal economics. Fractals are not just economic phenomena. Speaking generally, fractals are mathematical calculations and representations of “roughness.”²⁸⁴ Take coastlines as an example. The smooth coast of the Sarasota Gulf of

282. Mandelbrot, *What's Wrong with Wall Street*, *supra* note 26.

283. Mandelbrot, *What's Wrong with Wall Street*, *supra* note 26; *see also* NASSIM NICHOLAS TALEB, *THE BLACK SWAN: THE IMPACT OF THE HIGHLY IMPROBABLE* 277 (2007) (“After the stock market crash [in 1987], they rewarded two theoreticians, Harry Markowitz and William Sharpe, who built beautifully Platonic models on a Gaussian base, contributing to what is called Modern Portfolio Theory. Simply, if you remove their Gaussian assumptions and treat prices as scalable, you are left with hot air. The Nobel Committee could have tested the Sharpe and Markowitz models—they work like quack remedies sold on the Internet—but nobody in Stockholm seems to have thought of it.”).

284. *See* Mandelbrot, *What's Wrong with Wall Street*, *supra* note 26 (“Fractal patterns appear not just in the price changes of securities but in the distribution of galaxies throughout the cosmos, in the shape of coastlines and in the decorative designs generated by innumerable computer programs.”).

Mexico beaches is decidedly less rough than the White Cliffs of Dover or other Irish/English destinations. In both circumstances, the representation can be through a one-dimensional line. But there is a roughness inherent to the English coastline that makes it a profoundly more complex, intricate line (the line turns out to be infinitely long). For that reason, Benoit Mandelbrot created an index of dimensionality that is *fractal* and *fractional*.²⁸⁵ For instance, one might say that a straight line is 1.0. A slightly curved coast of Sarasota could be 1.2. But the coast of England, with its gnarled crags, cliffs, and rough beaches could be 1.6.²⁸⁶

The same concept of roughness translates to markets and their volatilities. Market prices fluctuate over time. The frequency and scope of those fluctuations can be mild, but far more frequently than standard probability models such as MPT predict, those fluctuations are *wild*.²⁸⁷ In one of his books, Mandelbrot recounts his interaction with Harvard economist Hendrik Houthakker and the mystery of cotton price volatility.²⁸⁸ When visiting Houthakker, Mandelbrot noticed a diagram on the board of price movements that looked to have the same fractal roughness as some of Mandelbrot's models.²⁸⁹ Mandelbrot inquired as to what the diagram was, and Houthakker explained it was based on a century of cotton price records from the New York Cotton Exchange.²⁹⁰ Houthakker was frustrated that he could not get the prices to fit his standard models of volatility.²⁹¹

Upon inspection, Mandelbrot realized that cotton prices are far more volatile than any standard model would predict.²⁹² Rather, by using a fractal estimation (which consists of an initial mathematical condition and a “generator” that when applied iteratively, produces a price trend including significant volatilities), Mandelbrot could much more accurately measure the volatility of cotton prices than any standard economic or finance model could.²⁹³ Even more wild volatility has subsequently been found for other asset prices, such as U.S. Treasury bills.²⁹⁴

Economic fractal models, unlike econometric ones, are not causal models. Mandelbrot stresses that economic fractals do not identify, or even attempt to identify, the “unknown rules that govern actual markets.”²⁹⁵ Rather, they provide insight into the frequency and magnitude of volatility thus far observed on those markets—and show that markets typically greatly exceed the volatilities than would be predicted using traditional econometrics.²⁹⁶ Fractal modelers understand that real volatility may shift for

285. See BENOIT B. MANDELBROT, *THE FRACTAL GEOMETRY OF NATURE* 14–19 (1983).

286. See *id.* at 25–33, 33 fig.33 (1983) (“Coastlines are fractal patterns.”).

287. See Mandelbrot, *What's Wrong with Wall Street*, *supra* note 26.

288. MANDELBROT & HUDSON, *supra* note 25, at 147–50.

289. *Id.* at 148.

290. *Id.*

291. *Id.* at 148–49.

292. *Id.* at 149.

293. *Id.* at 149–50.

294. See RICHARD ROLL, *THE BEHAVIOR OF INTEREST RATES: THE APPLICATION OF THE EFFICIENT MARKET MODEL TO U.S. TREASURY BILLS* 46, 52–61 (1970).

295. Mandelbrot, *What's Wrong with Wall Street*, *supra* note 26.

296. See *id.*

unpredictable reasons over time.²⁹⁷ Fractals are, therefore, “similar worlds” models that attempt to *mimic* the true nature of economic reality thus far observed, but without purporting to *predict* future real-world volatilities.²⁹⁸

The concept of “similar worlds” fractal modeling may not seem much different than econometrics viewed through the lens of rhetorical narrative. Yet the difference is profound. Econometrics introduces simplifying assumptions to create a limited but (hopefully) appealing story about past or *future* reality.²⁹⁹ Fractal modelers, by contrast, purport to create a model that exactly mimics *historically* observed price or risk changes.³⁰⁰ While econometricians claim that their models have some future predictive capacity,³⁰¹ fractal economists demur on the question of predictivity and acknowledge that the fractal models’ rules of the economy may differ from any real ones, and that as real rules or conditions change, so too may the degree and frequency of volatilities diverge from the model.³⁰²

IV. RELEVANCE AND TRUTH

The criticisms of econometrics by heterodox approaches leads to a fundamental question about the admissibility of model-based testimony: Can courts assess *Daubert* reliability if there are more fundamental concerns about relevance and truth? Part IV.A summarizes certain Federal Rules of Evidence and judicial opinions interpreting them, particularly in the context of economics evidence. Part IV.B then turns to a consideration of how judges reason about relevance.

A. *The Federal Rules of Evidence and Judicial Opinions*

In the Federal Rules of Evidence, there are three provisions that speak directly to the critical importance that evidence be relevant to be admissible: Rules 401, 402, and 403. First, Rule 401 states that evidence is relevant if: “(a) it has any tendency to make a fact more or less probable than it would be without the evidence; and (b) the fact is of consequence in determining the action.”³⁰³

In the committee notes to Rule 401, the first issue dispensed with is one of *conditional* relevance.³⁰⁴ The committee gave as an example that if someone were to provide evidence that notice had been given to another, but there was also undisputed

297. *See id.*

298. *Id.* (“These techniques do not come closer to forecasting a price drop or rise on a specific day on the basis of past records. But they provide estimates of the probability of what the market *might* do and allow one to prepare for inevitable sea changes.” (emphasis added)).

299. *See supra* note 83–86 and accompanying text for a discussion of how econometrics can provide a simple narrative for juries.

300. *See* MANDELBROT & HUDSON, *supra* note 25, at 247 (“The data overwhelmingly show that the magnitude of price changes depends on those of the past, and that the bell curve is a nonsense.”).

301. Allensworth, *supra* note 2, at 828 (explaining that econometric models are “mathematical abstractions used to predict or describe natural or market processes”); Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 288 (explaining that one purpose of a model is “to predict or measure that which is ‘unknown or unseen’”).

302. *See id.*

303. FED. R. EVID. 401 advisory committee’s note to 1972 proposed rules.

304. *Id.*

evidence that that person had not received it, then the evidence of notice would be irrelevant and inadmissible.³⁰⁵ The committee noted a more often pertinent consideration:

Relevancy is not an inherent characteristic of any item of evidence but exists only as a relation between an item of evidence and a matter properly provable in the case. Does the item of evidence tend to prove the matter sought to be proved? Whether the relationship exists depends upon principles evolved by experience or science, applied logically to the situation at hand. . . .

. . . .

. . . The fact to be proved may be ultimate, intermediate, or evidentiary; it matters not, so long as it is of consequence in the determination of the action.³⁰⁶

Rule 402 excludes any evidence, even if relevant, whose admission in court would violate the U.S. Constitution, federal laws, or evidence rules.³⁰⁷ Additionally, Rule 403 lists a variety of reasons why, even if evidence were otherwise relevant, judges may exclude it.³⁰⁸ The committee gave two specific examples: testimony that may evoke too much emotion and evidence that simply wastes too much time to present.³⁰⁹

Taken together, these three rules, standing on their own, provide little clear guidance on how a judge is to decide relevance.³¹⁰ An exceedingly broad swath of possibilities is left to the judge's discretion, even to the point that relevance seems an entirely subjective inquiry.³¹¹

Yet, relevance cannot be ignored when a judge assesses the admissibility of economic testimony. Indeed, in the order of operations for deciding whether evidence is admissible, a judge's *first* consideration should be the evidence's relevance to the proceedings—*before* deciding the evidence's reliability or "realisticness."³¹²

The Supreme Court has engaged in only one discussion squarely on econometrics' legal relevance. In a race discrimination case, *Bazemore v. Friday*, the trial court excluded several of an expert's regression analyses, reasoning that while the regression analyses included independent variables like race, job title, education, experience, and tenure, the analyses failed to include several relevant independent variables like "across the board and percentage pay increases which varied from county to county."³¹³

305. *Id.*

306. *Id.* (citation omitted).

307. FED. R. EVID. 402.

308. FED. R. EVID. 403 ("[C]ourt[s] may exclude relevant evidence if its probative value is substantially outweighed by a danger of one or more of the following: unfair prejudice, confusing the issues, misleading the jury, undue delay, wasting time, or needlessly presenting cumulative evidence.").

309. FED. R. EVID. 403 advisory committee's note to 1972 proposed rules.

310. See Guzelian, *Relevance*, *supra* note 38, *passim*.

311. *Id.* at 162.

312. *Id.* at 160 ("[D]eciding relevance . . . is the handmaiden to the truth-seeking mission of American trials."); see Dale A. Nance, *Conditional Relevance Reinterpreted*, 70 B.U. L. REV. 447, 447 (1990) ("The cornerstone of modern evidence law is relevance.").

313. *Bazemore v. Friday*, 478 U.S. 385, 398–99 (1986) (Brennan, J., concurring) (per curiam) (quoting *Bazemore v. Friday*, 751 F.2d 662, 672 (4th Cir. 1984)).

The case was appealed to the Supreme Court, which reversed the trial court's decision because "failure to include variables will affect the analysis' probativeness, not its admissibility."³¹⁴ However, Justice Brennan cautioned that, although not a concern in the immediate case before the Court, a regression analysis could be "so incomplete as to be inadmissible as irrelevant."³¹⁵ As Todd previously observed, "[t]he main impact of *Bazemore* seems to be that courts scrutinize not only assumptions of inclusion but also assumptions of exclusion, about what the expert thinks is and is not worthy of attention."³¹⁶

Some lower courts regard relevance as nothing more than the "fit" of a model to the facts before the court, but then stipulate with unsettling candor that "fit is not always obvious, and scientific validity for one purpose is not necessarily scientific validity for other, unrelated purposes."³¹⁷ Others say with similar ambiguity that relevance means that the testimony "logically advances a material aspect of the proposing party's case."³¹⁸ Irrelevance is merely the existence of "[f]undamentally unsupported" opinions.³¹⁹

Some courts are routinely willing to roll up their sleeves and adopt a searching, painstaking scrutiny of any proffered econometric testimony, diving deep into methodological and data soundness in deciding the testimony's relevance.³²⁰ At least one court took a very stringent approach to excluding econometric antitrust testimony as irrelevant because it felt the testimony did not comport with standard methodologies set out by the Supreme Court and a circuit court.³²¹

Nevertheless, many, if not most, courts take a liberal approach to admissibility. Some courts state with surprising candor that the hurdle of legal relevance for *all* econometric evidence is "not high"³²² or that challenges to econometric relevance should

314. *Id.* at 400.

315. *Id.* at 400 n.10; *see also In re Death Penalty Disparity Claims*, No. TSRCV054000632S, 2013 WL 5879422, at *25 (Conn. Super. Ct. Oct. 11, 2013) (rejecting econometric analysis in part due to failure to include relevant data).

316. Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 316 (citing David Goodstein, *How Science Works*, in REFERENCE MANUAL ON SCIENTIFIC EVIDENCE, *supra* note 5, at 37, 40 (characterizing the hypothesis as a "prejudice" based upon "having some reason to choose what is and is not worth observing"). While the later, more famous case of *Daubert* concluded that expert testimony must be "relevant to the task at hand," it offered no specifics as to how relevance should specifically be determined. *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 592–93, 597 (1993).

317. *In re Rail Freight Fuel Surcharge Antitrust Litig.*, 292 F. Supp. 3d 14, 42 (D.D.C. 2017) (quoting *Ambrosini v. Labarraque*, 101 F.3d 129, 134 (D.C. Cir. 1996)).

318. *In re Apollo Grp. Inc. Sec. Litig.*, 527 F. Supp. 2d 957, 959–60 (D. Ariz. 2007) (quoting *Daubert v. Merrell Dow Pharm., Inc.*, 43 F.3d 1311, 1315 (9th Cir. 1995)).

319. *In re Pool Prods. Distrib. Mkt. Antitrust Litig.*, MDL No. 2328, 2016 WL 2756437, at *3 (E.D. La. May 12, 2016) (quoting *Guile v. United States*, 422 F.3d 221, 227 (5th Cir. 2005)).

320. *See, e.g., Bricklayers & Trowel Trades Int'l Pension Fund v. Credit Suisse Sec. (USA) LLC*, 752 F.3d 82, 91–97 (1st Cir. 2014); *Craik v. Minn. State Univ. Bd.*, 731 F.2d 465 (8th Cir. 1984); *Students for Fair Admissions, Inc. v. President of Harvard Coll.*, 397 F. Supp. 3d 126, 158–75 (D. Mass. 2019); *Dailey v. Mich. Blue Cross/Blue Shield, Inc.*, 612 F. Supp. 1444 (E.D. Mich. 1985).

321. *See City of Tuscaloosa v. Harcros Chems., Inc.*, 877 F. Supp. 1504, 1526–27 (N.D. Ala. 1995).

322. *United States v. Am. Express Co.*, No. 10–CV–4496 (NGG)(RER), 2014 WL 2879811, at *8 (E.D.N.Y. June 24, 2014) (quoting, *inter alia*, *United States v. Southland Corp.*, 760 F.2d 1366, 1375 (2d Cir. 1985)); *cf. POM Wonderful LLC v. Organic Juice USA, Inc.*, 769 F. Supp. 2d 188, 200–01 (S.D.N.Y. 2011).

typically “go to the weight of [the] testimony not its admissibility.”³²³ Some courts even candidly admit that the judge does not have the competence to determine whether a particular econometric technique is relevant and thus the matter should be left to a jury.³²⁴ Moreover, the Seventh Circuit has repeatedly held that all statistical evidence, including regression analysis, is typically relevant when used to demonstrate discrimination in disparate treatment cases.³²⁵

Other courts defer to a consensus approach: if the proffered testimony relies on a methodology that the expert can show is “widely accepted in the econometric community,” the model is admitted.³²⁶ Indeed, for some courts, there is not even an attempt to ascertain consensus. The courts simply assert that it is “undisputed” that econometric modeling is relevant, such as in sex discrimination cases.³²⁷ Still, other courts defer to a willful blindness test of econometric relevance: only testimony that

(“Courts in this district have routinely admitted flawed survey evidence where the evidence does not appear to be devoid of all probative value.”).

323. *Arista Records LLC v. Lime Grp. LLC*, No. 06 CV 5936 (KMW), 2011 WL 1674796, at *13 (S.D.N.Y. May 2, 2011); *see also LidoChem, Inc. v. Stoller Enters. Inc.*, No. 1:09-cv-204, 2013 WL 12224209, at *4–5 (W.D. Mich. May 7, 2013).

324. *See, e.g., Mozilla Corp. v. Fed. Comm’n’s Comm’n*, 940 F.3d 1, 52 (D.C. Cir. 2019) (“When intricacies of econometric modeling are in dispute, ‘we do not sit as a panel of referees on a professional economics journal, but as a panel of generalist judges obliged to defer to a reasonable judgment’” (quoting *U.S. Telecom Ass’n v. FCC*, 825 F.3d 674, 697 (D.C. Cir. 2016))); *In re Processed Egg Prods. Antitrust Litig.*, 392 F. Supp. 3d 498, 512 (E.D. Pa. 2019) (“[This case] does not fit neatly into the mold of antitrust cases, leaving this Court to parse through a complicated set of facts and econometric models to determine whether a reasonable jury could rule in the DAPs’ favor. . . . Indeed, this uniqueness, in part, makes it an excellent candidate—again—for trial and again the cause for additional development of antitrust law outside the mold. The defendants make compelling arguments, but these arguments are better suited for a jury.”); *United States v. Fell*, 224 F. Supp. 3d 327, 348 (D. Vt. 2016) (“A court seeking to make use of this information is challenged by the high level of mathematical and statistical skill required to understand the studies. Comprehension and meaningful judgment about the truth of any single econometric study lies beyond the skill and education level of most judges. . . . [T]he court’s own experience [is to] listen[] to the testimony of witnesses on both sides of the question.”); *EEOC v. Wal-Mart Stores, Inc.*, No. 6:01-CV-339-KKC, 2010 WL 583680, at *7 (E.D. Ky. Feb. 16, 2010) (“The Court has no way of determining which of the experts is correct regarding the use of the R-Squared value in this case. Accordingly, both experts should be permitted to present their opinions on this issue to the jury.”).

325. *See Adams v. Ameritech Servs., Inc.*, 231 F.3d 414, 425 (7th Cir. 2000) (stating that to be relevant, a statistical analysis “need only make the existence of ‘any fact that is of consequence’ more or less probable” (quoting *FED. R. EVID.* 401)); *EEOC v. Sears, Roebuck & Co.*, 839 F.2d 302, 324 n.22 (7th Cir. 1988) (“Multiple regression analyses, designed to determine the effect of several independent variables on a dependent variable, . . . are an accepted and common method of proving disparate treatment claims.”); *Mister v. Ill. Cent. Gulf R.R. Co.*, 832 F.2d 1427, 1430–31 (7th Cir. 1987) (reversing a grant of summary judgment in a disparate treatment case where the defendant failed to rebut the plaintiffs’ statistical showing that the defendant hired a much larger proportion of White than Black applicants).

326. *In re Urethane Antitrust Litig.*, 166 F. Supp. 3d 501, 509 (D.N.J. 2016) (citing *In re High-Tech Emp. Antitrust Litig.*, No. 11-CV-02509-LHK, 2014 WL 1351040, at *14 (N.D. Cal. Apr. 4, 2014)); *see also EEOC v. Paramount Staffing, Inc.*, No. 02:06-cv-2624-JPM-dkv, 2010 WL 2521034, at *5 (W.D. Tenn. May 17, 2010); *In re Polypropylene Carpet Antitrust Litig.*, No. 1075, 2000 WL 863456, at *2 (N.D. Ga. Apr. 27, 2000).

327. *In re Elec. Books Antitrust Litig.*, No. 11 MD 2293(DLC), 2014 WL 1282293, at *9 n.18 (S.D.N.Y. Mar. 28, 2014) (citing *Lavin-McEleney v. Marist Coll.*, 239 F.3d 476, 482 (2d Cir. 2001)); *see also Apple iPod iTunes Antitrust Litig.*, No. 05-CV-0037 YGR, 2014 WL 4809288, at *7 (N.D. Cal. Sept. 26, 2014) (asserting the “general acceptance of multiple-regression analysis” in rejecting a challenge to the expert’s admissibility).

intentionally overlooks data contrary to the asserted position will be viewed with skepticism.³²⁸

Other courts, noting the “soft science” nature of economics, conclude that the “use of professional judgement” is required and *all* expert econometric testimony is “less likely to be excluded because ‘challenges may ultimately be viewed as matters in which reasonable experts may differ.’”³²⁹ Even where specific statistical prerequisites of econometrics are lacking, such as identifying breakpoints in a time series analysis or the dubious selection of data inputs, courts have been reluctant to exclude expert testimony.³³⁰ The Supreme Court, however, has contended that because “expert evidence can be both powerful and quite misleading,” courts should exercise “more control over experts than over lay witnesses.”³³¹

This is not to say that any proffered econometric testimony is relevant. Where the proposed testimony has no bearing on the legal matter before the court—for instance, testimony that is meant to show that conspirators in a fraud scheme thought that the victims would ultimately benefit *after* the fraud had been committed (an impermissible legal defense)—the courts exclude the testimony as irrelevant.³³² But if an econometric study has sampled a population that is over- or underinclusive of a target population relevant at trial, courts have found that sampling to still be relevant.³³³

Tellingly, this Article’s authors have not located a single case in all reported state and federal cases that involved the admissibility of fractal economic or Austrian economic testimony. Thus, while no court has specifically excluded alternate forms of economic testimony other than econometrics,³³⁴ there are no present examples of testimonies involving the two heterodox forms of economic theory that were discussed in this Article. This suggests that the scope of relevance has been misunderstood by judges and attorneys alike, in terms of which experts and what testimony is admissible in the courtroom.

328. See, e.g., *United States v. Am. Express Co.*, No. 10–CV–4496 (NGG)(RER), 2014 WL 2879811, at *6–7 (E.D.N.Y. June 24, 2014).

329. *In re Air Cargo Shipping Servs. Antitrust Litig.*, No. 06–MD–1175 (JG)(VVP), 2014 WL 7882100, at *8 (E.D.N.Y. Oct. 15, 2014) (quoting *In re Vitamin C Antitrust Litig.*, No. 06–MD–1738 (BMC)(JO), 2012 WL 6675117, at *5 (E.D.N.Y. Dec. 21, 2012)); see also *In re Mushroom Direct Purchaser Antitrust Litig.*, No. 06–0620, 2015 WL 5775600, at *3 (E.D. Pa. Aug. 5, 2015) (“[S]ince economics and econometrics are disciplines that ‘require the use of professional judgment, expert testimony [in those fields] is less likely to be excluded because challenges may ultimately be viewed as matters in which reasonable experts may differ.’” (quoting *In re Air Cargo*, 2014 WL 7882100, at *8 (second alteration in original))).

330. See *Chen-Oster v. Goldman, Sachs & Co.*, 114 F. Supp. 3d 110, 121–23 (S.D.N.Y. 2015) (listing cases in which courts permitted econometrician testimony despite failure to adhere to the Chow test); *Manpower, Inc. v. Ins. Co. of Pa.*, 732 F.3d 796, 808–10 (7th Cir. 2013) (allowing testimony despite serious concerns about data inputs).

331. *Schwab v. Philip Morris USA, Inc.*, 449 F. Supp. 2d 992, 1134 (E.D.N.Y. 2006) (quoting *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 595 (1993)).

332. See, e.g., *United States v. Gatto*, No. 17-cr-0686 (LAK), 2019 WL 266944, at *10 (S.D.N.Y. Jan. 17, 2019) (excluding testimony concerning “economic benefits a five-star student-athlete might have yielded to the Victim Universities . . . after the immediate deprivation of property”).

333. *Schwab*, 449 F. Supp. 2d at 1134–35.

334. One court rejected the idea that econometric analysis in an antitrust case is necessary. Instead the court concluded that practical indicia such as “voice of the consumer” surveys could be adequate. *TransWeb, LLC v. 3M Innovative Props. Co.*, No. 10-4413 (FSH)(PS), 2012 WL 10634568, at *6 (D.N.J. July 13, 2012).

B. *How a Judge Determines Relevance*

The operative question, then, is how a judge should decide relevance in actual practice. As discussed by Guzelian elsewhere, when deciding relevance, a judge may oscillate between two poles in her mind.³³⁵ At the one extreme, she may opt to be a legal objectivist or formalist. This means that she believes:

finding relevance is an impartial and mostly rational endeavor, epistemologically akin to discovering a scientific fact. It is uninfluenced by extralegal factors such as one's moral or political sentiments, personal interests, or breezily, "what the judge ate for breakfast." From an objectivist perspective, it follows that (1) there is an ontologically correct answer to any particular question of relevance (i.e., "relevant" or "irrelevant") and (2) the same answer is consistently reached regardless of which judge is presiding.³³⁶

At the other pole, a judge could be an extreme "subjectivist" when it comes to deciding relevance. Subjectivism was represented most famously by late federal judge Jerome Frank. Judge Frank went further than almost any other realist, specifically claiming that determining the relevance of facts—regarded even by his subjectivist peers as among the most objective trial processes—is a subjective decision.³³⁷ Judge Frank contended that all judges actually rely on intuitive hunches to decide relevance.³³⁸ Only after having made up their minds (owing to their hunches) do judges invent express rationales—whether honest or deceitful—that support their conclusions.³³⁹

Therefore, Judge Frank surmised, one must identify the hunch-producers—the actual causes of a judge's hunch—to understand or predict the judge's decisions about relevance.³⁴⁰ Judge Frank contended that extralegal factors, like personal morality, or (more importantly for our purposes) economic or political persuasions, significantly mold a hunch.³⁴¹ More strikingly, he claimed that a judge's hunch-producers are innumerable, frequently unconscious, and unique.³⁴² Coupling this conclusion with his belief that every trial's circumstances are unique, Judge Frank concluded that there is no objectivity in determining relevance.³⁴³

The implications of subjectivist relevance are daunting. If a judge has full authority to decide relevance over all proffered evidence—and she does—her decisions are

335. See Guzelian, *Relevance*, *supra* note 38, *passim*.

336. Guzelian, *Relevance*, *supra* note 38, at 161 (footnotes omitted); see generally 11 GERALD J. POSTEMA, *LEGAL PHILOSOPHY IN THE TWENTIETH CENTURY: THE COMMON LAW WORLD* § 3.2.2.5 (2011) (explaining that the problems with legal formalism—the strict rational application of legal rules to particular circumstances—have been exposed in the legal philosophical literature). But see Shai Danziger, Jonathan Levav & Liora Avnaim-Pesso, *Extraneous Factors in Judicial Decisions*, 108 PROCS. NAT'L ACAD. SCI. 6889, 6890 (2011) (finding that parole decisions were influenced substantially by their timing relative to judges' two daily food breaks).

337. See JEROME FRANK, *LAW AND THE MODERN MIND* 105–06 (1930).

338. See *id.* at 104–05.

339. *Id.* at 101–03.

340. See *id.* at 104–05.

341. *Id.*

342. See *id.* at 104–07.

343. See *id.* at 116.

entirely her own subjective whims. As such, she can steer the trial to the conclusion she wishes with no oversight, even at the appellate level.³⁴⁴

Readers might be horrified to think that a judge's relevance decision is purely subjective, and they might overreact by fleeing to the opposite conclusion that relevance is only an objective inquiry, bound strictly by rules. The problem is that even if an objective conception of relevance squares better with sentimental notions of American justice, recent neuroscience and philosophical experiments do not support the belief. The available evidence *does* suggest that a great deal of subjectivity exists for relevance decisions. It turns out that not only do facts influence moral judgments, but moral attitudes cause certain facts to be found (or dismissed as false).³⁴⁵ For instance, Yale philosopher Joshua Knobe has shown that a fact finder's preexisting moral attitudes significantly impact their factual conclusions.³⁴⁶ This is true for issues such as identifying intent; establishing scientific causation; producing knowledge, happiness, or freedom; or determining whether a person's behavior constitutes a positive action or instead merely an allowance of natural consequences.³⁴⁷

Guzelian attempted to broach this unsettling divide between objectivist and subjectivist relevance by acknowledging that Judge Frank's conclusions seem to be borne out in the scientific literature; but at the same time, there is a kind of objectivity to decisions of relevance that a judge should not overlook.³⁴⁸ Specifically, judges are a kind of typology. They are a class of individuals, selected based on their legal training, education, careers, and relations, which makes them ideally suited to sit in the roles that they do. They refer to the same laws, speak a common language, share somewhat similar backgrounds and American cultural norms, and are sworn to the same oaths.

344. As explained in Guzelian's paper:

The consequences of adopting a subjective attitude toward relevance are several. First, the ambition to "correctly" decide relevance vanishes (or becomes a nonsensical concept) when relevance is viewed through a subjectivist's lens. If, as Judge Frank claimed, relevance is decided by the confluence of unique trials and idiosyncratic judicial hunches, a decision is "correct"—not ontologically according to "a brooding omnipresence in the sky," but rather by simple virtue of the judge's vested authority to make it. And yet, American law allows appellate review of relevance. If Judge Frank was indeed right about relevance's subjectivity, what would it mean when an appellate judge decides that the trial judge committed "error"? After all, in a subjectivist way of thinking, the appellate judge shares neither the same hunch nor trial circumstances as the trial judge. Thus, an upheld relevance judgment must mean that the appellate judge finds that the trial judge's explicit rationale justifying the decision is consistent with the trial judge's unique hunch about relevance. Said differently, under a subjective view of relevance, an appellate judge would properly uphold a decision [as long as] the trial judge appeared to be true to that trial judge's usual convictions in deciding relevance. *Sincerity*, however, is a far cry from being *correct*.

Guzelian, *Relevance*, *supra* note 38, at 163 (footnotes omitted).

345. See Joshua Knobe, *Intentional Action and Side Effects in Ordinary Language*, 63 ANALYSIS 190, 191 (2003) [hereinafter Knobe, *Intentional Action*]; Joshua Knobe, *Person as Scientist, Person as Moralizer*, 33 BEHAV. & BRAIN SCI. 315, 315 (2010) [hereinafter Knobe, *Person as Scientist*].

346. Knobe, *Intentional Action*, *supra* note 345, at 191; Knobe, *Person as Scientist*, *supra* note 345, at 315.

347. See Knobe, *Person as Scientist*, *supra* note 345, at 317–20.

348. See Guzelian, *Relevance*, *supra* note 38, at 165–67.

For that reason, Guzelian asserted that judges, however subjective their relevance decisions may seem, are in fact bounded by the extent to which they can “freelance” in deciding matters of relevance.³⁴⁹ Admittedly, the bounds are wide, and the delineations to those bounds are somewhat murky.³⁵⁰ But they do indeed exist.³⁵¹ Importantly, there is experimental evidence that suggests the more a group of individuals aspires to be objective and pursue the truth, the more likely it is that they will achieve such.³⁵²

In sum, judges’ decisions about relevance are frankly quite subjective. But there are means and methods for ensuring that the class of individuals who become judges remains relatively consistent, such that courtroom participants can expect a “bounded but discretionary” uniformity in relevance decisions from judge to judge. It should also be the case that judges expect such uniformity.

V. ANALYSIS AND APPLICATION: A LOW THRESHOLD FOR ADMITTING EXPERT TESTIMONY

Instead of bringing admissibility issues into focus, Part V.A explains how the economics literature seems to further distort the picture because the minority voices question the efficacy of modeling. Legal scholars could disregard these voices as “outliers” and “mavericks” who engage in “junk science.”³⁵³ Courts, if faced with a party’s expert who relied upon these theories to oppose an econometric expert, might simply ignore the heterodox expert as unreliable since *Daubert* empowered courts to view techniques that have only minimal support in the community “with skepticism.”³⁵⁴

Additionally, courts have shown a preference for economic approaches based on consensus.³⁵⁵ Yet if consensus follows a normal distribution, then “nonconsensus” theories are not outliers but instead divergent perspectives that are nevertheless “on the curve.”³⁵⁶ One takeaway from Section IV is that neither Austrian nor fractal economics live at the margins but instead constitute robust minority voices that offer alternative approaches to economics and, in doing so, highlight the shortcomings of the status

349. *See id.* at 166–67.

350. *See id.* at 167 (“[I]f judges share common variants of these influential hunch-producers, one can anticipate a *rough* uniformity across judges’ relevance decisions.” (emphasis added)).

351. *See id.* at 165–68.

352. *See* DAN ARIELY, PREDICTABLY IRRATIONAL 206–13 (2008) (explaining that studies demonstrate a differential in cheating prevalence among students primed and unprimed by an honor code pledge or a recitation of the Ten Commandments).

353. *See* Haw, *supra* note 37, at 1301–04 (proposing that parties be able to use peremptory strikes against the opponent’s economics experts to keep testimony based on theories with only a handful of adherents from the jury); Mnookin, *supra* note 79, at 1570, 1579 (recognizing the purpose behind *Daubert* was to screen out experts who employ “junk science” that could mislead “scientifically naïve” jurors).

354. *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 594 (1993) (“[A] known technique which has been able to attract only minimal support within the community’ may properly be viewed with skepticism.” (quoting *United States v. Downing* 753 F.2d 1224, 1238 (3d Cir. 1985))).

355. *See, e.g.,* *Weyerhaeuser Co. v. Ross-Simmons Hardwood Lumber Co.*, 549 U.S. 312, 323–26 (2007) (reversing a jury award where the district court admitted dueling experts because the weight of economic authority supported the theory relied upon by the defendant’s rather than the plaintiff’s expert); Hungar & Koopmans, *supra* note 27, at 54 (opining that courts in antitrust cases prefer expert testimony based on consensus).

356. Haw, *supra* note 37, at 1304–05.

quo.³⁵⁷ These shortcomings do not cease to exist if courts and commentators ignore the critics. More importantly, the criticisms raise questions about the admissibility of econometric expert testimony, not because of *Daubert* unreliability but because of potential irrelevance under Rules 401 and 402.

Before declaring an entire field of study off limits to litigation, remember that the relevance of econometric—or any economics—expert testimony starts with the judge. Part V.B argues that a judge approaches relevance neither wholly objectively nor subjectively; instead, she relies on hunch-producers like the nexus of U.S. laws and rules and the context of the case. Law review articles and related economics scholarship reveal a field with different voices in the understanding and communication of economic issues.³⁵⁸ Yet, as Part V.B explains, rhetoricians simultaneously recognize that the understanding of economics is better when all of these voices—rather than a select few—are heard. Part V.B also explains how the judge, in considering context, should be mindful of the role of the jury, which weaves a coherent story from threads of real-world experience and evidence—including the conflicting testimony of opposing experts.

Given the acceptance of multiple, divergent approaches to economics within the field and the role of the jury in piecing together evidentiary fragments to arrive at the truth, the judge need not withhold economics expert testimony because of relevance concerns. Instead, she should admit it—along with instructions explaining the approach of the proffered expert(s)—so that the jury can determine its relevant resemblance to the world when constructing its story.

A. *The Seeming Irrelevance of Economics Expert Testimony*

As suggested by the lengthy discussions in Part II.C and Section III, courts—and in turn, commentators—focus on *Daubert* when addressing the admissibility of economics expert testimony. Courts tend to assume relevance, either by not asking about it or by performing only a surface inquiry into the proffered testimony.³⁵⁹ Yet some commentators recognize that, in addition to Rule 702, the Federal Rules regarding relevance affect the admissibility of economics expert testimony.³⁶⁰ As Justice Brennan suggested in a footnote in *Bazemore*, a model could be so incomplete as to be

357. See, e.g., Wirth, *supra* note 27, at 9 (“[The Austrian school] remains a very important contributor to economic thought.”). While this Article has cited many significant books and articles about the Austrian school and fractal economics, those sources represent but a fraction of the scholarship from these perspectives. For example, entire journals like the *Quarterly Journal of Austrian Economics*, *Review of Austrian Economics*, and *Procesos de Mercado* are dedicated to scholarship in the Austrian tradition, and Oxford has published a handbook on this school. See OXFORD HANDBOOK OF AUSTRIAN ECONOMICS (Peter J. Boettke & Christopher J. Coyne eds., 2015). Moreover, scholarly treatises and textbooks cover methods for fractal analyses of economic phenomena. See, e.g., HASAN A. FALLAHGOUL, SERGIO M. FOCARDI & FRANK J. FABOZZI, FRACTIONAL CALCULUS AND FRACTIONAL PROCESSES WITH APPLICATIONS TO FINANCIAL ECONOMICS: THEORY AND APPLICATION (2017); HERB KUNZE, DAVIDE LA TORRE, FRANKLIN MENDIVIL & EDWARD R. VRSCAY, FRACTAL-BASED METHODS IN ANALYSIS (2012); PETERS, *supra* note 25.

358. See *supra* Sections II, III.

359. See *supra* Part IV.A.

360. See Gelbach, *supra* note 17, at 590 (“Rule 702 and the *Daubert* trilogy erect a variety of hurdles to admissibility of expert testimony, *over and above relevance* as Rule 401 defines it.” (emphasis added)); Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 296 (recognizing that, in addition to Rule 702, evidentiary rules dealing with relevance also affect the admissibility of economics expert testimony).

inadmissible as irrelevant.³⁶¹ This case continues to be cited by courts in support of excluding model-based testimony.³⁶² More importantly, the Court's analysis in *Daubert* reinforces the importance of relevance, even intimating that courts should address it before moving to whether expert testimony is reliable.³⁶³

Under the Federal Rules, only relevant evidence is admissible.³⁶⁴ Relevant evidence is defined as that which “has any tendency to make a fact more or less probable than it would be without the evidence.”³⁶⁵ Plaintiffs proffer econometric experts who rely on models that process large amounts of data to show correlations among key variables.³⁶⁶ From those correlations the experts opine that certain facts are more probable than others.³⁶⁷ These opinions are all a form of prediction—what will happen in the future or would have happened in some counterfactual past. Examples of these opinions include that low wages for minorities or women resulted from the defendant's discrimination rather than non-discriminatory factors like experience or education; that a small market share resulted from the defendant's anticompetitive conduct rather than its savvy business dealings; that, but for the defendant's tortious conduct, the plaintiff would earn a certain amount of profits rather than some other amount—or none at all.³⁶⁸ Although methodologists have tempered Friedman's claim that a model's realism is unimportant, they nevertheless agree in the potential for models to help make these predictions.³⁶⁹ Courts, in turn, trust in econometric experts to opine on causation and damages in complex litigation.³⁷⁰

For Austrian economists, the practice of economics involves explanation rather than prediction, and it is approached deductively via praxeology rather than inductively through data-driven models.³⁷¹ The reason that Austrians limit themselves to explanation is because they recognize that the vast realm of human actions and all the complex reasons why humans act make it impossible to isolate and test a few key factors—and then replicate the results of that test—as in the hard sciences.³⁷² Yet, in modeling,

361. *Bazemore v. Friday*, 478 U.S. 385, 400 n.10 (1986).

362. *See, e.g., Morgan v. United Parcel Serv. of Am., Inc.*, 380 F.3d 459, 468–72 (8th Cir. 2004) (relying on *Bazemore* to justify excluding an expert in a workplace discrimination case where the analyses did not contain explanatory variables about past pay and performance); *In re Live Concert Antitrust Litig.*, 863 F. Supp. 2d 966, 973, 978–79 (C.D. Cal. 2012) (citing *Bazemore* in support of granting a motion to exclude an economics expert in a concert ticket antitrust case where the regression analysis did not account for artist quality and the rise of downloadable music before the alleged anticompetitive conduct).

363. *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 587 (1993) (quoting FED. R. EVID. 401–402) (beginning its analysis with the Federal Rules of Evidence on relevance); *id.* at 589 (“[U]nder the Rules the trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable.”).

364. FED. R. EVID. 401–402.

365. FED. R. EVID. 401.

366. *See supra* notes 59–82 and accompanying text.

367. *See supra* notes 59–82 and accompanying text.

368. *See supra* notes 55–58, 83–86 and accompanying text.

369. *See McCloskey, Storytelling*, *supra* note 213, at 59–60; Todd, *Realistic Assumptions*, *supra* note 20, at 275.

370. *See supra* notes 2–5, 58 and accompanying text.

371. *See supra* notes 238–260 and accompanying text.

372. *See supra* notes 258–260 and accompanying text.

reduction is always necessary.³⁷³ Indeed, methodologists compare the functioning of models to tropes like metonymy, which is reduction, and synecdoche, in which a part substitutes for the whole.³⁷⁴ Further, methodologists concede that models are always false in the sense of being incomplete.³⁷⁵ This reduction is one of the supposed strengths of a model because it may not be “the whole truth,” but it does allow for the ascertainment of “nothing but the truth.”³⁷⁶ In disregarding the irrelevant details, the modeler can focus on those that are relevant and thereby reveal new insight about those details.³⁷⁷

This reasoning leads to the lesson in *Bazemore*: testimony might be irrelevant if the modeler omits too many details.³⁷⁸ Austrians highlight a fundamental problem: economists work with a data set drawn from a “chaotic reality,” so modelers always omit many—too many—details.³⁷⁹ These choices of which variables to include and exclude relate to the artistry of models, but the expert trusts in the science of modeling (i.e., statistics) to compensate for the inability to engage in controlled experiments.³⁸⁰ At trial, the plaintiff proffers this expert’s testimony as evidence of causation—sometimes the only evidence of causation.³⁸¹ But models never show causation. Regression analysis merely shows a correlation among variables from which the modeler can infer causation.³⁸² Because it is impossible to account for all variables, history does not predict the future or what would have happened in some counterfactual past.³⁸³

Even if one can look past relevance, the Austrian school criticism lends support to those who would deny admissibility of econometric experts under Rule 403 because of the potential to mislead and confuse jurors.³⁸⁴ Recall that Mises criticized the imposition of experimental and repeatable “hard” scientific methods on the “soft” economic science of human action, calling the two “impossible to reform.”³⁸⁵ Yet econometricians attempt

373. See, e.g., Allensworth, *supra* note 2, at 832–33; Klock, *supra* note 11, at 196–97.

374. See MCCLOSKEY, RHETORIC, *supra* note 48, at 48–51; Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 1003–05 (“[E]conomists employ models tropologically.”).

375. E.g., Friedman, *supra* note 211, at 24–25; Machlup, *supra* note 217, at 581–82; Mäki, *Reorienting*, *supra* note 34, at 243; Ernest Nagel, *Assumptions in Economic Theory*, 53 AM. ECON. REV. 211, 214 (1963).

376. Mäki, *Aspects of Realism*, *supra* note 223, at 311.

377. Mäki, *Reorienting*, *supra* note 34, at 243; Mäki, *Aspects of Realism*, *supra* note 223, at 311.

378. See Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 316 (explaining the main impact of *Bazemore* is that “courts scrutinize . . . assumptions of exclusion”).

379. See Allensworth, *supra* note 2, at 862; see also *supra* notes 248–261 and accompanying text.

380. See, e.g., Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 287–90.

381. See Blair & Herndon, *supra* note 6, at 802; Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 995–97.

382. E.g., Rubinfeld, *Reference Guide*, *supra* note 65, at 309–10; see Todd & Jewell, *Dubious Assumptions*, *supra* note 11, at 287 (writing that experts employing regression analysis “show a correlation among variables” and then “infer a causal relationship” from that correlation).

383. ROTHBARD, GREAT DEPRESSION, *supra* note 261, at xxxix; see Heald, *supra* note 34, at 308 (“Without accounting for all variables, economics can seldom prove to us what the right answer is.”).

384. The Court wrote that Rule 403, which allows for even relevant evidence to not be admitted, could also affect the admissibility of expert testimony. *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 595 (1993) (“Rule 403 permits the exclusion of relevant evidence ‘if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury’” (omission in original) (quoting FED. R. EVID. 403)).

385. MISES, HUMAN ACTION, *supra* note 23, at 31.

such a reformation, and in doing so, they necessarily draw from scientific language as part of justifying their approach and results.³⁸⁶

The danger is that such language can blur the distinction between the artistic and scientific aspects of modeling “by cloaking the legal discourse in the rhetorical garb of mathematics and science, making the findings appear to be more certain and absolute than they truly are.”³⁸⁷ When represented as a “nonmoral science” for rhetorical purposes, “economics can be misused.”³⁸⁸ Not only do scholars fret about naïve jurors being “bamboozled” by economics experts,³⁸⁹ but at least one court rejected an economics expert based on Rule 403.³⁹⁰ Austrian school criticisms thus lend additional support to opponents who would seek to deny admissibility on this ground.

Unlike Austrians, fractal economists engage in modeling; like Austrians, fractal economists believe that econometricians are selling a falsehood by claiming that models can reliably forecast economic trends.³⁹¹ Fractal economists employ models as tools to mimic past events and thereby learn about them, but adherents to this camp do not think that models can predict the future—or presumably a counterfactual past of what could have been.³⁹² The basis for this limitation is the roughness of the real world; unexpected events happen, and when they do, sometimes the effect is slight, but other times it can be a wild swing.³⁹³ As the example of the cotton market demonstrated, it is impossible to account for the occurrence and severity of these swings.³⁹⁴

Yet econometricians attempt to do exactly that by making assumptions about the hypothetical world of litigation where, but for the defendant’s unlawful acts, the plaintiff would not have suffered damages.³⁹⁵ Such assumptions include that some factor has a negligible effect on the analysis and therefore can be excluded from the model or that for tractability purposes assumptions like continued growth, a stable market, or the performance of a contract are plausible.³⁹⁶ However, a factor dismissed as negligible could have a huge effect—particularly when influenced by some other factor, whether known or unknown, in which the joint effect is non-negligible.³⁹⁷ Even modest

386. See *supra* notes 59–69 and accompanying text for a discussion on the process of analyzing and creating economic models.

387. Michael D. Murray, *The Great Recession and the Rhetorical Canons of Law and Economics*, 58 LOY. L. REV. 615, 638–39 (2012) (footnotes omitted).

388. Donald N. McCloskey, *The Rhetoric of Law and Economics*, 86 MICH. L. REV. 752, 766 (1988).

389. Lloyd, *supra* note 18, at 380–81, 384.

390. *Three Crown Ltd. P’ship v. Salomon Bros. Inc.*, 906 F. Supp. 876, 894 (S.D.N.Y. 1995) (excluding, under Rule 403, an expert whose model contained too many assumptions about what the plaintiff and the markets would have done).

391. See *supra* Part III.B for a discussion on how fractal economists challenge the function and value that methodologists attribute to econometric models.

392. See *supra* notes 288–302 and accompanying text for examples in which economists struggled to make and use helpful fractal models due to the complexities of the real world.

393. See *supra* notes 286, 294–302 and accompanying text discussing the limitations of economic models.

394. See MANDELROT & HUDSON, *supra* note 25, at 147–50.

395. See *supra* notes 83–86 for a discussion of and examples of expert regression analysis being used to explain and support a plaintiff’s case theory.

396. See Todd, *Realistic Assumptions*, *supra* note 20, at 285–89.

397. Mäki, *Kinds of Assumptions*, *supra* note 222, at 320–22.

tractability assumptions are plausible only if one assumes that nothing unexpected and severe will or would have happened—an assumption controverted by the very notion of “market shocks.”³⁹⁸

Courts already distrust models built upon numerous assumptions about markets, consumers, and products, but fractal economists illuminate a more fundamental problem: even modest or conservative assumptions are neither modest nor conservative because while economists cannot know the timing or effect of the big swing, they can expect that one will occur.³⁹⁹ In short, fractal economists cast doubt on whether economists can know how past trends will predict future changes.

Both the Austrian and fractal schools cut against courts that continue to make effortless findings that econometric expert testimony is relevant. In fact, opponents could rely on scholarship like this, or on their own Austrian and fractal experts, to challenge an econometrician and thereby force a court to take these criticisms seriously. Some courts have declined to admit model-based expert testimony on relevance grounds,⁴⁰⁰ so more courts might make this finding when confronted with additional theories on the shortcomings of econometrics.

Indeed, courts would be hard-pressed to justify admitting evidence when faced with reasons why that evidence cannot show causation or related damages, the very things for which such testimony is proffered. Of course, given that Austrian and fractal economists disclaim any ability to predict—and even go so far as to question whether relevance is capable of being determined—these criticisms could shift the question to whether any economics testimony is relevant and thus admissible.

B. *Hunches and the Search for Truth: Relevance as (Primarily) a Jury Issue*

While courts and commentators should consider criticisms regarding the methodologies employed by different economics schools, those criticisms do not necessarily mean that the shortcomings of any one school render that approach irrelevant to the search for truth in trial. Pause and remember that the determination of whether

398. Defendants' acts or failures to act are often claimed to have shocked the market and thus caused plaintiff harm. *See, e.g.,* Brumbaugh v. Wave Systems Corp., 416 F. Supp. 2d 239, 255–56 (D. Mass. 2006) (finding loss causation adequately pled where the plaintiffs had alleged that the company's disclosure of an SEC investigation relating to the defendant's misleading statements had “shocked the market” and caused the stock price to drop); *In re Acterna Corp. Sec. Litig.*, 378 F. Supp. 2d 561, 568 (D. Md. 2005) (“Despite the bleak financial portrait the company had been painting for several quarters throughout the Class Period, and the dramatic decline in its stock price, Plaintiffs allege that on October 30, 2002, Acterna ‘shocked the financial markets by taking a massive \$388 million goodwill impairment charge’ in the second quarter of fiscal 2003.”). While this Article was being drafted, investor nervousness in response to COVID-19 resulted in a 1,000-point decline in the Dow Jones Industrial Average, a large decline in stock markets worldwide, a decline in the price of crude oil, and a shift to safe haven investments like gold and government bonds. Caitlin McCabe, *Dow Industrials Close 1,000 Points Lower as Coronavirus Cases Mount*, WALL STREET J. (Feb. 24, 2020, 5:05 PM), <http://www.wsj.com/articles/stocks-fall-as-coronavirus-spread-accelerates-outside-china-11582533308> [<https://perma.cc/5BXN-N92D>].

399. See *supra* notes 288–298 and accompanying text for a discussion of the difficulties of modeling volatile markets and the impact of working with erratic market behaviors.

400. See, e.g., *Morgan v. United Parcel Servs. of Am., Inc.*, 380 F.3d 459, 469 (8th Cir. 2004) (excluding expert testimony that failed to include relevant variables such as past pay in the regression analysis).

evidence is relevant starts with the judge.⁴⁰¹ The judge does not approach the relevance inquiry by objectively knowing the truth of any evidence, nor does she depend only upon a subjective gut feeling; instead, she engages in a typological inquiry.⁴⁰² The inquiry is semi-objective because judges evaluate relevance via several shared extralegal hunch-producers like the nexus of U.S. laws and rules and the situational context.⁴⁰³

Judges must certainly consider rules of evidence and case law in determining relevance, but they also can and often do consult scholarship,⁴⁰⁴ and some areas of law, like antitrust, are built from economic theory.⁴⁰⁵ Accordingly, the judge's search for relevance could include scholarship that blends law and economics.

Rhetoricians of economics recognize "the contingency of language in the representation of economic phenomena."⁴⁰⁶ Economics is a broad field with multiple camps that use different languages, each with profoundly different purposes, meanings, suppositions, and capacities for being understood by others.⁴⁰⁷ Rather than ignore these differences or allow them to degrade economics, rhetoricians urge these camps to engage each other's arguments.⁴⁰⁸ Even Mises recognizes that different types of economists explain the same issue in different ways, but he goes farther in conceding that one cannot necessarily determine which story is better.⁴⁰⁹

While some cling stubbornly to a wall of separation between inductive and deductive approaches like modeling and praxeology, others argue that multiple

401. Todd, *An Interdisciplinary Perspective*, *supra* note 6, at 986 ("The [Federal Rules of Evidence] make clear that the relevance of an expert's statistical model affects admissibility.").

402. See Guzelian, *Relevance*, *supra* note 38, at 161–62, 167.

403. *Id.* at 167–68.

404. See David L. Schwartz & Lee Petherbridge, *The Use of Legal Scholarship by the Federal Courts of Appeals: An Empirical Study*, 96 CORNELL L. REV. 1345, 1352 (2011) (conducting an empirical analysis of federal courts of appeals to conclude that citations to legal scholarship have been increasing).

405. Gavil, *Defining Reliable Forensic Economics*, *supra* note 45, at 833–35; see Lopatka & Page, *supra* note 4, at 703 ("Though courts can rely on economic authority to adopt per se rules foreclosing most significant factual issues, the availability of economic expertise allows courts to frame rules that allow the ex post acquisition of the information necessary to identify competitive effects.").

406. Catherine Chaput & Joshua S. Hanan, *Economic Rhetoric as Taxis: Neoliberal Governmentality and the Dispositif of Freakonomics*, 8 J. CULTURAL ECON. 42, 42 (2014) (citing MCCLOSKEY, RHETORIC, *supra* note 48).

407. See MCCLOSKEY, KNOWLEDGE, *supra* note 40, at 42 (writing that economists understand phenomena via metaphors, and a "Marxist or institutionalist or Austrian . . . will see somewhat differently" than a "mainstream, neoclassical" economist); Avsar, *supra* note 40, at 139 ("Economists see and represent their subject matter, the Economy, in different ways . . ."); Christopher M. Duerringer, *Research in the Rhetoric of Economics: A Critical Review*, 18 REV. COMM. 284, 286 (2018) ("To recognize that economics is rhetorical is to appreciate not only the logical arguments, but also the aesthetic, affective, and sociological appeals of economic thought.").

408. Arjo Klamer & Donald N. McCloskey, *Economics in the Human Conversation*, in THE CONSEQUENCES OF ECONOMIC RHETORIC, *supra* note 212, at 18 ("A rhetoric of economics examines all the arguments, and encourages admirable goodness in argument all round."); see Avsar, *supra* note 40, at 152–53 (arguing that entrenched ideographs "should not be allowed to circumvent genuine conversation on policy issues" and "alternative rhetorical strateg[ies]" are warranted); Chaput & Hanan, *supra* note 406, at 56 (arguing that economics is humanistic and rhetorical and that "value circulates through exchange").

409. MISES, HUMAN ACTION, *supra* note 23, at 57–58.

perspectives can lead to more insight.⁴¹⁰ For example, one commentator writes that in “understanding the truth about the economic dimension of human life . . . economists have a range of tools at their disposal, including logic, inference, historical analysis, statistics, *and* mathematics.”⁴¹¹ Further, econometrics can be improved by returning to the field’s roots in theorists like Adam Smith and by considering contemporary dissidents.⁴¹²

In evaluating the legal relevance of economics, the judge also considers the context of the case,⁴¹³ more particularly the role of the jury as the ultimate determiner of the truth.⁴¹⁴ Through the presentation of economic evidence, the jurors “test the coherence and consistency of each side’s story.”⁴¹⁵ They assess the economic evidence in light of their past experiences, social norms, the demeanor of the witness (expert and lay alike), and the context of the evidence and the case.⁴¹⁶

The jury’s role is not merely a matter of picking one party’s or another’s version; instead, the pieces of economic evidence are “story fragments” from which the jury constructs its own narrative to lead toward a verdict.⁴¹⁷ The jury’s final economic narrative is constructed from “the conflicting adversary presentation of evidence” and informed by each juror’s past experiences as well as their collective “common sense justice.”⁴¹⁸ The jury renders a verdict that is “the jury’s [economic] truth.”⁴¹⁹

410. Guzelian, *Testing*, *supra* note 22, at 306–07, 306 n.6; see HENDRIK HAGEDORN, A MODEL OF AUSTRIAN ECONOMICS 1–4 (2015) (urging for a blend of Austrian theories with neoclassical economics to lead to a better understanding of economic phenomena).

411. Samuel Gregg, *Smith Versus Keynes: Economics and Political Economy in the Post-Crisis Era*, 33 HARV. J.L. & PUB. POL’Y 443, 456 (2010).

412. *Id.* at 463 (“Economists wishing to re-engage economics in a wider discussion about the truth of human reality could thus do worse than return to the writings of Adam Smith.”).

413. Mnookin, *supra* note 79, at 1535 (writing that “relevance determinations are nonetheless necessarily somewhat context dependent”).

414. See FRANK, *supra* note 337, at 170 (“The function of the jury is supposed to be fact-finding.”).

415. Hans & Vidmar, *supra* note 43, at 229; see *Old Chief v. United States*, 519 U.S. 172, 187 (1997) (“[A]s [the] pieces [of evidence] come together a narrative gains momentum, with power not only to support conclusions but to sustain the willingness of jurors to draw the inferences, whatever they may be, necessary to reach an honest verdict.”).

416. Todd, *Realistic Assumptions*, *supra* note 20, at 241–42; see Allensworth, *supra* note 2, at 848–49 (recognizing that the jury as a collective consider social norms); Faigman et al., *Gatekeeping Science*, *supra* note 16, at 896–99 (writing that jurors make common sense inferences on credibility issues like demeanor and context); Podlas, *supra* note 43, at 482 (“Jurors reference stories with which they are familiar about similar events in order to reconstruct evidentiary information into a story.” (footnotes omitted)); Vidmar & Diamond, *supra* note 82, at 1137–38 (writing that jurors “utilize their past experience to filter and understand the various pieces of evidence”).

417. Reid Hastie, *The Role of “Stories” in Civil Jury Judgments*, 32 U. MICH. J.L. REFORM 227, 229 (1999) (writing that jurors use story fragments of evidence in the case to construct their narrative); Lenora Ledwon, *The Poetics of Evidence: Some Applications from Law & Literature*, 21 QUINNIPIAC L. REV. 1145, 1150 (2003) (calling the domain of the Federal Rules of Evidence one of “story fragments”). Austrian school economists, one camp of economists, might well disagree that they are providing “story fragments” in the fashion of an econometrician. Rather, they would contend that they present logico-deductive postulates, much like mathematical axioms, capable of *explaining* historical or conjectured future events. See Guzelian, *Testing*, *supra* note 22, at 304–05.

418. Hans & Vidmar, *supra* note 43, at 227.

419. Podlas, *supra* note 43, at 482.

The implication for economics expert testimony is that the remedy for the incompleteness or misuse of any one camp is not exclusion but inclusion by admitting multiple, and even divergent, approaches to economics into evidence, since each can contribute to the jury's ascertainment of truth as relevant for trial. After all, Rebecca Haw already proposes admitting both consensus and minority voices to let the jury choose to credit or discount claims that the expert's opinion comports with the economic majority.⁴²⁰ She also makes a call to judges: require experts to testify about the status of their theories in the academy.⁴²¹ This Article calls for slightly more engagement by judges because they must instruct the jury on the theories and contours of the various economic camps represented by experts.

This proposal may seem to call for judges to shirk their responsibility under the Federal Rules of Evidence by improperly punting the question of relevance to the jury.⁴²² This Article contends, however, that declining to admit economics expert testimony because of concerns about relevance intrudes on the province of the jury to listen to the evidence and find the truth.⁴²³ Judges should trust their hunches that different, even contradictory, types of economics expert testimony can be relevant and should therefore allow the jury to weigh how the testimony leads to truth.

Scholars argue that the audience for an economic model—in litigation, the jury—assesses the relevance of the modeler's choices to reveal the truth: how well the model as trope bears a “relevant resemblance” to the world.⁴²⁴ All models are reductions, but their efficacy for revealing insight must be evaluated as whether the model allows a focus on relevant factors, what Robert Sugden characterizes as the model's “verisimilitude” or “truthlikeness.”⁴²⁵

This Article extends the thinking of these economics methodologists by drawing on the call of rhetoricians for a disciplinary conversation to propose that heterodox voices be part of the jury's assessment. The judge's role in determining relevance is to make clear to a jury the contours of a particular camp of economists' language: what are its suppositions, what are its purposes, and whether there are dialects. It is *not* the judge's role to evaluate the language's proximity or distance from helping the jury in locating the “truth” about some economic question before them. After all, economists engage in different rhetorical techniques for different audiences,⁴²⁶ so it is ultimately the jury's role to evaluate the credibility of the expert's testimony to determine relevance in conjunction

420. Haw, *supra* note 37, at 1300–01.

421. *Id.* at 1300.

422. See FED. R. EVID. 402 (“Irrelevant evidence is not admissible.”).

423. See U.S. CONST. amend. VII (guaranteeing a jury for civil trials where the amount in controversy is over twenty dollars); see also Podlas, *supra* note 43, at 481–82 (calling the verdict the “jury's truth”); Sward, *supra* note 78, at 583 (writing that the Seventh Amendment protects the jury's fact finding authority from review by the courts).

424. Mäki, *Contested Modeling*, *supra* note 219, at 92, 94 (defining the model's “relevant resemblance,” as its resemblance “relative to some purpose and audience”); Robert Sugden, *Credible Worlds: The Status of Theoretical Models in Economics*, 7 J. ECON. METHODOLOGY 1, 25–26 (2000) (writing that the model world must be credible so that the reader can close the gap between the model world and the real world).

425. Sugden, *Capacities and Mechanisms*, *supra* note 219, at 17–18.

426. See Ana Maria Bianchi, *For Different Audiences, Different Arguments: Economic Rhetoric at the Beginning of the Latin American School*, 24 J. HIST. ECON. THOUGHT 291, 291 (2002) (exploring how the same economist explained the same economic theories in two very different ways to reach its target audiences).

with deciding truth. The judge should therefore admit the testimony with sufficient explanation and then allow the jury to fulfill its role.

CONCLUSION

Although courts and commentators typically think about the admissibility of economics expert testimony in terms of its reliability, the Supreme Court in *Daubert* recognized that relevance comes first, and in *Bazemore*, the Court suggested that a woefully incomplete model might be irrelevant. Relevance, however, should typically not be a ground to keep economics expert testimony from the jury; instead, questions about relevance are intertwined with considerations of credibility and truth, both of which are the province of the jury. A model may be highly suspect because of a lack of variables, but the more sound approach would be to question whether the exclusion of too many variables renders the testimony insufficient under Rule 104(b), or perhaps whether the testimony might be unreliable because the evidence suggests consideration of a necessary variable.⁴²⁷

In addition, when the committee for the Federal Rules of Evidence says that the “‘knowledge and experience’ of [a] particular field” should determine whether an expert’s testimony is relevant,⁴²⁸ that is *not* the same thing as asking whether the testimony is the *consensus* of the field. Rather, because knowledge and experience vary so widely among economists, all that is being asked of the judge under the relevance standard is to admit the economics expert testimony, and then make clear the approximate boundaries of the typology of experts on the stand—be they heterodox, like adherents to Austrian and fractal theories, or orthodox econometricians.

427. See Todd, *Realistic Assumptions*, *supra* note 20, at 286–87, 290–91.

428. FED. R. EVID. 702 advisory committee’s note to 2000 amendment (quoting Am. Coll. of Trial Lawyers, *supra* note 19, at 579).