TOWARD A UNIFIED THEORY OF MATERIALITY IN SECURITIES LAW

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ABSTRACT

In the face of rapidly advancing globalization of capital markets, data, and information channels, U.S. and E.U. securities regulators are increasingly focused on formally defining materiality, an essential securities law concept. In the United States, the Supreme Court has loosely regulated materiality through a line of cases beginning with TSC Industries v. Northway and Basic, Inc. v. Levinson, whose reasonable investor rubric is frequently disregarded by lower courts, prosecutors, and the Securities and Exchange Commission, and is criticized in legal and behavioral economics scholarship for its ambiguity, unpredictability, and disconnection from market psychology. Recognizing these criticisms, this article conducts an international comparative investigation of materiality in the legislation, regulation, and case law of the United States and European Union, revealing a shared, probabilistic Bayesian infrastructure of materiality. The article then proposes a flexible Bayesian framework that harmonizes the substantive evaluation of materiality under existing U.S. and E.U. law, and then models application of the framework using Bayesian network analysis in the context of a hypothetical stock transaction.

I. INTRODUCTION

Executives of publicly traded companies face delicate disclosure choices on nearly a daily basis. How much of what information should the market receive when? Saying too much or too little can result in share price gyrations,[1] lawsuits,[2] or prison time.[3] Where to draw the line on disclosure is a murky question of materiality,[4] the definition of which is the subject of scholarly debate,[5] conflicting case law,[6] and a growing priority for regulators in the United States and Europe.[7]

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[1] *See, e.g.*, Phil Wahba, *Target Says Boycotts Over Bathroom Policy Not Hurting Sales*, FORTUNE (May 18, 2016), http://fortune.com/2016/05/18/target-transgender-bathroom-2/ (reporting on Target's share price decline following a consumer boycott reacting to a transgender restroom policy that Target's CEO claimed was immaterial).

[2] *See, e.g.*, SEC v. Huang, No. 2:15-cv-00269-MAK (E.D.Pa. Sept. 20, 2016). *See also*, Matt Levine, *Capital One Fraud Researchers May Have Done Some Fraud*, BLOOMBERG VIEW (Jan. 23, 2015), http://www.bloombergview.com/articles/2015-01-23/capital-one-fraud-researchers-may-also-have-done-some-fraud; Complaint For Violations of the Federal Securities Laws, S.E.C. v. Huang, No. 2:15-cv-00269-MAK (Jan. 21, 2015), https://www.sec.gov/litigation/complaints/2015/comp23216.pdf.

[3] *See, e.g.*, Skilling v. U.S., 561 U.S. 358 (2010).

[4] Materiality is an essential element of securities negligence and fraud. *See* Matrixx Initiatives, Inc. v. Siracusano, 563 U.S. 27, 37-38 (2011).

[5] *See, e.g.*, James L. Park, *Assessing the Materiality of Financial Misstatements*, 34 J. CORP. L. 513, 515 (2009) (proposing clarification of the current "nebulous" "qualitative" definition); Margaret V. Sachs, *Materiality and Social Change: The Case for Replacing "the Reasonable Investor" with "the Least Sophisticated Investor" in Inefficient Markets*, 81 TUL. L. REV. 473 (2006) (proposing replacement of *Basic*'s "reasonable investor" with "least sophisticated investor"); Richard A. Booth, *The Two Faces of Materiality*, 38 DEL. J. CORP. L. 517, 570 (2013) (arguing that Amgen exposed contradictions in the fraud on the market theory [hereinafter FOTM] endorsed by *Basic*); Thomas M. Madden, *Significance and the Materiality Tautology*, 10 J. BUS. & TECH. L. 217, 217 (2015) (describing the Supreme Court's definition of materiality as a "terrible fog"); Peter H. Huang, *Moody Investing and the Supreme Court: Rethinking the Materiality of Information and the Reasonableness of Investors*, 13 SUP. CT.

Supreme Court precedent holds that a fact is material if there is a substantial likelihood that a reasonable investor would view the fact as significantly altering the total mix of information available about the company in question.[8] However, this definition, which we shall call the *TSC-Basic* rubric after two landmark Supreme Court decisions, is open to question for a variety of reasons. First, the meaning of *substantial likelihood* is so vague that it invites arbitrary decision-making.[9] Second, research in behavioral economics suggests that *reasonable investors*—upon whom *TSC-Basic* relies—may be only seasonal or even mythical creatures.[10] If reasonable investors exist, they have such a variety of liquidity, consumption, and risk preferences[11] that courts are hard-pressed to choose from among them. Third, what information should be included in the *total mix of information* is unclear.

As highlighted by recent case law and scholarship,[12] the uncertainty surrounding materiality means that neither corporate officers, counsel, nor courts clearly understand what information should be disclosed to capital markets or when. Thus, abundantly cautious (or fearful) CFOs

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ECON. REV. 99, 99 (2005) (arguing that materiality should recognize and accommodate irrational or "moody" investing).

[6] *See infra* Part II.C.

[7] *See, e.g.*, Directive 2013/34/E.U., 2013 O.J. (L 182/19) [hereinafter Accounting Directive] (17) of the preamble to the Directive (elevating materiality to a fundamental European accounting principle); Business and Financial Disclosure Required by Regulation S-K Exchange Act Release No. 33-10064, 81 FR 23915 (Apr. 22, 2016), https://www.sec.gov/rules/concept/2016/33-10064.pdf [hereinafter "SEC Concept Release"] (seeking public comment on inter alia the definition of materiality); FASB, Proposed Accounting Standards Update, *Notes to Financial Statements (Topic 235): Assessing Whether Disclosures Are Material* (Sept. 2015); IFRS Practice Statement, Application of Materiality to Financial Statements, ED/2015/8 (Oct. 2015); Financial Reporting Council [hereinafter "FRC"], *FRC issues report on auditor's materiality judgements* (Dec. 16, 2013), https://www.frc.org.uk/News-and-Events/FRC-Press/Press/2013/December/FRC-issues-report-on-auditor-s-materiality-judgeme.aspx (reporting on the U.K. FRC's thematic review of auditor "consideration and application of materiality").

[8] TSC Industries, Inc. v. Northway, Inc., 426 U.S. 438, 449 (1976); Basic, Inc. v. Levinson, 485 U.S. 224, 231–232 (1988). Both cases will be discussed in detail in Part II.

[9] *See, e.g.*, *TSC Industries.*, 426 U.S. at 445 (acknowledging "variations" in "just how significant a fact must be" to qualify as material); Thomas M. Madden, *Significance and the Materiality Tautology*, 10 J. Bus. & Tech. L. 217, 224–230 (2015) (presenting diverse circuit court interpretations of "significant qua material" under *TSC-Basic*).

[10] *See, e.g.*, Transcript of Oral Argument at 38-58, Matrixx Initiatives, Inc. v. Siracusano, 563 U.S. 27 (2011) (No. 09-1156) (debating Respondent's suggestion that reasonable investors might consider material the possibility that irrational investors might sell a stock over counter-factual rumors of the company's "link" to Satan); Stephen J. Choi and A.C. Pritchard, *Behavioral Economics and the SEC*, 56 STAN. L. REV. 1 (2003); Fredrick C. Dunbar & Dana Heller, *Fraud on the Market Meets Behavioral Finance*, 31 DEL. J. CORP. L. 455, 509 (2006) (asserting that herd dynamics may cause otherwise immaterial information about a security to affect share prices); Troy A. Paredes, *Blinded by the Light: Information Overload and Its Consequences for Securities Regulation*, 81 WASH. U. L. Q. 417, 419–420 (2003) (citing research suggesting that investors are imperfectly rational); Daniel Kahneman, THINKING, FAST AND SLOW 212-217 (2011) (discussing the "illusion of stock-picking skill" and related research); Michael J. Kaufman, *Behavioral Economics and Investor Protection*, 44 Loy. U. Chi. L. J. 1323 (2013) (discussing Kahneman's findings); Park, *supra* note 5 at 531 (categorizing investors as rational or irrational depending on their stock valuation methods); Geoffrey Rapp, *Rewiring the DNA of Securities Fraud Litigation: Amgen's Missed Opportunity*, 44 LOY. U. CHI. L. J. 1475 (2013) (arguing that the judicial conception of materiality has been so discredited by advances in behavioral psychology that it should be discarded or "fundamentally rethought").

[11] *See* K.J. Martijn Cremers & Simone M. Sepe, *Shareholder Value of Empowered Boards*, 68 STAN. L. REV. 67, 110–12 (2016) (observing that differing shareholder preferences for liquidity and risk lead to multiple definitions of equilibrium stock prices, in the context of corporate takeover defenses).

[12] *See, e.g.*, *TSC Industries.*, 426 U.S. at 445 (acknowledging "variations" in "just how significant a fact must be" to qualify as material); Madden, *supra* note 5 at 224–230 (presenting diverse circuit court interpretations of "significant qua material" under *TSC-Basic*).

overload markets with financial trivia, rendering disclosures costly and ineffective.[13] Lacking consistent guidance, prosecutors, plaintiffs, regulators, and lower courts disregard or misinterpret precedent, leading to even greater uncertainty.[14] Further misapplication of *TSC-Basic* seems inevitable as corporations attempt to inform increasingly globalized capital markets[15] while materiality as a legal concept continues to be governed by domestic regulators and courts through diverse national laws, cultures, and concepts.[16]

Seeking to harmonize materiality for more consistent interpretation worldwide, this Article comparatively analyzes related U.S. and European statutes, case law, and professional standards. We observe that the logical infrastructure of the *TSC-Basic* rubric and related European concepts—anchored by the reasonable investor's probabilistic evaluation of an omitted fact's significant influence on the total mix of information—is implicitly Bayesian.[17]

Broadly speaking, Bayesian reasoning may be described as the use of Bayes' theorem to draw logical inferences from evidence and to directly evaluate the probabilistic uncertainty of those inferences.[18] Bayesian analysis is ideally suited to answer probabilistic questions like "How likely is it that a reasonable investor would find Steve Jobs' cancer diagnosis significant?" by iteratively adding new evidence to "prior" evidence, thereby shifting plausibility among possible outcomes. In this sense, bench, bar, and lay juries routinely engage in Bayesian reasoning while measuring available evidence against the inherently probabilistic preponderance-of-evidence and beyond-reasonable-doubt standards of proof.[19]

While Bayesian analysis is often used in some other areas of the law,[20] to our knowledge its role in defining materiality in securities cases has not previously been explored. Based on our investigation, we believe that making *TSC-Basic's* Bayesian infrastructure explicit under a

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[13] *See* Paredes, *supra* note 10, at 419–20 (2003) (arguing that the SEC's disclosure system may be overloading readers and, therefore, might be improved by reducing the volume of required disclosures).

[14] *See infra* Part II.C.3 (analyzing lower court departures from binding Supreme Court precedent).

[15] *See generally* Karel Van Hulle, *International Convergence of Accounting Standards: A Comment on Jeffrey*, 12 DUKE J. COMP. INT'L. L. 357 (2002).

[16] *See* Roberta S. Karmel, *The E.U. Challenge to the SEC*, 31 FORDHAM INT'L L.J. 1692 (2008) (discussing the effort, at least temporarily abandoned in 2014, to converge U.S. GAAP and IFRS).

[17] It seems unlikely that *TSC* (1976) and *Basic* (1988) were written with Bayesian intent, yet Bayesian reasoning entered into academic legal debate before 1976. *See, e.g.*, Michael O. Finkelstein & William B. Fairley, *A Bayesian Approach to Identification Evidence*, 83 HARV. L. REV. 489 (1970).

[18] *See, e.g.*, Stephen E. Fienberg and Mark J. Schervish, *The Relevance of Bayesian Inference for the Presentation of Statistical Evidence and for Legal Decisionmaking*, 66 B.U.L. REV. 771, 773 (1986) (Bayesian theory "provides a framework" for quantifying and "revising uncertainty measures in the light of new evidence"); Enrique Guerra-Pujol, *Visualizing Probabilistic Proof*, 7 WASH. U. JURIS. REV. 39, 71 (2014) (Bayesian reasoning measures the strength of inferences and the evidence on which they are based); D. H. Kaye, *What is Bayesianism? A Guide for the Perplexed*, 28 JURIMETRICS 161, 171 (1988) [hereinafter Kaye 1988] (stating that Bayesian inference, in contrast to traditional statistics, permits "direct statements about the probability of particular hypotheses"); RICHARD MCELREATH, STATISTICAL RETHINKING: A BAYESIAN COURSE WITH EXAMPLES IN R AND STAN 13 (2016) (arguing that Bayesian models lead to more intuitive interpretations than do frequentist statistics).

[19] *See* RICHARD A. POSNER, HOW JUDGES THINK 67 (2008) (asserting that judges utilize Bayesian reasoning); David H. Kaye, *Rounding Up the Usual Suspects: A Logical and Legal Analysis of DNA Trawling Cases*, 87 N.C. L. REV. 425, 465-467 (2009) [hereinafter Kaye 2009] (applying Bayesian reasoning to courtroom use of DNA evidence); Kaye 1988 at 170–71; FED. JUDICIAL CTR., REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 174 (3rd ed. 2011) (asserting that "Bayes' rule is routine in cases involving parentage testing"). The Reference Manual contains 111 instances of the root word "Bayes."

[20] *See, e.g.*, Kaye 1988 at 161; Norman Fenton et al., *Bayes and the Law*, 3 ANN. REV. STAT. APPL. 51, 60 (2016) (placing Bayes' Rule in the legal context and documenting its use for trial preparation and as admissible evidence in U.S. and non-U.S. cases).

unified analytical framework will improve the fairness, consistency, and predictability of securities case outcomes worldwide by fundamentally changing how courts, counsel, corporate officers, regulators, and academics process their thinking about materiality.

The Article proceeds as follows: Part II surveys materiality under current U.S. statutes, regulations, and case law; Part III briefly treats recent regulatory attempts at clarifying materiality; Part IV mines applicable E.U. law for comparative international perspectives helpful to global harmonization; Part V outlines and models a proposed Bayesian materiality framework; and Part VI offers conclusions, limitations, and suggestions for further research.

II. MATERIALITY IN U.S. LAW

Investor interest in corporate financial information often conflicts with cost and confidentiality constraints.[21] Information overload, which can render financial disclosure too costly or even ineffective, is also a risk.[22] Attempting to balance these conflicting priorities, statutes, SEC regulations, and auditing (though not accounting[23]) standards use the word "materiality," whose definition varies.[24]

A. Statutes & Regulations

In relevant statutes, 15 U.S.C. §77 and §78,[25] the word "material" appears 28 times but is not defined. For example, in the Exchange Act of 1934, 15 U.S. Code § 78j–1 requires public company audits to be designed to detect illegal acts with a material financial statement impact. Similarly, 15 U.S.C. § 78r imposes civil liability for materially false or misleading statements about the price of securities. In the Securities Act of 1933, 15 U.S.C. § 77d and 15 U.S.C. § 77k contain similar language, also without defining "material."

In related regulations, 17 CFR Parts 210, 229, 230 and 240, the term "material" appears in 28, 81, 60, and 112 subparts, respectively, sometimes multiple times per subpart.[26] For example, 17 CFR §240.10b-5 (commonly known as SEC Rule 10b-5) prohibits material untrue statements and omissions in connection with securities transactions,[27] and Rule 12b-20 requires registrants

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[21] *See* SEC Concept Release, *supra* note 7 at 14 (citing concerns of disclosure of sensitive information); Karel Lannoo, *The Emerging Framework for Disclosure in the E.U.*, 3 J. CORP. L. STUD. 329, 331–33 (2003) (explaining the underlying reasons for mandating disclosure in securities market regulation).

[22] *See TSC Industries*, 426 U.S. 438, 448–49 (1976); SEC Concept Release, *supra* note 7 at 14 (acknowledging cost-benefit tradeoff between too little and too much information); Paredes, *supra* note 10, at 419 (arguing that the SEC's disclosure system may be overloading readers and, therefore, might be improved by reducing the volume of required disclosures); Cristina Müller-Burmeister and Patrick Velte, *Increased materiality judgments in financial accounting and external audit: a critical comparison between German and international standard setting*, 8 INT. J. CRITICAL ACCT 227, 236-37 (2016) (arguing that quality of disclosure decreases as quantity increases).

[23] As discussed in Parts II.B. and III. below, despite its practical importance for the accounting profession, U.S. accounting standards have never defined materiality, though auditing standards do so.

[24] *See infra* Parts II. A. and B.

[25] 15 U.S.C. §77 and §78 contain, respectively the Securities Act of 1933 [hereinafter Securities Act] and the Securities Exchange Act of 1934 [hereinafter Exchange Act].

[26] Part 210 contains SEC Regulation S-X, regulating the contents of financial statements included in SEC filings, while Part 229 contains Regulation S-K, governing external disclosures, and Parts 230 and 240 contain general rules under the Securities Act and Exchange Act. *See* Securities Lawyer's Deskbook, Table of Contents, https://lawblogs.uc.edu/sld/.

[27] 17 CFR §240.10b-5.

to supplement their SEC filings with "further material information" necessary to make the required statements not misleading.[28]

In contrast to related statutes, SEC regulations briefly define "material," essentially repeating the Supreme Court's definition, but are rarely cited as authority in SEC administrative determinations or in court. For example, 17 CFR §230.405,[29] borrowed from Supreme Court's definition in *TSC Industries*,[30] is cited to define "material"[31] in only three published court cases and four decisions by SEC administrative law judges. Similarly, 17 CFR §210.1-02(o), which defines as material "those matters about which an average prudent investor ought reasonably to be informed" as to any subject,[32] is not cited in any published court decision and appears in only one 2012 SEC ALJ opinion.[33] In contrast, U.S. district courts have cited *Basic, Inc.* and *TSC Industries* 546 and 85 times, respectively, since January 2010 alone.[34]

The comparative prevalence of the Supreme Court's definition may seem odd given the SEC's statutory authority to define "material."[35] In *TSC Industries*, the Court acknowledged this authority and cited the agency's amicus brief in support of the Court's definition.[36] Nevertheless, the SEC has unambiguously admitted that it adopted the Court's definition, not the other way around.[37]

B. Accounting & Auditing Standards

In the United States, financial reporting decisions—as to which numbers and text to include in the financial statements—are typically made by company management, including internal accountants or financial statement "preparers." These decisions are later reviewed for consistency with accounting standards by independent[38] Certified Public Accountants (CPAs) who serve as external auditors. Preparers and auditors of publicly traded U.S. companies must follow *accounting* standards set by the U.S. Financial Accounting Standards Board (FASB)

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[28] 17 CFR §240.12b-20.

[29] 17 CFR §230.405 (2016) (stating that the term "material . . . limits the information required to those matters to which there is a substantial likelihood that a reasonable investor would attach importance . . .").

[30] *TSC Industries*, 426 U.S. at 449 (1976).

[31] In case law relating to terms other than "material," 17 CFR §230.405 and 17 CFR §240.12b-2 appear frequently. No administrative law judge [hereinafter ALJ] or SEC decision on the SEC website cites 17 CFR §240.12b-2 to define materiality.

[32] 17 CFR §210.1-02(o) (2016). The SEC discounts this definition, noting that the *TSC Industries* definition "would be applied for any purpose" under both the Securities Act and the Exchange Act. SEC Concept Release at 37.

[33] The SEC and its ALJs typically use the term "material" without citing authority. *See, e.g.*, SEC, In re IEC Electronics Corp., Rel. No. 78017 at 8 n.4 (Jun. 8, 2016), https://www.sec.gov/litigation/admin/2016/34-78017.pdf; SEC, In re BEHRUZ AFSHAR, Rel. No. 3746 at 3 (Mar. 30, 2016), https://www.sec.gov/alj/aljorders/2016/ap-3746.pdf. SEC, *In re* Raymon Holmdahl, CPA, Rel. No. 75843 (Sept. 4, 2015), https://www.sec.gov/litigation/admin/2015/34-75843.pdf.

[34] For discussion of these cases, see Part II.C. below.

[35] *TSC Industries*, 426 U.S. at 449 n.10 (1976).

[36] *Id*.

[37] SEC Concept Release at 36, https://www.sec.gov/rules/concept/2016/33-10064.pdf. SEC staff have issued their own non-binding disquisition on materiality. Staff Accounting Bulletin [hereinafter "SAB"] No. 99, http://www.sec.gov/interps/account/sab99.htm. SAB No. 99 is often incorrectly cited as having been issued by the SEC, *see, e.g.*, Park, *supra* note 5 at 516, despite the fact that SAB No. 99 clearly states that SABs are neither SEC rules nor interpretations nor officially approved by the SEC. SAB No. 99.

[38] While the literature technically requires that external auditors be "independent," they are, nevertheless, appointed by the auditee's audit committee and compensated directly by the auditee.

under authority delegated by the SEC.[39] These standards, called "U.S. generally accepted accounting principles" or "U.S. GAAP," are found today exclusively in the FASB's Accounting Standards Codification.[40] They offer no guidance on the meaning of materiality.

Additionally, public company auditors must follow *auditing* standards set by the Public Company Accounting Oversight Board (PCAOB), a federal agency that reports to the SEC. These standards include AS 2105, Consideration of Materiality in Planning and Performing an Audit,[41] which explicitly defers to *TSC Industries*.

For audits of non-public companies, the American Institute of Certified Public Accountants (AICPA) sets auditing standards. In contrast to U.S. GAAP and PCAOB standards, AICPA standards address materiality in considerable detail, stating that materiality depends on the needs of users who (a) have a "reasonable knowledge of business, economic activities, and accounting and a willingness to study the information in the financial statements with reasonable diligence" and (b) "make reasonable economic decisions" while appreciating the uncertainty inherent in such information.[42]

In summary, with the exception of the AICPA, U.S. professional standard setters either do not define materiality or defer to the Supreme Court.

C. Case Law

Inattention of Congress, SEC, and FASB has left the elaboration of materiality to case law of which TSC Industries, Inc. v. Northway, Inc. and Basic, Inc. v. Levinson are foundational. Both are extensively discussed elsewhere.[43] However, we reexamine *TSC* and *Basic* to clearly contextualize their core doctrines which, as Part V. will show, are fortuitously built around a Bayesian infrastructure. We then interrogate a non-random sample of subsequent cases showing judicial extension, observance, and (sometimes) breach of the *TSC-Basic* materiality rubric, in order to set the stage for proposed reforms.

1. Materiality under *TSC* & *Basic*

TSC and *Basic* each involved seller plaintiffs and the acquisition of one corporation by another. However, the plaintiff in *TSC* was a single shareholder whereas the plaintiffs in *Basic* were a class of former shareholders. Northway, Inc. (Northway), a TSC Industries, Inc. (TSC) shareholder, alleged that TSC and its acquirer, National Industries, Inc. had violated Securities Act §14(a) and related SEC Rules 14a-3 and 14a-9 by omitting from a November 12, 1969 proxy

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[39] Policy Statement: Reaffirming the Status of the FASB as a Designated Private-Sector Standard Setter Exchange Act Release No. FR- 70 (Apr. 25, 2003), http://www.sec.gov/rules/policy/33-8221.htm#P25_3300 [hereinafter FR-70].

[40] FASB, ACCOUNTING STANDARDS CODIFICATION subtopic 105-10-05 (2016) [hereinafter FASB CODIFICATION], https://asc.fasb.org/ (purporting to designate the FASB CODIFICATION as the only "authoritative" source of U.S. GAAP, beginning in 2009).

[41] PCAOB, AS 2105, CONSIDERATION OF MATERIALITY IN PLANNING AND PERFORMING AN AUDIT (2016), https://pcaobus.org/Standards/Auditing/Pages/AS2105.aspx.

[42] AICPA, AU-C § 320, MATERIALITY IN PLANNING AND PERFORMING AN AUDIT (2016), https://www.aicpa.org/research/standards/auditattest/downloadabledocuments/au-c-00320.pdf.

[43] *See, e.g.*, Yvonne Ching Ling Lee, *The Elusive Concept of "Materiality" Under U.S. Federal Securities Laws*, 40 WILLAMETTE L. REV. 661 (2004); Donald C. Langevoort, *Basic at Twenty: Rethinking Fraud on the Market*, 2009 WIS. L. REV. 151 (2009); Madden, *supra* note 5, at 220-25; Robert A. Prentice, *Stoneridge, Securities Fraud Litigation, and the Supreme Court*, 45 AM. BUS. L.J. 611 (2008); Sharon Sutter, *Basic, Inc. v. Levinson: The Standard for Materiality Under Rule 10b-5*, 21 U. TOL. L. REV. 291 (1989).

statement the fact that National effectively controlled TSC's board, on October 16, 1969, when the board approved National's acquisition of TSC.[44]

After the trial court denied Northway's motion for summary judgment on all counts, the Seventh Circuit reversed as to the Rule 14a-9 claims, holding that National's de facto control over TSC was material as a matter of law[45] because a reasonable TSC shareholder *might* consider National's control important in deciding how to vote on the sale.[46]

Unanimously reversing the Seventh Circuit on the Rule 14a-9 claims, the Supreme Court first found that facts provided in the proxy materials—e.g., that National owned 34-percent of TSC's outstanding shares and that five of ten TSC directors were nominated by National—did disclose, or at least generally pointed to, the extent of National's influence over TSC, thereby suggesting that information about the precise control mechanism might not significantly change the factual picture for reasonable investors.

The Court then compared the meanings of "might" (denoting mere possibility) and "would" (denoting high probability or even certainty), concluding that an omitted fact is material when, under all the circumstances, there is a *substantial likelihood* that the omitted fact *would* have assumed actual significance in the deliberations of a reasonable shareholder or, in other words, a substantial likelihood that a reasonable investor *would* view the omitted fact as significantly altering "the 'total mix' of information" available about the security in question.[47]

Adding that determining materiality "requires delicate assessments of the inferences a 'reasonable shareholder' would draw from a given set of facts and the significance of those inferences to him," the Court cautioned that materiality should be decided as a matter of law only where the omission is "so obviously important" that reasonable minds *cannot* differ as to the result[48] and that it does not require proof that disclosure *would change the vote* of a reasonable shareholder.[49] Importantly, the Court did not find that the specific information demanded by the plaintiffs about National's effective control of TSC was immaterial but only that the materiality of that information was a factual issue that must be resolved at trial. The Court's *TSC Industries* "total mix" definition of materiality has been followed (at least superficially) ever since by lower courts,[50] the SEC,[51] and the Court itself.[52]

Basic, Inc. v. Levinson involved the acquisition of one steel refractory manufacturer (Basic Incorporated) by another (Combustion Engineering, Inc.) with relevant events occurring between

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[44] *TSC Industries*, 426 U.S. at 442 (1976).
[45] *Id*. at 443.
[46] *Id*. at 445.
[47] *Id*. at 449.
[48] *Id*. at 450.
[49] *Id*. at 449.
[50] *See, e.g.*, Marbury Management, Inc. v. Kohn, 470 F. Supp. 509 (S.D.N.Y. 1979); Woodward & Lothrop, Inc. v. Schnabel, 593 F. Supp. 1385 (D.D.C. 1984); *In re* Apple Computer Securities Litigation, 672 F. Supp. 1552 (N.D. Cal. 1987); *In re* Newbridge Networks Securities Litigation, 767 F. Supp. 275 (D.D.C. 1991); Cione v. Gorr, 843 F. Supp. 1199 (N.D. Ohio 1994); *In re* Duke Energy Corp. Securities Litigation, 282 F.Supp.2d 158 (S.D.N.Y. 2003); *In re* Global Crossing, Ltd. Securities Litigation, 322 F.Supp.2d 319 (S.D.N.Y. 2004); *In re* Xm Satellite Radio Holdings Securities Lit., 479 F.Supp.2d 165 (D.D.C. 2007); *In re* Lehman Bros. Sec. & Erisa Litig., 684 F. Supp.2d 485 (S.D.N.Y. 2010); AG Funds, L.P. v. Sanofi, 87 F.Supp.3d 510 (S.D.N.Y, 2015).
[51] *See, e.g.*, Carroll A. Wallace, CPA, Initial Decision Release No. 178 (Dec. 8, 2000); Byron G. Borgardt, Securities Act Release No. 8274 (Aug. 25, 2003); Dolphin and Bradbury, Inc., Exchange Act Release No. 54143 (Jul. 13, 2006); China Ruitai International Holdings Co., Ltd., Initial Decision Release No. 742 (Feb. 5, 2015); L&L Energy, Inc., Initial Decision Release No. 962 (Feb. 17, 2016).
[52] *See, e.g.*, *Basic*, 485 U.S. at 224 (plurality opinion) (1988); *Matrixx*, 563 U.S. (2011); Amgen Inc. v. Plans, 133 S.Ct. 1184 (2013); Halliburton Co. v. Erica P. John Fund, Inc., 134 S. Ct. 2398 (2014).

September 1976 and December 1978.[53] Merger discussions between the companies began in 1976 but were publicly denied three times in 1977 and 1978 by Basic's management.[54] Finally, on December 18, 1978, Basic announced that merger talks were ongoing.[55] The plaintiffs subsequently initiated a class action alleging that Basic and nine of its directors[56] had violated 1934 Exchange Act §10(b) and Rule 10b-5 by denying the existence of the merger talks.[57] Plaintiffs—who sold their shares at various times after the first denial, on October 21, 1977, and before the market's close on December 15, 1978—alleged that their reliance on management's denials caused them "substantial" damages.[58]

On the merits, the district court granted summary judgment to the defendants, holding the fact of merger discussions immaterial as a matter of law because, as of October 21, negotiations were not ongoing and although they were ongoing at subsequent denial dates, these later negotiations were not "destined with reasonable certainty" to result in a "merger agreement in principle."[59] The Sixth Circuit reversed,[60] holding that preliminary merger discussions are not immaterial as a matter of law and that, when publicly denied, "even discussions that might not have been material in absence of the denial are material because they make the statement made untrue."[61]

The court did not explain how the denial of otherwise immaterial merger discussions automatically makes the existence of such discussions material, nor did it offer support for its express conclusion that knowledge of the merger discussions would "without doubt" alter the total mix of information for reasonable investors or its implied conclusion that in dumping their Basic, Inc. shares too early the plaintiffs reasonably relied on denials of otherwise immaterial merger talks.

At the Supreme Court, a 4-2 plurality affirmed and adopted verbatim the *TSC Industries* "reasonable investor" and "total mix" rubric for Section 10(b) claims,[62] adding that no single fact is always determinative of materiality,[63] quantitative materiality of forward-looking or contingent information should be assessed using a probabilistic, expected value framework that balances the probability of the event and its "anticipated magnitude" in relation to the activity of the company as a whole,[64] and that materiality does not "attribute to investors a child-like

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[53] *Basic*, 485 U.S. at 227–28 (plurality opinion).
[54] *Id*. at 227.
[55] *Basic*, 485 U.S. at 227–28 (plurality opinion).
[56] *Id*. at 228 n.2.
[57] *Id*. at 228.
[58] Levinson v. Basic, Inc., 786 F.2d 741, 743 (6th Cir. 1986).
[59] *Id*. at 229.
[60] *Levinson*, 786 F.2d at 741.
[61] *Id*. at 749.
[62] *Basic*, 485 U.S. at 231-32 (plurality opinion) (quoting *TSC Industries*, 426 U.S. at 449 (1976)).
[63] *Id*. at 236 n.14 (citing H. COMM. ON INTERSTATE AND FOREIGN COMMERCE, 95TH CONG., REP. OF THE ADVISORY COMM. ON CORPORATE DISCLOSURE TO THE SECURITIES AND EXCHANGE COMMISSION 327 (Comm. Print 1977) (noting that "absolute certainty in the application of the materiality concept . . . is illusory and unrealistic")). *Compare* Council Directive 2013/34/E.U., art. 2, 2013 O.J. (L 182) 19, 28 (defining "material" as "the status of information where its omission or misstatement could reasonably be expected to influence decisions that users make on the basis of the financial statements of the undertaking").
[64] *Basic*, 485 U.S. at 238 (plurality opinion) (holding that "materiality will depend at any given time upon a balancing of both the indicated probability that the event will occur and the anticipated magnitude of the event in light of the totality of the company activity") (quoting SEC v. Texas Gulf Sulphur Co., 401 F. 2d 833, 849 (2nd Cir. 1968)). Expected value is the anticipated value of an investment calculated by multiplying each possible value by its probability of occurrence and then summing these probability-weighted values. *See Expected Value*, INVESTOPEDIA,

simplicity [or] an inability to grasp the probabilistic significance of negotiations" but must "filter out . . . information that a reasonable investor would not consider significant."[65]

After first dismissing as inconsequential their own lack of applicable expertise,[66] the *Basic* plurality also famously endorsed the so-called fraud-on-the-market theory (FOTM) for Section 10(b) cases involving publicly traded stocks,[67] holding that plaintiffs are entitled to a rebuttable presumption of reliance on the "integrity" of the stock's market price as a "reflection of its value."[68] In a strongly-worded dissent joined by Justice O'Connor, Justice White concurred in extending the *TSC* materiality rubric to Section 10(b) cases but derided the plurality's FOTM-presumed reliance doctrine, questioned the Court's intellectual preparation to "assess which theories aptly describe the functioning of the securities industry," and noted that many investors buy or sell precisely because they believe the market price is inaccurate.[69]

2. *TSC-Basic* extension

In Matrixx Industries Inc. v. Siracusano, the Supreme Court recommitted to *TSC-Basic* and (implicitly) to Bayesian materiality, while slightly diminishing the probative value of frequentist or NHST statistics as evidence in securities fraud cases.[70]

Matrixx covered a class period from October 2003 to February 2004.[71] Investors alleged that Matrixx had violated Securities Act §10(b) and SEC Rule 10b-5[72] by failing to disclose (a) adverse event reports (AERs) that the company's nasal spray, Zicam Cold Remedy, had caused anosmia (loss of sense of smell) in twenty-three users,[73] and (b) four lawsuits making similar (possibly duplicative) allegations[74] in conjunction with company statements about business growth and product safety. Matrixx countered that a mere twenty-three AERs received over four

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http://www.investopedia.com/terms/e/expected-value.asp (last visited Oct. 23, 2016). For example, where a pharmaceutical patent will or will not be granted, the owner will realize a gain outcome of $1 billion if the patent is granted but if it is not granted, the gain will equal zero. If the probability of *granted* equals .25, then the probability of *not granted* must be 1 - .25 = .75, because the probabilities of all possible outcomes must sum to 1. Multiplying the gain and no-gain outcomes by their respective probabilities yields an overall expected value of $250 million = (.25 x $1 billion) + (.75 x 0).

[65] *Basic*, 485 U.S. at 234 (quoting *TSC Industries*, 426 U.S. at 448–49).

[66] "We need not determine by adjudication what economists and social scientists have debated through the use of sophisticated statistical analysis and the application of economic theory . . . [W]e need only believe that market professionals generally consider most publicly announced material statements about companies, thereby affecting stock market prices." *Id*. at 247 n.24.

[67] The fraud on the market theory [hereinafter FOTM] hypothesizes that in a well-functioning ("efficient") securities market, stock prices are based on "available material information regarding the company and its business" and, therefore, misleading statements will defraud even purchasers who "do not directly rely on the misstatements." *Id*. at 241–42 (quoting Peil v. Speiser, 806 F. 2d 1154, 1160–61 (3rd Cir. 1986)).

[68] *Id*. at 244, 247.

[69] *Id*. at 253–57 (White, J., dissenting).

[70] "NHST" refers to "null-hypothesis significance testing," a non-Bayesian statistical approach upon which the *Matrixx* defendants unsuccessfully relied to prove that adverse event reports (AERs) of patient harm were not material. *Matrixx*, 563 U.S. at 39 n.6 (2011) (discussing NHST statistical significance). *See also* Finkelstein & Fairley, *supra* note 17, at 490 (1970) (recommending Bayesian probability analysis of identification evidence in criminal cases). *But see generally* Joseph L. Gastwirth, *Statistical Considerations Support the Supreme Court's Decision in Matrixx Initiatives v. Siracusano*, 52 JURIMETRICS 155 (2012) (presenting an alternative NHST analysis indicating that the Matrixx AERs *were* statistically significant).

[71] *Matrixx*, 563 U.S. at 31 (2011).

[72] *Id*. at 27.

[73] Brief for Petitioner at 6 n.1 (Matrixx Brief), *Matrixx*, 563 U.S. (2011) (No. 09-1156).

[74] Siracusano v. Matrixx Initiatives, Inc., 585 F.3d 1167, 1179 (9th Cir. 2009). *See also* Matrixx Brief at 5–6.

years from among millions of users could not be material, in part because such a small number was "statistically" insignificant.[75] In addition, Matrixx pointed to two pre-market, double-blind, randomized clinical trials that produced no reports of anosmia as supporting the view that no reasonable investor should take these AERs seriously.[76] The trial court agreed, dismissing the case for failure to plead scienter and materiality.[77]

On appeal, the Ninth Circuit reversed, citing the Supreme Court's rejection of bright-line standards and holding that the materiality of the AERs was sufficient to overcome a motion to dismiss and should not be decided as a matter of law.[78] The court did not use the terms "circumstances" or "total mix,"[79] apparently disregarding this part of the *TSC-Basic* materiality model.

Despite the oversight, the Supreme Court unanimously affirmed, holding that the statistical insignificance (in frequentist terms) of the AERs was not dispositive of materiality for purposes of Section 10(b) and Rule 10b-5.[80] In so holding, however, the Court expressly invoked the total mix test and ruled that reasonable investors may infer a material causal relationship with or without "statistical significance."[81] In dicta, the Court also emphasized that Section 10(b) and Rule 10b-5(b) create no "affirmative duty to disclose any and all material information" but only the information necessary to make the statements made not misleading.[82] By incorporating in its materiality analysis information beyond the frequentist results of Matrixx's clinical trials, the Court implicitly endorsed Bayesian reasoning which explicitly recognizes multiple sources of information in reaching probabilistic answers.[83]

In Christine Asia Co., Ltd. v. Alibaba Group Holding Limited, investors accused Chinese e-commerce giant Alibaba Group of concealing a July 16, 2014 meeting in which China's State Administration for Industry and Commerce (SAIC) warned Alibaba—in the form of "administrative guidance"—that it lacked sufficient internal controls, was violating Chinese law by failing to better regulate the sales of counterfeit products through its websites, and could therefore incur large financial penalties.[84] Alibaba's September 18, 2014 SEC registration

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[75] *Id.* at 31, 46.
[76] *Id.* at 8.
[77] *See* Matrixx Brief at 11.
[78] *Siracusano*, 585 F.3d 1179–80.
[79] *See generally Siracusano*, 585 F.3d.
[80] *See* Benjamin A. Leisawitz, *Matrixx Initiatives, Inc. v. Siracusano: Rejection of the Statistically Significant Standard Reopened the Door to Securities Fraud Strike Suits*, 36 DEL. J. CORP. L. 675 (2011). Shortly before Supreme Court oral arguments, Matrixx was bought by private equity firm H.I.G., for $75.2 million or $8.00 per share, a 56.3% premium over the December 13, 2010 closing price. *See H.I.G. Capital to Pay $75.2M For Matrixx Initiatives*, THE PE HUB NETWORk, Dec. 14, 2010, https://www.pehub.com/2010/12/hig-capital-to-pay-752m-for-matrixx-initiatives/#
[81] *Matrixx*, 563 U.S. at 38-47 (2011). *But see* Booth, *supra* note 5, at 529 (arguing that in *Basic* the Court relied explicitly on a "total mix" test and implicitly on a "price impact test," while acknowledging that price impact was not used in *Matrixx*).
[82] *Matrixx*, 563 U.S. at 44. The phrase "not misleading" implies that the statements are meant to *lead* somewhere. This raises questions beyond the scope of the current inquiry.
[83] *See generally* Fienberg & Schervish, *supra* note 18; Fenton et al., *supra* note 15, at 51; Kaye 1988 at 165, 169 (defining "frequentist probability" and describing it as a "theory" having "limited applicability in law" because "events in dispute in most litigation are not subject to repetition" while infinite repetition is necessary to frequentist statistical analysis).
[84] Consolidated Complaint at 2-5, *In re* Alibaba Group Holdings Ltd. Securities Litigation, No. 15-md-02631 (S.D.N.Y. Jul. 1, 2015). *See also* Jonathan Stempel, Alibaba wins dismissal of lawsuit over pre-IPO regulatory warning, Reuters (Jun. 22, 2016), http://www.reuters.com/article/us-alibaba-lawsuit-idUSKCN0Z81TE.

statement omitted the SAIC meeting but highlighted the risks identified in the meeting and more, noting that the SAIC was stepping up enforcement efforts. A day later, on September 19, 2014, Alibaba's initial public offering launched on the New York Stock Exchange.[85]

On January 27, 2015, a whitepaper purporting to summarize the SAIC meeting briefly appeared on the SAIC's website. On January 28, Alibaba's share price fell 4.4 percent to $98.45. On January 29, Alibaba acknowledged the July SAIC meeting and its shares fell another 9 percent to $89.81, as several stock analysts downgraded Alibaba based on the SAIC whitepaper. The back-to-back price drops equated to a roughly $33 billion loss in market capitalization.

In dismissing the case, the court found that the SAIC white paper offered no new material information beyond that already in Alibaba's registration statement. Therefore, despite analysts' "sell" recommendations and successive 4.4 and 9 percent drops in share price widely blamed on the white paper, the white paper was legally immaterial. *Alibaba* teaches, among other things, that sophisticated financial analysts and investors sometimes respond to legally immaterial information as if it were significant to investment decisions, suggesting that even experts can misjudge materiality in the heat of the moment. Thus, the *Alibaba* court, unlike those in *Skilling* and *Huang*, discussed below, appears to have followed both the reasonable investor and total mix prongs of *TSC-Basic*, while analysts and plaintiff investors did not.

3. Breaches of *TSC-Basic*

Recent empirical research suggests that because of knowledge limitations, time constraints, or ideology, federal district court judges routinely violate at least one mandatory statutory provision of the Exchange Act.[86] The cases discussed in this subsection anecdotally suggest that this judicial non-compliance phenomenon extends, as well, to the definition of materiality and that judges are not alone in failing to comply.

The criminal trial of former Enron CEO Jeffrey Skilling offers a stark illustration of *Basic* disagreement (and perhaps outright disregard) among courts, accountants, prosecutors, and defense counsel over the definition and application of materiality.[87] Skilling was accused of manipulating or circumventing accounting standards in SEC filings and communications with auditors.[88] Two defense accounting experts, Jerry Arnold and Walter Rush, averred that Enron's financial statements were largely compliant with accounting rules.[89] However, the court severely undercut the credibility of both witnesses before the jury. First, with Rush on the verge of explaining materiality, the court reassured the prosecutor in the jury's presence that "accounting materiality" and legal materiality were two different things, implying that Rush's testimony should be disregarded.[90]

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[85] Christine Asia Co., Ltd. v. Alibaba Group Holding Limited, Order Granting Defendants' Motion to Dismiss (No. 15-02631) (S.D.N.Y. Jun. 21, 2016).

[86] *See* M. Todd Henderson & William H.J. Hubbard, *Judicial Noncompliance with Mandatory Procedural Rules Under the PSLRA*, Coase-Sandor Institute for Law & Economics Working Paper No. 671, 29 (2014) (reporting that district courts certified attorney compliance with FRCP 11(b) in only 13.5 percent of 1,039 sampled cases).

[87] *Skilling*, 561 U.S. (2010).

[88] Superseding Indictment at 10–13, 16, 18–19, 24, 31, 33, 52, U.S. v. Skilling (S.D. Tex. Jul. 7, 2004) (Cr. No. H-04-25).

[89] Transcript of Record at 16441–16526, 16716–17823, U.S. v. Skilling (S.D. Tex. 2006) (04-CR-25) [hereinafter Skilling Transcript] (reciting the direct examination of Arnold and Rush).

[90] Skilling Transcript at 16736–37. The court never subsequently defined "accounting materiality" or distinguished it for the jury from legal materiality.

Toward Arnold, the court was even more dismissive. When he was asked on cross-examination whether Enron's investors should have been told that Enron had a "one billion dollar accounting error on its books," the court interrupted before Arnold could answer, "[T]hat's a question for the jury to decide. He testified as to accounting materiality, not to the issues that will go before this jury."[91] While the court savaged the defense experts, the prosecution discarded *TSC Industries'* reasonable investor constraint, resorting to "common investor" witnesses to offer "human perspective," in a direct appeal to the jury's "empathy."[92] Adding injury to insult, the court rejected the defendant's proposed jury instruction on materiality[93] and departed from *TSC-Basic*[94] by defining a material fact or omission as one which *could* (versus *Basic*'s would) reasonably be expected to induce *a person* (versus *Basic*'s reasonable investor) to invest or not invest in Enron stock.[95] With this instruction, which lowered the *TSC-Basic* materiality bar in two key ways, the jury found Skilling guilty of securities fraud and making false statements to auditors.[96]

On appeal, Skilling alleged as error the trial court's failure to "instruct the jury on accepted principles of materiality."[97] In affirming, the Fifth Circuit held that the materiality instruction was close enough even if not precisely in line with the Supreme Court's *TSC Industries* rubric.[98]

SEC v. Huang[99] illustrates judicial non-compliance with *TSC-Basic* in the civil SEC insider-trading context. The SEC alleged that two Capital One anti-fraud data analysts misappropriated credit card purchases data to which they enjoyed job-related access.[100] The defendants then applied their analytical expertise to massage the raw *data* into useable *information*—we deliberately distinguish here between data and information—about "hundreds" of publicly traded retailers in advance of their quarterly sales announcements.[101] By trading in the retailers' stocks and options ahead of the announcements, they earned a three-year return of 1,819 percent on an original investment of $147,000.[102]

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[91] Skilling Transcript at 16677.

[92] *See* John C. Hueston, *Behind the Scenes of the Enron Trial: Creating the Decisive Moments*, 44 AM. CRIM. L. REV. 197, 208–09 (2007) (noting that to provide a "human perspective" to the jury, the DOJ's Enron Task Force used "common investors" who, though offering "less compelling evidence of materiality," could "level the field in the battle for jury empathy").

[93] *See* Skilling Brief at 99; U.S. v. Skilling, 554 F.3d 529, 552, 554–55 (5th Cir. 2009), *aff'd in part, vacated in part, on other grounds*, 561 U.S. 358 (2010) (detailing part of the proposed supplemental instruction identifying forward-looking statements, facts already known to the market, and non-specific puffery as "inherently not material").

[94] *Basic*, 485 U.S. 231–32 (1988).

[95] The jury instruction read in part as follows:

> [F]or you to find a fact or omission material, the Government must prove . . . that the fact misstated or the fact omitted was of such importance that it could reasonably be expected to . . . induce a person to invest or to cause or induce a person not to invest in Enron stock.

Skilling, 554 F.3d at 552.

[96] *Skilling*, 554 F.3d at 542.

[97] *Id.* at 551–55.

[98] *Id.* (finding that the court's actual instructions "captured most of the substance of Skilling's proposed supplement and adequately explained 'materiality' to the jury").

[99] *See* Complaint, SEC v. Huang [hereinafter "Huang Complaint"], https://www.sec.gov/litigation/complaints/2015/comp23216.pdf.

[100] *Id.*

[101] Memorandum Order 1, SEC v. Nan Huang [hereinafter "Huang Order"] (E.D. Pa. May 9, 2016) (No. 15-269).

[102] *See* Levine, *supra* note 2.

One defendant settled before trial. As to the other, Huang, in November 2015, the trial court denied the government's motion for summary judgment holding that the materiality of the inside information should be determined by a jury.[103] Huang argued that the misappropriated data was quantitatively immaterial largely because it was only a tiny slice—typically between 2 and 4 percent but often less than 1 percent of each retailer's revenues—of the total mix of information available about each traded company.[104] The proposed jury instructions suggest that the SEC's attorneys were unsure about the precise meaning of "material":

> Material information is information which a reasonable investor would have considered significant in making an investment decision. Information is material when there is a substantial likelihood that disclosure of the information would be viewed by a reasonable investor as significantly altering the "total mix" of information made available concerning the company. Nonpublic information about a company's revenue is material.[105]

This proposed instruction conflicts with itself and with market reality. The first sentence implies an unachievable 100 percent probability threshold ("reasonable investor *would* have considered"), while the second sentence requires *TSC-Basic*'s lower *substantial likelihood* threshold. The last sentence, which counter-logically defines as material *any* nonpublic information about revenue no matter how trivial, was dropped from the final instruction and the following sentence was added: "In determining whether the information is material, you are to consider all of the circumstances . . . at the time of the trades or trade."[106]

While the jury was instructed to consider *all* of the circumstances, the defendant argued post-trial that the government provided insufficient evidence for them to do so,[107] pointing to the SEC's expert, Graham, who testified, "I considered the total mix of information to be the analysts' expectation."[108] Nevertheless, despite the fact that Huang had traded not on the raw Capital One *data* but on his *statistical analysis* thereof,[109] the jury found him liable for insider trading.[110]

In denying Huang's motion to overturn the verdict, the court did not deny that the government had failed to prove "all of the circumstances" at the time of the trades and—despite

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[103] *See* Carmen Germaine, *SEC Denied Quick Win In Sales Data Insider Trading Suit*, LAW 360, Nov. 17, 2015, http://www.law360.com/articles/727823/sec-denied-quick-win-in-sales-data-insider-trading-suit.

[104] Defendant's Memorandum of Law in Support of His Motion for Judgment as a Matter of Law at 2, 10 SEC v. Nan Huang [hereinafter "Huang Memorandum"] (E.D. Pa. Mar. 24, 2016) (No. 15-269).

[105] Plaintiff Securities and Exchange Commission's Proposed Jury Instructions at 21, SEC v. Nan Huang (E.D. Pa. Nov. 12, 2015) (No. 15-269).

[106] *See* Huang Memorandum at 2.

[107] *See* Huang Memorandum at 2–4, 6–7 ("The defense asked each SEC witness whether he conducted an analysis of the total mix of information available to investors at the time of each alleged instance of insider trading, and each witness confirmed that he had not done such an analysis.").

[108] *See* Huang Memorandum, at 6 n. 3. The "analysts" referenced here by Graham were presumably financial analysts, not the defendants.

[109] The identified credit sales *data* as the offending inside information. Huang Complaint at 2 para. 5. However, the record does not show how this fragmentary data, which the SEC does not require retailers to reveal to investors, nevertheless ranked as material.

[110] *See* Huang Memorandum at 2. *See also* Suzanne Barlyn, *U.S. jury finds ex-Capital One analyst liable in insider trading case*, REUTERS, Jan. 14, 2016, http://www.reuters.com/article/us-sec-capitalone-insidertrading-idUSKCN0UR2KR20160114.

having instructed the jury to consider all of them through the eyes of a reasonable investor—betrayed impatience with and confusion over Huang's insistence that the jury must know all of the circumstances[111] and must have insight into the thinking of a reasonable investor to reach a verdict.[112]

Like *Skilling*, where the Fifth Circuit detached the "reasonable" qualifier from "reasonable investor;" *Huang* reveals a court and prosecutors unwilling or unable to live within the spirit or the letter of *Basic's* Bayesian definition of materiality. Yet, in *Huang*, they strayed even further, with the plaintiff SEC offering the jury no evidence of the "total mix of information available," the reasonable investor's mindset,[113] or of the probability that a reasonable investor would view the misappropriated data as significantly altering the (prior) total mix of information.

Federal courts are not alone in misreading or misapplying *TSC-Basic*. Margaret Sachs highlights three cases brought by the SEC in which reckless or very unsophisticated investors — as opposed to the reasonable investors required by *TSC-Basic*—were duped by promises of absurdly high returns.[114] Such promises could not, by definition, be taken seriously by reasonable investors. Sachs argues that such cases justify replacing "reasonable investor" with "least sophisticated investor."[115] In Part V.B.2., we argue that the opposite may be true.[116]

Since 1976, the Supreme Court has consistently reaffirmed *TSC-Basic's* Bayesian total-mix materiality model, while Congress, regulators and the accounting profession have given the Court plenty of room to do just that. Yet, recent lower-court activity surveyed above makes it clear that other players—including judges, prosecutors, SEC, and defense counsel—frequently depart from the model's total mix and reasonable investor requirements. Taken together, these findings warrant reconsideration of the *TSC-Basic* model. Part III summarizes recent regulatory attempts.

III. REGULATORY PROPOSALS

Over the eighty years between the creation of the SEC and 2014, no U.S. accounting standards-setting body attempted to define materiality.[117] Finally, in September 2015, the FASB floated a 45-word draft, stating in essence, "Materiality is applied to quantitative and qualitative disclosures individually and in the aggregate in the context of the financial statements taken as a

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[111] Huang Memorandum at 6–7.

[112] Memorandum Order 5, SEC v. Nan Huang [hereinafter "Huang Order"] (E.D. Pa. May 9, 2016) (No. 15-269) ("We are not aware of any case . . . requiring the Commission to have a random 'reasonable investor' testify. If we could devine [sic] 'reasonable investor' testimony, we do not see how the inquiry would remain objective; any investor's testimony would delve into her investment practices."). Two pages later, the court appears confused about why Huang demanded evidence of "all circumstances": "We suppose one reason . . . is to argue no reasonable investor would alter their investment strategy based on the disclosure of the credit card revenue data if this other information were available." *Id.* at 7.

[113] *See* Huang Memorandum at 8 ("SEC provided no information as to what the reasonable investor would have thought").

[114] Sachs, *supra* note 5, at 497–500 (discussing SEC v. Hasho, 784 F. Supp. 1059 (S.D.N.Y. 1992); SEC v. Infinity Group Co., 993 F. Supp. 324, 327–29 (E.D. Pa. 1998), aff'd, 212 F.3d 180 (3d Cir. 2000); and SEC v. George, 426 F.3d 786 (6th Cir. 2005)).

[115] Sachs, *supra* note 5, at 481.

[116] *See infra* text accompanying notes 315-17.

[117] *See* Kurt S. Schulzke, *Wink, Wink, Nudge Judge: Persuading U.S. Courts to Take Accountants Seriously in Federal Securities Cases with Help from the U.K. Companies Act*, 16 TENN. J. BUS. L. 231 (2015) (contextualizing materiality in the larger financial reporting debate over fair presentation of financial statements).

whole . . . [and] is a legal concept."[118] This minimalist proposal would apply to textual disclosures, not to the core financial statements themselves.[119] The proposal has so bitterly divided preparers and auditors[120] from investor advocates[121] that the FASB has put the draft on hold.[122]

In contrast, in October 2015, the International Accounting Standards Board (IASB), a private standards-setting body[123] whose standards are used in the financial statements of companies around the globe,[124] issued a draft 20-page, non-binding practice statement[125] on the proper application of materiality which the IASB's Conceptual Framework defines as follows:

> Information is material if omitting it or misstating it could influence decisions that users make on the basis of financial information about a specific reporting entity. In other words, materiality is an entity-specific aspect of relevance based on the nature and magnitude, or both, of the items to which the information relates in the context of an individual entity's financial report.[126]

The IASB draft, which appears to be less controversial[127] than the FASB's, limits material information to that which is "relevant" to a range of "primary users"[128] who, while reasonably knowledgeable about "business and economic activities" and reasonably diligent in reviewing the information,[129]should not be presumed "financial reporting experts."[130] The draft also notes that disclosure of too much immaterial information may obscure or conceal material information.[131]

Not to be outdone, in April 2016, the SEC issued a 341-page Concept Release, seeking public comment, in part, on the definition and application of materiality in SEC disclosures.[132] The Release claims that as early as 1937 the SEC was already defining materiality as information "which an average prudent investor ought reasonably [to know] before buying or selling" a security[133] and that Regulation S-K was written to provide investors specific data contained in

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[118] FASB, Proposed Accounting Standards Update, *Notes to Financial Statements (Topic 235): Assessing Whether Disclosures Are Material* 7 (2015).
[119] *Id.* at 10.
[120] *See, e.g.*, Craig M. Meynard, Chief Accounting Officer, Delta Airlines. Letter to FASB, Dec. 18, 2015 (averring that the proposed guidance would benefit financial statement users and preparers by making the disclosures more concise).
[121] *See, e.g.*, James Andrus, CalPers Investment Manager, Letter to FASB, Dec. 8, 2015 (strongly disagreeing with the proposal because it would reduce disclosures).
[122] Interview with Marc A. Siegel, FASB Board Member, at Kennesaw, Georgia (Sept. 12, 2016).
[123] *See* http://www.ifrs.org/About-us/IASB/Pages/Home.aspx (last visited Feb. 22, 2017).
[124] *See* http://www.ifrs.org/Use-around-the-world/Pages/Jurisdiction-profiles.aspx (last visited Feb. 22, 2017).
[125] IASB, IFRS Practice Statement: Application of Materiality to Financial Statements, Exposure Draft ED/2015/08 (ED 2015), http://www.ifrs.org/Current-Projects/IASB-Projects/Disclosure-Initiative/Materiality/Exposure-Draft-October-2015/Documents/ED_IFRSPracticeStatement_OCT2015_WEBSITE.
[126] *Id*.
[127] See related comment letters at http://www.ifrs.org/Current-Projects/IASB-Projects/Disclosure-Initiative/Materiality/Exposure-Draft-October-2015/Pages/Comment-letter.aspx.
[128] ED 2015 para. 19.
[129] ED 2015 para. 15.
[130] ED 2015 para. 16.
[131] ED 2015 para. 10.
[132] SEC Concept Release at 36-38.
[133] SEC Concept Release at 36 n. 105.

"broad categories of material information."[134] The Release supports many of the rationale underlying the IASB's draft and solicits comments on what a definition might look like.

With these marginal regulatory efforts in mind, and against the backdrop of increasingly integrated global capital markets, Part IV comparatively investigates E.U. law to better inform Part V's comprehensive reform proposal which is intended to regularize, rationalize, and globally harmonize the analysis of materiality.

IV. MATERIALITY IN E.U. LAW

Uncertainty about the application and interpretation of materiality is not limited to the United States. Materiality or similar terms, such as "significant,"[135] "principal,"[136] or "relevant,"[137] is also central to E.U. financial disclosure laws and the national laws of individual E.U. Member States.[138] The concepts of materiality and related terms appear in various E.U. directives or regulations[139] with differing degrees of refinement and sometimes slightly different meanings due to imprecise translation.[140]

For example, the E.U. Prospectus Directive,[141] adopted in 2001 to harmonize disclosure requirements across E.U. securities markets,[142] uses the term "material" fourteen times without defining it, though Article 2 defines various other terms. Similarly, the 2014 E.U. Market Abuse Regulation (MAR) requires "as soon as possible" disclosure of "inside information,"[143] which it defines as unpublished "information of a precise nature" relating to an issuer or financial

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[134] SEC Concept Release at 34.

[135] Directive 2003/6/EC, art. 1, O.J. (L 96/16).

[136] Directive 2013/34/E.U., art. 19 (1), O.J. (L 182/19).

[137] Directive 2013/34/E.U., art. 19(2)(e) in its German translation.

[138] *See, e.g.*, THE PANEL ON TAKEOVERS & MERGERS, THE TAKEOVER CODE, r. 9 (11th ed., 2013), http://www.thetakeoverpanel.org.uk/wp-content/uploads/2008/11/code.pdf [hereinafter the City Code]; HANDELSGESETZBUCH [HGB][COMMERCIAL CODE], §317(1), https://www.gesetze-im-internet.de/bundesrecht/hgb/gesamt.pdf (Ger.) [hereinafter HGB]; WERTPAPIERPROSPEKTGESETZ [WPPG][GERMAN SECURITIES PROSPECTUS LAW], §21, http://www.gesetze-im-internet.de/wppg/__21.html (Ger.) [hereinafter WpPG]; AUSTRIAN CODE OF CORPORATE GOVERNANCE §§9, 23, http://www.ecgi.org/codes/documents/cg_code_austria_jul2012_en.pdf; GERMAN CORPORATE GOVERNANCE CODE §§2.2.3, 5.4.1., 6.1, http://www.dcgk.de//files/dcgk/usercontent/en/download/code/2015-05-05_Corporate_Governance_Code_EN.pdf. Under German law, a company is liable for non-disclosure or false disclosure of "inside information." GESETZ ÜBER DEN WERTPAPIERHANDEL/ WERTPAPIERHANDELSGESETZ [WPHG][SECURITIES TRADING ACT] §§47(b), (c) (Ger.) [hereinafterWpHG]. Companies are required to disclose "inside information," §15 WpHG, now defined by MAR, art. 7, discussed below. *See infra* note 143 and accompanying text.

[139] E.U. regulations are directly binding without additional domestic legislation, while directives require local legislation in each Member State. *See* EUROPEAN UNION, Regulations, Directives and Other Acts, http://europa.E.U./european-union/law/legal-acts_en (last visited Feb. 21, 2017).

[140] *See, e.g.*, Directive 2013/34/E.U., art. 19(2)(e) (reading, in English, "where *material* for the assessment" of financial position and operations, the German version uses "von Belang" which translates into English as "relevant" more so than "material." E.U. legislation is binding in all official E.U. languages, therefore no language version prevails over another. *See* Case C-215/10, Pacific World and FDD International, 2011 E.C.R. I-7255, 48 (with references).

[141] Directive 2003/71/EC O.J. (L345/64), amending Directive 2001/34, amended by Directives 2008/11/EC, 2010/73/E.U. and 2010/78/E.U. [hereinafter Prospectus Directive].

[142] *See* Karmel, *supra* note 16, at 1697–99 (describing the aim of the directive and comparing its structure to U.S. securities law).

[143] Regulation 596/2014, art. 17 (1), O.J. (L 173/1) [hereinafter "MAR"].

instrument which if published "would be likely to have a significant effect" on the price of related securities or derivatives.[144]

Similarly, the 2002 IAS Regulation[145] and the 2013 Accounting Directive[146] attempt broad definitions of materiality. Meanwhile, Transparency Directive Article 8 sets a purely quantitative materiality threshold, EUR 100,000 per year,[147] for reporting payments to governments, while the 2014 Audit Regulation requires auditors to disclose "the quantitative level of materiality" applied to perform the audit.[148]

The following sections will, first, briefly overview the development of E.U. financial disclosure law; second, describe how materiality is defined in E.U. legislation, comprising the 2002 IAS Regulation, the 2003 Prospectus Directive,[149] the 2013 Accounting Directive, and the 2014 MAR; and, third, analyze the relationship between harmonized E.U. law and the domestic laws of E.U. Member States and what this means for the development of a unified definition of materiality by European courts.

A. Development of E.U. Financial Disclosure Law

Compared to the United States, the European Union and its members have little experience with securities market regulation.[150] This can be attributed, in part, to the relatively small role of domestic capital markets in continental European states.[151] Other factors include a public pension system not dependent on private investment[152] and a prevalence in some states, like Germany,[153] of unlisted small and medium-sized firms (SMEs) primarily reliant on bank

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[144] MAR, art. 7(1)(a).

[145] Regulation 1606/2002/EC O.J. (L 243/1) [hereinafter IAS Regulation].

[146] *See supra* note 7.

[147] Directive 2004/109/EC O.J. (L 390/38) [hereinafter "Transparency Directive"]. This directive is intended to ensure the transparency of financial reports and other disclosures required by the Market Abuse Directive (2003/6/EC). *See Transparency Directive*, EUROPEAN SECURITIES AND MARKETS AUTHORITY [ESMA], https://www.esma.europa.E.U./regulation/corporate-disclosure/transparency-directive.

[148] Regulation 537/2014/EC, art. 11(2)(h), O.J. (L 158/77) [hereinafter "Audit Regulation"]. *See also* Burmeister & Velte, *supra* note 22, at 228 (noting the increasing relevance of materiality to this and other E.U. regulations).

[149] Amended in 2010.

[150] *See* Lannoo, *supra* note 21, at 329 (stating that disclosure is a "core principle of securities market regulation," in which E.U. members have limited experience).

[151] Stephen Bond et al., *Financial Factors and Investment in Belgium, France, Germany, and the United Kingdom: A Comparison Using Company Panel Data*, 85 REV. ECON. & STAT. 153, 162 (2003) (analyzing how different financial systems affect company investment).

[152] Most European pension systems depend heavily on public "pay as you go" (PAYG) schemes, where current workers fund retiree pensions. *See* Luis Ferruz Agudo & Mercedes Alda García, *The reform of some European public pension systems: Spain, Italy and Sweden: A breakthrough?*, 15 PENSIONS 297, 298 (2010). For a comparison of the French and the U.K. pension system *see* Christine Lagoutte & Anne Reimat, *Pension Systems after the Storm: France and the United Kingdom in a Comparative Analysis*, 9 EUR. J. COMP. ECON. 305, 311 (2012) (stating that British pensions are mainly market-supported, while French pensions rely on public schemes). *See also generally* Philipp B. Volmer et al., *New Governance Modes for Germany's Financial Reporting System: Another Retreat of The Nation State?*, 5 SOC. ECON. REV. 437, 438 (2007) (citing Nicholas Barr, *Reforming pensions: myths, truths, and policy choices*, 55 INTERNATIONAL SOCIAL SECURITY REVIEW, 3–36) (2002).

[153] For 2013 the German Federal Statistical Office reports that 99.3 % of German enterprises were SMEs. *See Shares of small and medium-sized enterprises in selected variables, 2013*, DESTATIS, https://www.destatis.de/EN/FactsFigures/NationalEconomyEnvironment/EnterprisesCrafts/SmallMediumSizedEnterprises/Tables/Total_CIK.html (last visited Sept. 19, 2016 at 4:50pm). On the importance of SMEs for the German economy s*ee generally* René Söllner, *The Economic Importance of Small and Medium-Sized Enterprises in Germany*,

financing.[154] However with increasing private investment and stronger integration of European capital markets,[155] harmonization of accounting and financial disclosure laws has gradually become a regulatory focus.[156] The growing attention is part of an overall harmonization of European company law designed to support the free movement of persons, services and capital, a foundational principle of the European Union.[157]

Enforcement of the new European rules remains relatively weak due to systemic differences between continental European and Anglo-Saxon accounting traditions[158] and a lack of centralized European enforcement authority.[159] Enforcement remains with Member States, whose diverse authorities have historically lacked the powers of the U.S. SEC.[160] Contributing to weak enforcement is that in many European countries securities fraud class actions remain

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https://www.destatis.de/EN/Publications/WirtschaftStatistik/TheEconomicImportance_Soellner_12014.html (last visited Feb. 21, 2017).

[154] *See* Rolf Uwe Fülbier & Malte Klein, *Financial Accounting and Reporting in Germany: A Case Study on German Accounting Tradition and Experiences with the IFRS Adoption* 10–11 (January 10, 2015), https://papers.ssrn.com/sol3/papers2.cfm?abstract_id=2200805 (explaining the role of SME's in the German economy and its impact on the German accounting praxis and regulation leading to "Germany's cautious position in the general debate on the IFRS for SMEs").

[155] *See Private Debt in 2015:Thinking Outside the Bank*, BROWN, BROTHERS, HARRIMAN 3 (June 2015), https://www.bbh.com/en-us/insights/private-debt-in-2015--thinking-outside-the-bank/4094. (describing the changing European debt market); Etienne Desjardins, *Direct Lending Dawns in Europe*, GLOBAL RISKS INSIGHTS, http://globalriskinsights.com/2016/03/direct-lending-dawns-in-europe/ (describing the shift from bank loans to private lending in Europe).

[156] *See* Alexander Schaub, *The Use of International Accounting Standards in the European Union*, 25 NORTHWESTERN J. INT'L. L. & BUS. 609, 609 (2005) (stating that this objective "developed organically from the need to harmonize company law requirements for the creation of an internal market"). On the harmonization of E.U. financial regulation, see Karel, *supra* note 16, at 1692 (describing mutual recognition as "a construct of the E.U." providing that a firm doing business in one E.U. member state can also do business in other member states without further approvals).

[157] Title IV Consolidated versions of the Treaty on the Functioning of the European Union, [hereinafter EEC], O.J. C 326/47, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A12012E%2FTXT. *See also* Sabine D. Selbach, *The Harmonization of Corporate Taxation & Accounting Standards in the European Community and their Interrelationship*, 18 CONN. J. INT'L L. 523, 547 (2003) (describing the harmonization of accounting standards in the European Union as "part of company law harmonization").

[158] *See* Ulrich Sorgenfrei, *Vor § 331 ff. HGB*, in MÜENCHENER KOMMENTAR ZUM STRAFGESETZBUCH, Band 7, Nebenstraftrecht II 1086–87 (Wolfgang Joecks & Klaus Miebach eds., 2015) (Ger.) (stating that in practice, criminal prosecution of accounting fraud under financial disclosure laws such as sect. 331 HGB, the German equivalent to SOX Section 906, is often abandoned or limited to embezzlement or fraud according to sect. 154 Strafprozess Ordnung). *See generally* Patrick S. Ryan, *Understanding Director & Officer Liability in Germany For Dissemination of False Information: Perspectives From An Outsider*, 4 GERMAN L. J. 399 (2003) and Johann V. Loeffelmann, *Strength of Regulation for Financial Statements Disclosure: Evidence from the German Enforcement System* (June 13, 2011), http://ssrn.com/abstract=1863930 or http://dx.doi.org/10.2139/ssrn.1863930.

[159] *See* Steven Hijink, *Towards European Accounting Law*, 9 EUR. COMP. L. 201, 206 (2012) (commenting on the lack of an enforcement mechanism for accounting standards issued under the IAS Regulation and the limited power of the European Securities and Markets Authority (ESMA) in this respect.)

[160] *Id.* at 206 (reprising European IFRS enforcement authorities, ranging from private bodies (e.g., Germany) to a special appellate court chamber (e.g., Netherlands). *See also* Ryan, *supra* note 158, at 448 (noting that in Germany the "Bundesaufsichtsamt für den Wertpapierhandel"— now part of BaFin, *see* https://www.bafin.de/EN/DieBaFin/AufgabenGeschichte/aufgabengeschichte_node_en.html (Ger.)—an agency roughly comparable to the SEC was only created in 1994).

underdeveloped.[161] It was only in 2005, in connection with an unprecedented wave of lawsuits brought by small shareholders against actors of the so-called "New Economy,"[162] including Deutsche Telekom, that the German legislature codified shareholder class actions.[163] Thus, in contrast with abundant materiality case law in the U.S., European case law[164] remains relatively sparse.[165] According to continental European tradition, the interpretation of materiality falls mainly to legal academics and accounting scholars and practitioners, for whom the concept is of fundamental practical importance.[166]

European Union efforts to harmonize corporate reporting started with the adoption of the Fourth Company Law Directive, in 1978,[167] supplemented by the Seventh Company Directive, in 1983, for consolidated accounts, and two specialized Directives for banks[168] and insurance undertakings.[169] While these directives were meant to align accounting rules across Member States, the alignment did not go far in practice.[170] On the contrary, because of fundamental differences in accounting traditions, the Directives deliberately preserved distinct national systems.[171] In contrast to E.U. regulations,[172] the E.U. Accounting Directives are not directly

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[161] *See* Martin Gelter and Zehra G. Kavame Eroglu, *Whose Trojan Horse? The Dynamics of Resistance Against IFRS*, 36 U. PA. J. INT'L L. 89, 124 (2014) (citing Manning Gilbert Warren III, *The U.S. Securities Fraud Class Action: An Unlikely Export to the European Union*, 37 BROOK.
J. INT'L L. 1075, 1083-87 (2012). *See also* Ryan, *supra* note 158, at 440 (stating that in Germany criminal prosecution of corporate officers and directors may be more likely than civil litigation)

[162] "New Economy" has been used to describe the 1990s rise of technology-oriented companies of the German so-called "Neuer Markt," modeled after NASDAQ, which was shuttered after five years and numerous scandals. *See* Silvia Ascarelli & G. Thomas Sims, *Germany's Neuer Markt Exchange Will Be Shut Down Amid Scandals*, WALL ST. J., http://www.wsj.com/articles/SB1033035401850483033 (Sept. 27, 2002, 12:01 AM). *See also* Ryan, *supra* note 158, at 454–74 (summarizing German civil and criminal cases involving director and officer liability for false or undisclosed information).

[163] Kapitalanleger-Musterverfahrensgesetz [Capital Markets Model Case Act][KapMuG], Oct. 19, 2012, BGBL. I at 2182 (Ger.), English translation available at https://www.gesetze-im-internet.de/englisch_kapmug/index.html. In the case against Deutsche Telekom the German Supreme Court (Bundesgerichtshof) acknowledged a false prospectus but referred the case back to the trial court where it is still pending. *See* Bundesgerichtshof [BGH] [Federal Court of Justice], Oct. 21, 2014, 18 NEUE ZEITSCHRIFT FÜR GESELLSCHAFTSRECHT 20, 2015 (Ger.). *See* Thomas M.J. Möllers & Elisabeth Steinberger, *Die BGH-Entscheidung zum Telekom-Prozess und das europäische Anlegerleitbild*, 18 NEUE ZEITSCHRIFT FÜR GESELLSCHAFTSRECHT 329, 329-30 (2015) (Ger.) (summarizing the facts and legal status leading up to the Telecom case).

[164] In civil law countries, practitioners view court opinions as a source of law that, while theoretically non-binding, is practically binding because lower courts seek to avoid being overturned on appeal.

[165] For purposes of this comment, we exclude the U.K. by virtue of its recent vote to exit the E.U.

[166] *See generally* ESMA, Feedback Statement, Considerations of Materiality in Financial Reporting (2013), https://www.knf.gov.pl/Images/raport_koncepcja_istotnosci_18_02_2013_tcm75-33482.pdf and Carla Edgley, *A Genealogy of Accounting materiality*, 25 CRITICAL PERSP. ON ACCT. 255, 258 (2014) (providing an overview of accounting research on materiality). *See also* Wolfgang Osnadik, *Wesentlichkeit als Bestimmungsfaktor für Angabepflichten im Jahresabschluß und Lagebericht*, BETRIEBS-BERATER 1763 (1993) (Ger.), Patrick Velte, *Die Bedeutung des Wesentlichkeitsprinzips in den Rechnungslegungs-und Prüfungsnormen*, EUROPÄISCHES WIRTSCHAFTS- UND STEUERRECHT 142 (2014) (Ger.).

[167] Directive 78/660/EEC O.J. (L 222/11) [hereinafter "Fourth Directive"].

[168] Directive 86/635 O.J. (L 372/1).

[169] Directive 91/674 O.J. (L 374/7).

[170] *See* Schaub, *supra* note 156, at 610 (stating that the Directives "lifted the quality of financial reporting and had the merit of preserving different national accounting traditions within the internal market").

[171] *See* Karel van Hulle, *International Convergence of Accounting Standards, A Comment on Jeffrey*, 12 DUKE J. COMP. & INT'L. L. 357, 357 (2002) (observing that "[t]he purpose of these Accounting Directives was to align, though not to wholly harmonize, accounting requirements in Europe"). *See also* Graham Diggle & Christopher Nobes, *European rule-making in accounting: The seventh directive as a case study*, 24 ACCT. & BUS. RES., 319,

applicable law in the E.U. Member States and must be implemented by local legislation. Therefore, while directives provide a shared high-altitude outline, they preserve national differences in operational details.[173]

With the goal of attracting international investment, in the late 1990s, the E.U. developed a new strategy for full European capital market integration by 2002 expressed in the 1999 E.U. Financial Services Action Plan (FSAP).[174] This led to the 2002 adoption of the IAS Regulation,[175] which introduced into E.U. law the IASB's materiality concept discussed above.[176]

The purpose of the IAS Regulation was two-fold: impose more consistency in financial reporting by European firms under the Fourth and Seventh Company Law Directives, and provide European companies operating outside the E.U. a U.S. GAAP alternative better suited to their needs and (supposedly) controlled by the E.U. regulator.[177]

B. Directives & Regulations

1. IAS Regulation

Contrary to the Fourth and Seventh Directives, the IAS Regulation theoretically imposed immediate, uniform application in and among all E.U. Member States.[178] The IAS Regulation empowers the European Commission to adopt International Financial Reporting Standards (IFRS) issued by the IASB through a formal endorsement process,[179] and requires E.U. companies traded on regulated E.U. markets to use E.U. IFRS in their consolidated financial statements.[180] Through this so-called "comitology procedure," the European Commission, after consultation

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321(1994) (dividing E.U. Member States into two very distinct groups of accounting tradition, and analyzing the national legal influences on the Seventh Directive).

[172] On the difference between E.U. directives and E.U. regulations *see supra* note 139.

[173] *See* Manish Gupta, *Elan, Enron, and the Aftermath of Scandal: A Comparative Analysis of Recent Irish and American Corporate Governance Legislation*, 39 CAL. W. INT'L L.J. 1, 4 (2008) (citing RALPH H. FOLSOM, PRINCIPLES OF EUROPEAN UNION LAW 30, 31 (2005) and NIGEL FOSTER, FOSTER ON E.U. LAW 90 (2006)). On the drawbacks of the Fourth and Seventh Directive *see generally* Selbach, *supra* note 157, at 550–52.

[174] European Commission, Financial Services Action Plan, COM 232 (1999), http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3Al24210. For a detailed overview of the development of the E.U. policy *see* Schaub, *supra* note 156, at 610–12.

[175] *See supra* note 145.

[176] See *supra* note 126 and accompanying text.

[177] *See* Schaub, *supra* note 156, at 611 (to satisfy the information needs of international investors, big European companies increasingly started to use U.S. Generally Accepted Accounting Practices (GAAP) in addition to their local standards, leading to sometimes conflicting results, high costs, and lack of political influence on the standard setting process by E.U. authorities). The E.U.'s hope to better control IFRS as opposed to U.S. GAAP however seems to have been disappointed. In actual practice the E.U. does not play a role in the IASB standard setting process but is limited to threatening the IASB to not adopt a standard. *See* Hijink, *supra* note 159, at 205.

[178] *See generally* European Commission, Banking and Finance, Regulation on the application of International Financial Reporting, http://ec.europa.eu/finance/company-reporting/ias-regulation/index_en.htm (last visited Feb. 24, 2017).

[179] 6 IAS Regulation 1606/2002, art. 3 (consolidated version) & 11 Council Decision 1999/468/EC, art. 5a(1)-(4) & art. 10 (consolidated version).

[180] *See* European Commission, *supra* note 178; Schaub, *supra* note 156, at 615 (no choice for E.U. issuers between U.S. GAAP and IFRS); Hijink, *supra* note 159, at 203 (describing the endorsement mechanism). In 2001 the International Accounting Standards Committee (IASC) was replaced by the IASB. While the IASC's standards were called IASs, the IASB's standards are now called IFRSs.

with advisory organizations,[181] can adopt individual standards issued by the IASB if the standards satisfy the "true and fair view" principle,[182] "are conducive to the European public good, and meet the criteria of understandability, relevance, reliability and comparability required . . . for making economic decisions and assessing the stewardship of management."[183] Unless the European Parliament or Council objects, the adopted IFRS become E.U. law upon publication in the Official Journal of the E.U.[184]

The IAS regulation has been criticized by members of the European accounting and legal communities because of the "strong Anglo-Saxon orientation of the IASB,"[185] whose asset-valuation approach is at odds with the accounting traditions of many continental European Member States.[186] In countries such as Germany or France, accounting has traditionally focused on creditor rather than investor protection[187] leading to "prudent" accounting, on the one hand, and limited dividend distribution and disclosure obligations on the other.[188] Additionally, in German law, financial reports are disclosures but historically have also served as a basis for dividend distribution and taxation. For these reasons, confidentiality and reliability of information in the contractual relationship has long been regarded as more important than disclosure to the capital markets,[189] in what has been labeled the German "insider" economy due to the close relationship between German companies and their creditors.[190]

In the legal academic debate, constitutional concerns have been raised about the IAS endorsement procedure. The European Parliament itself in a 2008 Resolution has questioned the legitimacy of the adoption process.[191] According to this criticism, despite adoption through the democratically legitimized European regulator, the underlying drafter of the IFRS remains the

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[181] *See* IAS Regulation, art. 6 (2). As advisory body serves in particular the Accounting Regulatory Committee (ARC) and European Financial Reporting Advisory Group (EFRAG).

[182] *See* IAS Regulation, art. 3 (2) (referencing the principle of "a true and fair view" "set out in article 2(3) of Directive 78/660/EEC and in article 16(3) of Directive 83/349/EEC").

[183] IAS Regulation, art. 3 (2).

[184] So-called "regulatory procedure with scrutiny"; the Lisbon Treaty from 2007 has introduced new comitology procedures (delegated and implementing acts), however these new procedures do not (yet) apply in the area of accounting, The Basis of the Endorsement Procedure for IFRS Accounting Standards 5, EUROPEAN PARLIAMENT, ECONOMIC AND MONETARY AFFAIRS, http://www.europarl.europa.E.U./RegData/etudes/BRIE/2016/578988/IPOL_BRI(2016)578988_EN.pdf. The European Parliament's right to object to the Commission's decision to adopt an IFRS was added in 2006 through Council Decision 2006/512/EC, O.J. (L 200) amending Decision 1999/468/EC; *contra* Schaub, *supra* note 156, at 615–16 (describing the process prior to 2006).

[185] Hijink, *supra* note 159, at 203.

[186] *See id.*

[187] *See* Gelter & Eroglu, *supra* note 161, at 138–47 (comparing U.S. and continental European objectives of accounting).

[188] *See* Hijink, *supra* note 159, at 203 (contrasting the future orientation of the Anglo-Saxon accounting tradition to an orientation to past performance in continental European accounting law).

[189] *See* Fülbier & Klein, *supra* note 154, at 14–15. On the reliability aspect, see *id*. at 12 (citing accounting research "arguing that contracting information should be "hard" and "difficult for people to disagree").

[190] Volmer et al., *supra* note 152, at 44 (referring to the "German insider economy" and pointing to the connection between tax and accounting law in Germany).

[191] Resolution of the European Parliament of Apr. 24, 2008 on international financial reporting standards (lFRS) and the governance of the International Accounting Standards Board (IASB) (2006/2248 (IN!); P6_TA (2008) 0183. *See* Hijink, *supra* note 159, at 204–06.

IASB – a private standard-setting body – over which the European Commission exercises little influence.[192]

While concerns about democratic legitimacy of accounting standards have been raised in the U.S., their private origin is particularly problematic in certain E.U. Member States where, prior to the introduction of IFRS, accounting rules were enacted through national statutes that remain in force alongside IFRS for the national context.[193] Another concern of the legal community is the vagueness and volatility of the rapidly changing IFRS,[194] as well as its relatively weak enforcement system,[195] which invite European commentators to question whether the adopted standards actually qualify as law.[196]

The democratic legitimacy of IFRS becomes particularly relevant with regard to materiality. European Commission adoption of IFRS[197] makes the IASB's definition of materiality[198] binding law in E.U. Member States, implying that it is also a basis for civil and criminal liability under the domestic laws of E.U. Member States, as far as they rely on materiality. It further implies that the European Court of Justice is competent to interpret IFRS materiality as part of E.U. law.[199] Thus, the Commission's endorsement of IFRS and the European Court of Justice's interpretive competence together suggest that the IFRS definition of materiality is shared across E.U. Member States and across legal and accounting environments. However, to our knowledge,

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[192] *See generally* Maystadt, *Should IFRS standards be more "European"?: Mission to reinforce the E.U.'s contribution to the development of international accounting standards* (2013), http://ec.europa.E.U./internal_market/accounting/docs/governance/reform/131112_report_en.pdf (suggesting to restructure EFRAG to enhance its legitimacy and role). *See also* Gelter & Eroglu, *supra* note 161, at 109–14 (retracing constitutional arguments against the adoption of IFRS in the E.U. and U.S.); Hijink, *supra* note 159, at 205 (arguing that the European Commission's influence is basically limited to threatening the IASB not to adopt a standard).

[193] *See* Gelter & Eroglu, *supra* note *161* at 109-114, 137–38 (referencing French and German accounting law). *See also* Burmeister & Velte, *supra* note 22 (comparing materiality in German accounting law to IFRS and U.S. GAAP).

[194] *See* Hijink, *supra* note 159, at 204 (to be qualified as law "rules must be clear, consistent, and relatively stable"). Other commentary suggest that flexibility is one of the advantages of the IAS regulation. *See* Selbach, *supra* note 157, at 550 (stating that "[A]ccounting practice needs to respond rapidly to changing needs and circumstances").

[195] *See supra* note 159 and accompanying text.

[196] *See* Hijink *supra* note 159, at 204–05 (critiquing the qualification of adopted IFRS as European accounting law).

[197] Regulation 1274/2008 O.J. (L 339/3), at 5 (adopting IAS 1, inter alia, as E.U. law).

[198] Under IAS 1, para. 7 omissions or misstatements

> . . . are material if they could, individually or collectively, influence the economic decisions that users make on the basis of the financial statements. Materiality depends on the size and nature of the omission or misstatement judged in the surrounding circumstances. The size or nature of the item, or a combination of both, could be the determining factor.
>
> Assessing whether an omission or misstatement could influence economic decisions of users, and so be material, requires consideration of the characteristics of those users. The *Framework for the Preparation and Presentation of Financial Statements* states . . . that 'users are assumed to have a reasonable knowledge of business and economic activities and accounting and a willingness to study the information with reasonable diligence.' . . .

[199] EEC, art. 267. According to E.U. law, the highest national courts of E.U. Member States, in case of uncertainty about the interpretation of a legal term originating in E.U. law, are obliged to defer to the European Court of Justice for clarifying its meaning. This procedure is supposed to secure uniform application of E.U. law in all Member States. *See* Hijink *supra* note 159, at 206 (discussing the role of the European Court of Justice for the interpretation of IFRS).

no case has been referred to the ECJ for guidance on the meaning of materiality under the IAS Regulation, even though IAS 1 offers room for interpretation similar to that of *TSC-Basic*.

European commentators have observed that accounting laws in general have not been subject to many ECJ decisions, suggesting that the ECJ's role in interpreting IFRS may be limited.[200] Some suggest that ECJ guidance on IFRS might even be undesirable as it would create a specific, legally binding European interpretation of standards within the international IFRS system, which might be objectionable to the IASB.[201] Nevertheless, the European Commission acknowledges the ECJ's authority[202] and the ECJ has provided some guidance on materiality in the context of Directive 2003/6/EC (Market Abuse Directive)[203] discussed below.

In German legal commentary, IAS 1's vague materiality definition and IFRS volatility are seen by some as problematic, especially in the context of criminal liability under the German Commercial Code.[204] According to the constitutionally guaranteed principle of legal certainty in German law "[a]n act may be punished only if it was defined by a law as a criminal offence before the act was committed."[205] In this context, the term "user" in IAS 1[206] has been criticized as insufficiently defined under Article 103 § 2 GG.[207] Furthermore, the *Framework* on which IAS 1 is based[208] is an IASB-authored guidance document and, therefore, even more lacking in legitimacy than the E.U.-endorsed IFRS themselves. Another critique is that IAS 1 leaves financial materiality to "generally prevailing opinion,"[209] which is almost impossible to determine because not all users are alike, especially in the international IFRS context.[210] Therefore, the German academic literature, in stark contrast to some of the U.S. decisions summarized above, acknowledges that, due to the principle of legal certainty, a false statement or omission of material facts can lead to criminal liability only if the mistake or omission is not only material but strikingly misleading.[211]

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[200] *See* Hijink, *supra* note 159, at 207 (citing P.M. van der Zanden, *Toezicht op toepassing van verslaggevingsregels*, in JAARREKENINGENRECHT, PREADVIES VAN DE VEREENIGING HANDELSRECHT 111 (2003) (Ger.)).

[201] Hijink, *supra* note 159, at 207 and Buck, JZ 2004, 883, 888 (arguing that as long as IASB has provided guidance on a standard, the ECJ should not be competent to decide on the interpretation of a standard).

[202] *See* ANDRÉ JAQCUES DICKEN & MARTIN HENSSLER, BILANZRECHT 918 (2015) (arguing that despite their international origin, adopted IFRS are actionable before domestic and European courts). *See also* Möllers & Steinberger, *supra* note 163, at 334 (arguing for the ECJ's competence to interpret indeterminate terms in the E.U. Prospectus Regulation).

[203] Directive 2003/6/EC O.J. (L 339/70) [hereinafter Market Abuse Directive]. The Directive has been replaced by the 2014 MAR, which will be discussed in detail in Part III. B. 3.

[204] Officers or directors of German companies are punishable by up to three years imprisonment or a fine for false financial statements. §331 HBG. For German companies subject to IFRS reporting, IFRS determines under which conditions a statement will be considered false, including IFRS materiality standards. § 315(a) HGB. *See generally* Sorgenfrei, *supra* note 158, at 71-72.

[205] Article 103 § 2 GRUNDGESETZ BASIC LAW], *translation at* https://www.gesetze-im-internet.de/englisch_gg/englisch_gg.html#p0568 (Ger.) [hereinafter "GG"].

[206] *See supra* note 183 (block-quoting IAS 1, para. 7).

[207] *See* Sorgenfrei, *supra* note 158, at 72; BGH 6.11.2003 – 1 StR 24 /03.

[208] IAS 1, para. 7.

[209] In German, "allgemeine Verkehrsanschauung."

[210] *See* Sorgenfrei, *supra* note 158, at 72 (with references).

[211] *Id.*

2. Prospectus and Transparency Directives

In connection with its Financial Services Action Plan, the E.U. also enacted the Prospectus[212] and Transparency directives.[213] The Transparency Directive purportedly regulates disclosures about securities already traded in a Member State.[214] Oddly, however, except for payments to governments,[215] it does not define or use the term materiality. By contrast, the Prospectus Directive, currently under review by the European Commission,[216] prescribes a "single passport" prospectus permitting seamless trading across the E.U. after home state approval[217] and illuminates materiality somewhat. Under Article 5 (1), each prospectus must

> contain all information which, according to the particular nature of the issuer and of the securities offered . . . is *necessary* to enable investors to make an informed assessment of the assets and liabilities, financial position, profit and losses, and prospects of the issuer . . . and of the rights attaching to such securities. . . [emphasis added]

Notably, Article 5 does not employ the term "material" even though it appears multiple times elsewhere in the Directive. This raises the question whether the Directive intentionally distinguishes "material" from "necessary." The Directive provides no further guidance on either term and, to date, the question has not been presented to the ECJ.

While the ECJ has not interpreted this aspect of the Prospectus Directive, domestic courts in the E.U. have determined the materiality of omissions from prospectuses, although these decisions predate the Directive. For example, the highest German Court in civil matters, the Bundesgerichtshof [hereinafter BGH], in a case alleging the non-disclosure of financial risks related to contractual terms between a German holding company and its subsidiary, defined material information as information that an investor is "more likely than not" to take into account when making an investment decision.[218] It is doubtful that this interpretation of materiality still holds under Prospectus Directive Article 5, as "necessary" implies that an investor *would* rely on the information rather than merely being "more likely to rely on it than not."[219] In future cases,

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[212] *See supra* note 141.
[213] *See supra* note 147.
[214] Transparency Directive, art. 1 (1).
[215] *See supra* note 147 and accompanying text.
[216] *See Proposal for a Regulation of the European Parliament and the Council on the Prospectus to be published when Securities are offered to the Public or admitted to trading*, EUROPEAN COMMISSION: BANKING AND FINANCE (11/30/2015), http://ec.europa.E.U./finance/securities/prospectus/index_en.htm.
[217] Prospectus Directive, art. 11(1). *See also The E.U. Prospectus Directive– Home Member State for Non-E.U.-Issuers*, SHEARMAN & STERLING LLP, Nov. 2003, at 1–2, http://www.shearman.com/~/media/Files/NewsInsights/Publications/2003/11/The-E.U.-Prospectus-Directive-Home-Member-State-fo__/Files/Download-PDF-The-E.U.-Prospectus-Directive-Home-Me__/FileAttachment/CM_1103.pdf (explaining the concept of Home Member State principle and its consequences for non-E.U. issuers).
[218] BGH, XI ZR 344/11 (Sept. 18, 2013) at 24, http://juris.bundesgerichtshof.de/cgi-bin/rechtsprechung/document.py?Gericht=bgh&Art=en&Datum=Aktuell&nr=61594&linked=pm.
[219] *See* The Free Dictionary, http://www.thefreedictionary.com/necessary (defining necessary as "needed or required"). *See also* John L. Murray, *Methods of Interpretation – Comparative Law Method*, Actes du colloque pour le cinquantième anniversaire des Traités de Rome 39, http://curia.europa.E.U./common/dpi/col_murray.pdf (last visited Feb. 22, 2017) (stating that "the literal, teleological and comparative law methods comprise a primary group of" legal interpretation methods).

domestic European courts will hopefully refer this question to the ECJ for European interpretation and elaboration.[220]

The question of investor characteristics is also raised by the cited BGH decision and Prospective Directive. The Directive clearly differentiates between "qualified" and other investors. Issuers are not required to publish a prospectus if the securities are offered solely to qualified (i.e., professional or institutional) investors,[221] but "ordinary" investors are undefined, leaving this task to the courts.[222]

In this regard, German jurisprudence and academic literature are inconsistent, much like U.S. counterparts. Ordinary investor ranges from the "average" investor, who according to the BGH is able to read and understand a balance sheet, but does not need to understand technical financial terms, [223] to an informed investor who has a basic prior knowledge and minimum understanding,[224] to small individual investors without any access to information outside of what is presented in the prospectus in cases, where the issuer targets such investors.[225] However, these country-specific German conceptions all predate the Prospectus Directive's entry into force. Any future materiality model must define "investor" in a manner consistent with the Directive.[226] As the Directive does not explicitly define the term, courts must interpret it using E.U. methods of interpretation whose detailed examination and application is beyond our scope.[227]

One possible interpretation in light of the Directive is based on the methods typically used by the ECJ to interpret ambiguous terms in EU law[228] such as linguistic (or semiotic), systemic (or contextual), and dynamic interpretation.[229] As to the intellectual capabilities that can be expected from other than "qualified" investors,[230] the Directive is inconclusive.[231] On the one hand, the Directive allows for the prospectus to contain technical elements such as balance sheets that draw upon IFRS. In addition, the prospectus can be issued in a foreign language "customary in

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[220] On the obligation of domestic courts to refer to the ECJ for preliminary rulings and the procedure in general, see Giulio Itzcovich, *The Interpretation of Community Law by the European Court of Justice*, 10 GER. L. J. 537, 545 (2009); Möllers & Steinberger, *supra* note 163, at 329, 334 (discussing the ECJ's competence to rule on the interpretation of Prospectus Directive, arts. 5 and 6 in connection with *Deutsche Telekom*, *supra* note 163).

[221] Prospectus Directive, art. 3 (2) (a).

[222] Prospectus Directive, art. 2 (1) (e).

[223] *See* BGH, *Beton- und Monierbau AG*, NEUE JURISTISCHE WOCHENSCHRIFT 2823, 2824 (1982).

[224] *See* references in Möllers & Steinberger, *supra* note 142, at 331 (designating this view as the current opinion in the German academic literature).

[225] Referred to as "Kleinanleger" in German jurisprudence and commentary. *See* Möllers & Steinberger, *supra* note 163, at 331.

[226] Case C-106/89, *Marleasing v. Comercial Internacional de Alimentación*, 1990 E.C.R. I-4135 and Case C-14/83, *Von Colson and Kamann v. Land Nordrhein - Westfalen*, 1984 E.C.R. 1891 (requiring national courts to interpret their domestic law "as far as possible in the light of the wording and purpose of the directive"). *See also* Möllers & Steinberger, *supra* note 163, at 331 (discussing *Deutsche Telekom*).

[227] For extensive discussion of the topic, see Itzcovich, *supra* note 220.

[228] It should be noted that due to its autonomous nature, community law interpretation (i.e., of laws and regulations issued by one of the E.U. institutions), does not follow the same interpretative methods as international law or treaty interpretation. *See* Itzcovich, *supra* note 220, at 557 (finding that "the dynamic criteria of interpretation, i.e. by arguments based on consequences, purposes and efficiency," is the prevalent method used by the ECJ).

[229] *See* Itzcovich, *supra* note 220, at 549–57 (providing a detailed explanation of the Court's interpretative methods). *See also id*. at 538 (stating that "the interpretative criteria and, more generally, the legal argumentation techniques of the ECJ are essentially the same ones which are familiar to the national legal contexts," as the European justices have been trained in those national methods).

[230] The Prospective Directive excludes "qualified" (i.e. professional) investors from its scope. *See supra* note 221 and accompanying text.

[231] The following suggestions build on Möllers & Steinberger, *supra* note 163, at 332 –33.

the sphere of international finance,"[232] which suggests that some technical knowledge can be expected from the investor. On the other hand, the Directive specifically distinguishes between the body of the prospectus and the required accompanying summary that:

> […] in a concise manner and in non-technical language, provides key information in the language in which the prospectus was originally drawn up. The format and content of the summary of the prospectus shall provide . . . appropriate information about essential elements of the securities concerned in order to aid investors when considering whether to invest . . .[233]

Conversely, this wording suggests that only the summary, but not the prospectus in general, needs to be written in a "non-technical language." Accordingly, it may be said that investors are expected to be able to read a balance sheet in English (as the language of international finance) and, while not experts, have the basic technical knowledge required to evaluate the prospectus in its entirety.[234]

3. Market Abuse Regulation

Arguably the most detailed E.U. guidance on materiality is in the Market Abuse Regulation [hereinafter MAR],[235] effective in all E.U. member states as of July 3, 2016. The MAR updates and replaces the 2003 Market Abuse Directive,[236] and targets market abuse in financial, commodity, and related derivative markets, while reducing paperwork for smaller businesses.[237]

Article 17(1) MAR requires "as soon as possible" publication by issuers of "inside information,"[238] which Article 7 defines as "information of a *precise nature*" not previously published "relating, directly or indirectly to one or more issuers" that if "made public would be likely to have a significant effect on the prices of related financial instruments or their derivatives [emphasis added],"[239] where "information . . . likely to have a significant effect on the prices of financial instruments . . . mean[s] information a reasonable investor would be likely to use as part of the basis of his or her investment decisions."[240] MAR harmonizes insider

[232] Prospectus Directive, art. 19(2): "Where an offer to the public is made or admission to trading on a regulated market is sought in one or more Member States excluding the home Member State, the prospectus shall be drawn up either in a language accepted by the competent authorities of those Member States or in a language customary in the sphere of international finance."
[233] Prospectus Directive, art. 5(2).
[234] The latter follows from article 6(2)(2): ["…] no civil liability shall attach to any person solely on the basis of the summary, including any translation thereof, unless it is misleading, inaccurate or inconsistent, when read together with the other parts of the prospectus, or it does not provide, when read together with the other parts of the prospectus, key information in order to aid investors when considering whether to invest in such securities."
[235] *See supra* note 143.
[236] *See supra* note 203.
[237] *Preventing market abuse in financial markets*, Summaries of E.U. legislation, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=URISERV%3A240404_2 (last visited Feb. 22, 2017).
[238] MAR, art. 17, requires that inside information be published quickly and completely and that it be kept on the issuer's website for at least five years. The MAR is supported by a new Directive on criminal sanctions for market abuses, Directive 2014/57/E.U. O.J. (L 173/179).
[239] MAR, art. 7 (1)(a) uses the Market Abuse Directive's definition of "inside information."
[240] MAR, art. 7(4).

trading and disclosure obligations under art. 17 in order to minimize delimitation problems in practice.[241] Article 7(2) further elaborates that information is sufficiently "precise" if:

> [i]t indicates a set of circumstances which exists or which may reasonably be expected to come into existence, or an event which has occurred or which may reasonably be expected to occur, where it is specific enough to enable a conclusion to be drawn as to the possible effect of that set of circumstances or event on the prices of the financial instruments or [derivatives] . . . [or] a protracted process that is intended to bring about, or that results [in such circumstances or event] and also the intermediate steps of that process. . .

In other words, on-going merger negotiations like those in *Basic* can be sufficiently precise to constitute "inside" or material information. As an indication of the quasi-legislative power of the ECJ, this "protracted process" language was lifted from an ECJ decision in a case alleging that DaimlerChrysler AG misled investors by delaying announcement of then CEO Jürgen Schrempp's impending resignation, at the end of July 2005, after a protracted series of discussions that began in early April.[242] The German BGH in a preliminary ruling procedure[243] had asked the ECJ whether, under Article 1(1) of Directive 2003/124, (1) protracted processes (e.g., extended resignation discussions) intended to bring about some possible future circumstance or event (e.g., the CEO's resignation) and intermediate steps in such processes are precise information,[244] and (2) the magnitude of the event's effect on the prices should be considered when evaluating its precise nature.[245] The Court answered "yes" and "yes" to question (1), as now reflected in the MAR.[246] On question (2) the Court decided that information about future circumstances or events is precise, and therefore needs to be disclosed, if "on the basis of an overall assessment of the factors existing at the relevant time," there is a "realistic prospect" that they will occur.[247]

The ECJ thus marked a probabilistic threshold for precise information about future events: circumstances or events that are unlikely to materialize are not precise, but precision requires only a realistic prospect, not high probability.[248] The Court further clarified—and the MAR echoes this interpretation—that the magnitude of the impact of the event on share price is irrelevant to precision.[249] In other words, unlikely future events require no disclosure no matter what their magnitude.

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[241] *See* Petra R. Mennike & Niko Jakovou, in WERTPAPIERHANDELSGESETZ KOMMENTAR 401 (Andreas Fuchs ed., 2016) (Ger.) (describing this choice as rejection of the UK "RINGA" concept, which stands for "relevant information not generally available" and suggests to outlaw insider dealings based on RINGA, while not requiring companies to disclose this type of information).

[242] ECJ C-19/11 (Daimler) 12-17.

[243] *See* EEC, art. 267.

[244] *Id*. at 23 and 27.

[245] *Id.* at 23 and 41.

[246] MAR, art. 7(2).

[247] ECJ C-19/11 (Daimler) at 56. The reasoning of the Court is now reflected in Recital 16 to the preamble of the MAR.

[248] *See* Mennike & Jakovou, supra note 241, at 424 (setting the probability of the occurrence of the circumstances/event in question at 50+ %).

[249] *See* ECJ C-19/11 at 50-56 and reflected in Recital 16 MAR (rejecting so-called "probability/magnitude test," advocated by the Advocate General. *See* Opinion of Mr Advocate General Mengozzi (March 12, 2012), http://curia.europa.E.U./juris/celex.jsf?celex=62011CC0019&lang1=de&type=TXT&ancre=.

The MAR, therefore, reflects a two-step procedure for determining materiality. Step 1 asks if the information is precise which, for protracted processes leading to future events, requires a "realistic prospect" that the event will occur. Step 2 asks whether the information is "likely to have a significant effect on the price of the financial instrument."[250] To determine whether the information is likely to have a significant effect on price, the MAR adopts the perspective of the reasonable investor.[251]

Finally, the MAR clarifies that disclosure requirements should be based on information available *ex ante*, not retrospectively.[252] These specifications, though they primarily concern specific disclosure obligations under the MAR, provide valuable insights into potential interpretation of the materiality principle under E.U. law generally and will be reflected in our unified materiality model in Part V.

4. E.U. Accounting Directive

While the MAR defines "inside information" and proscribes its use in trading, the Accounting Directive[253] regulates the content of financial statements and ongoing disclosures. It combines, synthesizes, and replaces the Fourth and Seventh Directive mentioned above[254] to facilitate cross-border investment and improve comparability and public confidence in financial statements while reducing administrative burdens for companies.[255] The Accounting Directive explicitly introduces materiality into E.U. financial reporting.[256] While the term "material" appeared in many places in the Fourth Directive and was already part of domestic accounting regulation,[257] the Accounting Directive implicitly identifies materiality as a general principle of European financial reporting[258] and stresses its increasing importance to financial disclosures of European companies as European law shifts focus from creditor to investor protection.[259]

Under the Directive, information is material if "its omission or misstatement could reasonably be expected to influence decisions that users make on the basis of the financial statements."[260] "The materiality of individual items shall be assessed in the context of other

[250] *Id.* at 52.

[251] MAR, art. 7 (4) stipulates: "[I]nformation which, if it were made public, would be likely to have a significant effect on the prices of financial instruments . . . shall mean information a reasonable investor would be likely to use as part of the basis of his or her investment decisions."

[252] Market Abuse Directive, Recital 14. Recital 15 further specifies that while "*Ex post* information can be used to check the presumption that the *ex ante* information was price sensitive, [it] should not be used to take action against persons who drew reasonable conclusions from *ex ante* information."

[253] *See supra* note 7.

[254] *See supra* notes 167-168 and accompanying text.

[255] Recital 3, 4 and 55 of the preamble to the Directive and art. 1 and 2.

[256] *See* Velte, *supra* note 166, at 143 (pointing to questions of interpretation that materiality raises).

[257] In German law materiality has been regarded as part of the fairness element in the principle of "true and fair view." *See id.*; Wolfgang Ossadnik, *Wesentlichkeit als Bestimmungsfaktor für Angabepflichten in Jahresabschluß und Lagebericht*, Betriebsberater 1763, 1763 (1993) (stating that the BiRiG transposes the "true-and-fair view" principle as codified in Fourth E.U. Accounting Directive, art. 4 into § 264 (2) HGB and thereby elevates it to a fundamental accounting principle for listed German companies).

[258] "The requirements set out in this Directive regarding recognition, measurement, presentation, disclosure and consolidation need not be complied with when the effect of complying with them is immaterial." Accounting Directive, art. 6 (j).

[259] *See* Velte, *supra* note 166, at 143 (pointing towards the comparative unimportance of materiality in more creditor-oriented jurisdictions).

[260] Accounting Directive, art. 2 (16).

similar items."[261] This definition, which E.U. members are required to transpose into domestic law, still leaves the field wide open for interpretation but can be said to emphasize user expectations.[262] Recital 17, which courts will typically use for the term's interpretation,[263] provides some further guidance, stating that

> [T]he principle of materiality should govern recognition, measurement, presentation, disclosure and consolidation in financial statements. According to the principle of materiality, information that is considered immaterial may, for instance, be aggregated in the financial statements. However, while a single item might be considered to be immaterial, immaterial items of a similar nature might be considered material when taken as a whole . . .

These explanations still do not resolve many of the questions that are at the center of the international materiality debate. They do not define "user" or what information can be reasonably expected to influence user decisions. Thus, European domestic courts and the European Court of Justice must ultimately clarify the principle's meaning.[264] Because the Directive's transposition into national law is relatively recent—the transposal deadline was July 20, 2015 and the transposed provisions were first applicable to financial statements issued during calendar 2016—no case has yet been presented to the ECJ. However, the ECJ's potential to harmonize materiality should not be overestimated. First, the ECJ's historical involvement with accounting law has been inconspicuous.[265] Second, according to recital 41 in the preamble to the Directive, a company's liability for non-disclosure of or false presentation of material financial information continues to be governed by national laws, which might hinder a homogenous European interpretation of materiality.[266] In sum, our analysis of the E.U. regulatory framework and U.S. case law, as well as the advent of "big data" and increasing integration of capital

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[261] *Id.*

[262] Implementation by Member States has been varied. The German transposition, for example, does not repeat the Accounting Directive's definition of materiality. The German legislator believed that a sufficient transposition and definition of materiality is implicit in the German principle of proper bookkeeping *Grundsatz ordungsgemaeßer Buchführung* [hereinafter GoB], which provides underlying accounting principles in Germany. In fact, as part of the GoB, "materiality" has always been a *Grundnorm* of German financial reporting. Earlier scholarship or court decisions dealing with materiality therefore remain relevant, and "materiality" is not interpreted in isolation but dependent on other principles of the GoB which will likely result in unique German interpretation. *See* Wolfgang Hirschberger & Norbert Leuz, *Der Grundsatz der Wesentlichkeit bei der Jahresabschlusserstellung*, DER BETRIEB 2529 (2012) (Ger.) (stating that the transposition of the E.U. Directive' s principle of materiality in German law has only clarifying meaning since it has always been part of the GoB). *See also* Müller-Burmeister & Velte, *supra* note 22, at 233–34 (noting that the German legislator purposely did not codify the materiality principle because doing so "would steadily transform the HGB to Anglo-American case law").

[263] *See* Tadas Klimas & Jurate Vaiciukaite, *The Law of Recitals in European Community Legislation*, 15 ILSA J. INT'L & COMP. L. 1, 15–16 (2008), https://ssrn.com/abstract=1159604 (discussing the effect of recitals according to the doctrine of the ECJ).

[264] *See supra* note 199 (discussing the ECJ's competence to interpret IFRS materiality).

[265] *See supra* note 199 and accompanying text.

[266] (41) reads: "[l]iability for drawing up and publishing annual financial statements and consolidated financial statements, as well as management reports and consolidated management reports, is based on national law. Appropriate liability rules, as laid down by each Member State under its national law, should be applicable to members of the administrative, management and supervisory bodies of an undertaking. Member States should be allowed to determine the extent of the liability."

markets and the internet-driven global dissemination of market information,[267] call for a more comprehensive, predictable, and unified materiality model to guide companies' financial disclosure around the world. The following Part suggests such harmonized reformation of materiality through use of Bayesian analysis.

V. TOWARD UNIFIED BAYESIAN ANALYSIS OF MATERIALITY

A. Why Bayes?

The short answer is that Bayesian reasoning—which, as the following sections will show, operates seamlessly within the *TSC-Basic* materiality rubric—is an unparalleled analytical tool to make materiality and related disclosure choices less opaque and more consistent. As is widely discussed in legal evidence scholarship, Bayesian analysis is a structured approach to drawing logical inferences from evidence and probabilistically assessing their uncertainty.[268] Consciously or not, lawyers and judges routinely rely on Bayesian reasoning,[269] the three building blocks of which are *prior* belief or probability, *likelihood* (sometimes called "evidence"), and *posterior* probability.[270]

Under the probabilistic *TSC-Basic* materiality rubric, an omitted fact (or, by extension, a misrepresented one) is material when, under all the circumstances, there is a substantial likelihood that a reasonable investor would view the omitted fact as significantly altering the "total mix of information" available about the security.[271] In Bayesian terms, the initial total mix of information supports the reasonable investor's *prior probability*, while the omitted or misstated fact is new evidence supporting the *likelihood*. The combination of the initial total mix (the prior) with the new evidence (the likelihood) produces a *posterior probability*, which, in turn, supports a binary (yes/no) conclusion on materiality. Thus, the infrastructure of materiality as articulated by the U.S. Supreme Court in *TSC* and *Basic* is a natural, implicit expression of Bayesian reasoning. So was the Court's reliance on sources of information beyond frequentist statistics in *Matrixx*[272] and the ECJ's ruling on protracted processes.[273] We believe that making materiality's Bayesian infrastructure explicit will improve judicial compliance and predictability for the benefit of related decision-making by investors, firms, external auditors, regulators, courts, and counsel worldwide.

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[267] *See* Kara M. Stein, SEC Commissioner, A Vision for Data at the SEC, Keynote Address to Big Data in Finance Conference (Oct. 28, 2016), https://www.sec.gov/news/speech/speech-stein-10-28-2016.html (citing recent "astounding growth" in the amount of data available in calling for creation of an SEC Digital Disclosure Task Force and Office of Data Strategy); SEC Concept Release at 306 (requesting comment on how SEC disclosure rules should change in response recent dramatic increases in Internet access and investor reliance on the Internet sources for investment information).

[268] *See, e.g.*, Fenton et al., *supra* note 20 at 58-63 (contextualizing Bayesian reasoning and illustrating its use in legal settings); Fienberg and Schervish, *supra* note 18, at 794 (Bayesian inference "provides a normative approach to legal decisionmaking"); Kaye 1988 at 161 (placing Bayes' Rule in the legal context and documenting its use for trial preparation and admissible evidence in U.S. and non-U.S. cases).

[269] *See, e.g.*, RICHARD A. POSNER, HOW JUDGES THINK 67 (2008) (asserting that judges utilize Bayesian reasoning).

[270] *See* Kaye 1988 at 170–73.

[271] The Supreme Court has not explicitly defined "substantial likelihood," "reasonable investor," "significantly altering," or "total mix." These are discussed in more detail in Part V.

[272] *See supra* note 83 and accompanying text (discussing the *Matrixx* Court's rejection of empirical research and reliance on anecdotal adverse event reports).

[273] *See supra* notes 242-252 and accompanying text.

Choosing Bayes as the legal habitat for materiality is further supported by the prominence of Bayesian thought in U.S. evidence scholarship, its hand-in-glove fit with Federal Rules of Evidence 401,[274] its detailed and approving treatment in the Federal Judicial Center's Reference Manual on Scientific Evidence,[275] and its international courtroom appeal.[276] One of its greatest strengths is evidentiary versatility and ecumenism. Fenton calls Bayesian reasoning the "perfect formalism" for probabilistically combining "different pieces of (possibly competing) evidence" about legal hypotheses),[277] while Nance and Morris laud its ability to incorporate both quantitative or non-quantitative evidence.[278] Beyond mere desirability, Bayesian reasoning may be necessary to the avoidance of fallacies that often appear in litigation generally[279] and, we suggest more specifically, in the definition and application of materiality.

The proposed Bayesian framework, which is largely consistent with U.S. and E.U. norms, should be equally useful in and out of court, encouraging structured consideration and balancing of all relevant factors while enabling broad parameters or confidence intervals to guide materiality assessments, where desired. The following sections explain how the Bayesian concept of *conditional probability* can aid the substantive evaluation of materiality under US and E.U. law, summarize the proposed Bayesian materiality framework, and demonstrate its modeling implementation.

B. Bayesian Materiality Framework

1. Bayes' Rule

Bayes' Theorem (or Rule), which takes its name from the Reverend Thomas Bayes,[280] rests on the concept of *conditional probability*. This is to say, an observer's belief in (probability of)

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[274] Under Rule 401, evidence is relevant if it has "any tendency to make a [consequential] fact *more or less probable* than it would be without the evidence" (emphasis added). FED. R. EVID. 401. Thus, as discussed further below, Rule 401 describes Bayesian belief updating based on new evidence.

[275] *See, e.g.*, REFERENCE MANUAL ON SCIENTIFIC EVIDENCE at 707-14 (explaining that Bayesian analysis combines "existing evidence or a prior belief with additional evidence," which "may be the presence or absence of a symptom, sign, test, or research study results," and illustrating use of Bayes' Rule to diagnose breast cancer). *But see* Executive Office of the President, President's Council of Advisors on Science and Technology, REPORT TO THE PRESIDENT: FORENSIC SCIENCE IN CRIMINAL COURTS: ENSURING SCIENTIFIC VALIDITY OF FEATURE-COMPARISON METHODS 153-54 (Sept. 2016), https://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf (arguing that Bayesian analysis "poses challenges for use in court" because priors may vary among jurors who may also misunderstand the impact of priors on posterior probabilities).

[276] *See, e.g.*, Fenton et al., *supra* note 20 at 60 (citing the courtroom use of Bayesian analysis in the United States, United Kingdom, New Zealand, Australia, Netherlands, Slovenia, and Switzerland). *But see id*. at 60-63 (describing two U.K. cases in which ineffective experts discredited trial use of Bayes Rule). Fenton and Neil are directors of Agena Ltd. that sells Bayesian network software. *Id*. at 73.

[277] Fenton et al., *supra* note 20, at 62.

[278] *See* Dale A. Nance and Scott B. Morris, *An Empirical Assessment of Presentation Formats for Trace Evidence with a Relatively Large and Quantifiable Random Match Probability*, 42 JURIMETRICS J. 403, 405 (2002) (Bayesian analysis is "valid for all types of evidence," including non-scientific and non-quantitative evidence).

[279] *See, e.g.*, Fenton et al., *supra* note 20, at 70 (string-citing support for this proposition). *See also, generally*, Norman Fenton & Martin Neil, *Avoiding Probabilistic Reasoning Fallacies in Legal Practice using Bayesian Networks*, 26 AUSTL. J. OF LEGAL PHIL. 114 (2011).

[280] *See* SHARON BERTSCH MCGRAYNE, THE THEORY THAT WOULD NOT DIE: HOW BAYES' RULE CRACKED THE ENIGMA CODE, HUNTED DOWN RUSSIAN SUBMARINES, & EMERGED TRIUMPHANT FROM TWO CENTURIES OF CONTROVERSY at 3-33 (discussing the development of Bayes' Theorem); DAVID SALSBURG, THE LADY TASTING

one event may be affected by ("conditioned on") the probability of another event. Investors intuitively rely on conditional probability in making investment decisions, as do courts in deciding factual questions.[281] For example, an investor's belief (probability) that Basic, Inc.'s share price will rise (and, therefore, is currently too low), may be conditioned on her belief (probability) that the board of directors is currently negotiating the company's sale at a premium or, alternatively, that *others* will believe that such negotiations are ongoing and will, therefore, bid up the stock price.[282]

A defining characteristic of Bayesian reasoning is probabilistic *belief updating* or *Holmesian deduction*[283] through which *prior* probabilities are refined by successive dispensations of evidence.[284] Combining new evidence with priors iteratively renders some outcomes less plausible and others more probable.[285] At each iteration, the previous posterior becomes the new prior as evidence is layered on.

In the United States, criminal trials are typically governed by the maxim, "innocent until proven guilty." In Bayesian terms, this suggests that before the presentation of evidence the defendant's prior probability of guilt should be equivalent to that of each other member of the population,[286]assuming that a crime has been committed.[287] This prior probability distribution over guilty and not-guilty hypotheses is then updated by evidence adduced at trial which, in order to justify a guilty verdict, must shift the factfinder's posterior probability distribution toward guilt to the point where the guilty hypothesis appears true beyond a reasonable doubt. Evidence with probative value, which FRE 401 defines as "relevant,"[288] moves the mathematical or metaphorical probability needle; the verdict depends on where the needle rests after all of the evidence is in.[289]

In criminal and civil securities cases, a central factual question is the materiality of transaction-related facts or omissions.[290] *TSC-Basic* emphasizes the *total mix of information*,[291] while IAS 1 stipulates that omissions or misstatements are material if *individually or collectively*

TEA 16, 128 (2001) (citing Bayes' Theorem to illustrate "Stigler's law of misonomy" by which no mathematical principle is named for the person who discovers it).

[281] *See, e.g.*, NORMAN FENTON, RISK ASSESSMENT AND DECISION ANALYSIS WITH BAYESIAN NETWORKS 407 (2012) [hereinafter FENTON] (Bayesian belief updating based on evidence is analysis "the central concept of the law"); Fenton et al., *supra* note 20, at 60 (2016).

[282] *See* MAR, art. 7 (1) ("information…relating, directly or indirectly, to one or more issuers…").

[283] The fictional Sherlock Holmes chided his assistant, Dr. Watson, "How often have I said to you that when you have eliminated the impossible, whatever remains, however improbable, must be the truth?" ARTHUR CONAN DOYLE, THE SIGN OF FOUR, Ch. 6 (1890), http://classiclit.about.com/library/bl-etexts/acdoyle/bl-acdoyle-sign-6.htm.

[284] *See* Kaye 1988 at 170 ("Bayesian inference combines sample data with prior information to produce direct probability statements").

[285] POSNER, *supra* note 269, at 68–69.

[286] *See* Kaye 2009 at 480; FENTON at 114-15. Mathematically, a zero prior will always produce a zero posterior because posterior = prior x likelihood. *See* FENTON at 114; Lea Brilmayer & Lewis Kornhauser, *Quantitative Methods and Legal Decisions*, 46 U. CHI. L. REV. 116, 143 (1978) (asserting that calculation of a posterior requires a prior greater than zero).

[287] Criminal conviction requires proof that a crime has been committed *and* that the defendant committed it. Thus, the factfinder must form prior probabilities regarding the crime and the defendant's commission of it but neither of these is required by law to be zero. *See* Kaye 2009 at 480 n. 226.

[288] FED. R. EVID. 401.

[289] *See* Kaye 2009 at 472–73 (equating probability to a physical mass of fixed quantity whose location—over the defendant or not—should determine the verdict).

[290] While it may be called a "mixed question of law and fact," materiality is a question of law only where reasonable minds cannot differ upon it. *TSC Industries*, 426 U.S. at 450 (1976).

[291] *TSC Industries*, 426 U.S. at 449 (1976).

they could influence economic decisions based on the financial statements."[292] Similarly, the Accounting Directive requires the materiality of individual items to be measured *in the context of other similar items*.[293] These "individual items" are material under *TSC-Basic* only if there is a substantial likelihood[294] that they would have been viewed at the time by a reasonable investor as significantly altering the total mix of information previously available about the security in question.[295]

The German view discussed in Part IV further differentiates between civil and criminal cases and may require "striking" significance in criminal cases.[296] E.U. law additionally emphasizes the precision[297] and the "inside" or unpublished status of the information in question.[298] Whatever its details, a Bayesian materiality model should resolve the extent to which the *new evidence* (by correcting misstatements or supplying omitted information) changes the reasonable investor's *posterior* probabilistic evaluation of the security by altering the *prior* total mix.[299] Because judge or jury must decide materiality using only the evidence adduced at trial, *TSC-Basic* requires plaintiff or prosecutor to provide evidence of (a) the *prior* total mix[300] to the jury, as Huang argued,[301] and (b) omissions or misstatements that change the *prior* in arriving at the *posterior*. Thus, the evidence of the prior information mix forms the initial foundation of the Bayesian materiality framework.

With this foundation in mind, a simple Bayes' Rule representation of a hypothetical reasonable investor contemplating the sale of her shares in ABC Corp appears here:[302]

$$p(H_S|E) \propto p(H_S) * p(E|H_S) \qquad \text{(Equation 1)}$$

In plain English, where $p(.)$ denotes the probability of ".", H denotes "hypothesis," and H_S represents the hypothesis that Investor sells the stock (subscript "S"), E represents Investor's knowledge of a misstated or omitted fact (e.g., ongoing merger negotiations auguring higher future share value), and "|" represents "given." With this background, the *posterior* probability, $p(H_S|E)$, that she sells the stock given E is proportional ("$\propto$") to the *prior* probability, $p(H_S)$, that she sells without E (i.e., without information about merger talks) multiplied by the *likelihood* or probability, $p(E|H_S)$, that she knows of the misstatement or omission *given that* she sells the stock. The alternative to H_S, that she does *not* sell the shares, is denoted H_{NS}.[303] The ratio $\frac{p(H_S)}{p(H_{NS})}$ is called the *prior odds ratio* and it reflects the relative probability of the truth of the two competing, mutually exclusive hypotheses (sell/not sell) where Investor is unaware of the merger

[292] IAS 1, para. 7 (emphasis added). *See supra* note 198.
[293] Accounting Directive, art. 2 (16).
[294] *TSC Industries*, 426 U.S. at 450 (1976) ("there *must* be a substantial likelihood . . ." (emphasis added)).
[295] *Id.* at 449.
[296] *See supra* note 211 and accompanying text.
[297] MAR art. 7 (2). *See also supra* notes 246-249 and accompanying text.
[298] *See supra* notes 246-249 and accompanying text.
[299] While *TSC-Basic* and the E.U.'s MAR rely on the "reasonable investor," neither defines the term. By contrast, IAS 1, para. 7 refers to a "user" who must "have a reasonable knowledge of business and economic activities and accounting and a willingness to study the information with reasonable diligence," all of which seems to equate "user" to the AICPA's "reasonable investor." AICPA, AU-C § 320.
[300] *TSC Industries*, 426 U.S. at 450 (1976)).
[301] *See* Huang Memorandum at 1 (arguing that "to prove insider trading, the SEC has the obligation to prove that [the alleged insider information] significantly altered the total mix of information . . . available to investors at the time of the trade").
[302] *See* Kaye 1988 at 172.
[303] The subscripts "S" and "NS" denote, respectively, "sale" and "no sale."

talks. The *posterior* odds ratio, where Investor is aware (*E*), is the product of the prior odds ratio and the likelihood ratio (*LR*), as shown here:[304]

$$\frac{p(H_S|E)}{p(H_{NS}|E)} = \frac{p(H_S)}{p(H_{NS})} * \frac{p(E|H_S)}{p(E|H_{NS})} \qquad \text{(Equation 2)}$$

Thus, with hypothetical prior odds of 1.5 and *LR* of 0.75, the posterior odds—effectively the compromise between prior and *LR* that results from exposing Investor to knowledge of the initially omitted merger talks—equals 1.125.

Where the weight of the new evidence is relatively large in comparison to the prior evidence, the *LR* will exercise greater influence over the posterior probability than will the prior.[305] Recall that under the Bayesian-sounding FRE 401,[306] evidence is relevant (i.e., has probative value) if it has *any tendency* to make a consequential fact *more or less probable*.[307] Only relevant evidence—evidence with probative value—can meet the higher standard of materiality.[308] Here, the consequential fact is Investor's share sale with respect to which the merger talks are by definition relevant because when Investor knows of them (and, therefore, anticipates a short-term increase in share price), her sale of the stock is *less probable* than when she does not know of them.

With regard to materiality, the difference between prior and posterior odds ratios (1.5 vs. 1.125) means that in Investor's mind,[309] the merger talks have altered the total mix of information as expressed in *TSC-Basic*, the Accounting Directive,[310] and the MAR.[311] Consistent with the MAR's two-step process, the only remaining question is the required relative magnitude of the alteration. This must be *substantial* under TSC-Basic, *significant* under MAR,[312] or in criminal cases *striking*, as some German scholars argue.[313] We shall return to this question in Part V.C.[314]

2. Buffet's Factors

Underlying $p(H_S)$ is the prior evidence or "total mix of information," reflected in the MAR as "a set of circumstances,"[315] against which the factfinder must evaluate the misstated fact or omission represented by *E* in $p(H_S|E)$. For modeling purposes, the total mix boils down to a weighted list of factors to be considered in determining materiality. Factors and weights depend

[304] *See* Kaye 1988 at 172. *Accord* Finkelstein & Fairley, *supra* note 17, at 498–500 (deriving Bayes' Rule and offering an evidentiary illustration).
[305] *See id.*
[306] *See supra* note 274 and accompanying text (highlighting the Bayesian sensibility of FED. R. EVID. 401).
[307] *See* Kaye 2009 at 478 (equating probative value to a shift in the odds).
[308] FED. R. EVID. 401 sets the threshold relevance requirement for admission of evidence. Evidence cannot be material if not first relevant. FRE 401's structure and logic are essentially Bayesian. *See supra* note 274 and accompanying text.
[309] In this scenario, Investor represents the hypothetical reasonable investor and, therefore, the focus is objective reasonableness, not subjective reasonableness. The extent to which the materiality inquiry should be tailored to individual circumstances is fairly debatable.
[310] Accounting Directive, art. 2 (16) ("[t] he materiality of individual items shall be assessed in the context of other similar items").
[311] MAR, art. 7 (1) (a) ("likely to have a significant effect").
[312] *Id.*
[313] *See* Sorgenfrei, *supra* note 158, at 72.
[314] *See infra* notes 340, 345, 357 and accompanying text.
[315] MAR, art. 7 (2).

on how reasonable investor and investing philosophy are defined. Various prior mixes are suggested by case law,[316] regulation,[317] academic research,[318] and trade literature.[319] IASB and AICPA standards, E.U. law and jurisprudence, and scholarly commentary agree with *TSC-Basic* that reasonable investors may differ from each other in ways—expertise, rationality, consumption preferences, and risk tolerance—that can impact materiality.[320] What rocks the world of a day-trader (e.g., the market's negative reaction to a white paper that flashes briefly on the website of a Chinese regulator[321]) may have little meaning for an investor focused on a long-term retirement planning.[322] Along these lines, in some cases, lower courts have diverged from *TSC Industries*' reasonable investor rubric, testing materiality and reliance against subjective or actual perceptions[323] sometimes to the disadvantage of plaintiffs more sophisticated than normal or with access to inside information.[324]

For the health and safety of the market as a whole, we believe that regulatory policy should encourage prepared, disciplined investment. To this end, we favor a reasonable investor who, consistent with IASB, AICPA, and E.U. definitions, has "reasonable knowledge of business, economic activities, and accounting and a willingness to study the information in the financial statements with reasonable diligence," while appreciating their inherent uncertainty.[325] This coincides with *TSC-Basic*, which credits the reasonable investor with a level of acumen beyond "child-like simplicity" and "inability to grasp the probabilistic significance of [merger] negotiations."[326] It also converges with our interpretation of the Prospectus Directive that the

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[316] *See, e.g.*, Huang Memorandum at 6 (discussing expert testimony that the total mix should include earnings per share, potential mergers and acquisitions, cash flow, gross margin, new product lines, restructurings, company forecasts, analyst opinions, company filings, and the health of key employees).

[317] *See, e.g.*, Prospectus Directive (citing as factors the nature of the issuer and securities offered, assets and liabilities, financial position, profit and losses, and prospects of the issuer).

[318] *See, e.g.*, Edward Qian et al., *Global Value Investing Delivers Diversification: A Multi-Strategy Perspective*, 35 J. PORTFOLIO MANAGEMENT 42 (2009) (calling "value investing" the "universal centerpiece of modern portfolio management").

[319] *See, e.g.*, Guide to Stock-Picking Strategies, Investopedia, http://www.investopedia.com/university/stockpicking/ (identifying nine distinct investing strategies but cautioning that no failure-proof formula exists); David Larrabee, *A Stock Picker's Recipe for Success* (Dec. 28, 2015), https://blogs.cfainstitute.org/investor/2015/12/28/a-stock-pickers-recipe-for-success/ (citing Chuck Meyers, head of the Fidelity Small Cap Discovery Fund, for using relative valuation, patience, and balance sheet margin of safety as factors).

[320] That the U.S. Supreme Court defines materiality in terms of reasonable investors implies the existence of *unreasonable* ones. Yet, this binary division may be illusory in light of research suggesting that investors are often, if not always, irrational. *See* Michael J. Kaufman, *Behavioral Economics and Investor Protection*, 44 LOY. U. CHI. L. J. 1323 (2013) (arguing that case law is "heavily influenced by the rational choice model of human and market behavior," which research has discredited).

[321] *See supra* note 85 and accompanying text (describing *Alibaba* case facts).

[322] *See* Cremers & Sepe, *supra* note 11, at 110 (discussing the diverging short- and long-term goals and risk preferences among shareholders); Park, *supra* note 5, at 518 (dichotomizing investors as focused on either "persistent" discounted cash flows or emotional "market reaction," implying long- and short-term orientations).

[323] *See, e.g.*, U.S. v. Skilling, 554 F.3d 529; SEC v. Hasho, 784 F. Supp. 1059 (S.D.N.Y. 1992); SEC v. Infinity Group Co., 993 F. Supp. 324, 327–29 (E.D. Pa. 1998), aff'd, 212 F.3d 180 (3d Cir. 2000); and SEC v. George, 426 F.3d 786 (6th Cir. 2005).

[324] *See, e.g.*, Tracinda Corp. v. Daimlerchrysler Ag, 364 F. Supp. 2d 362, 415 (D. Del. 2005) (pointing to the sophistication and insider status of plaintiff Tracinda as a factor in deciding that Tracinda did not *actually* rely on or view as material information about the defendant's plan to eventually transform Chrysler Corp. into a division of Daimler); 502 F. 3d 212, 220–21 (3rd Cir. 2007).

[325] AICPA, AU-C § 320; IAS 1, para.7; MAR, art. 7(4).

[326] *Basic*, 485 U.S. at 234 (quoting *TSC Industries*, 426 U.S. at 448–49).

reasonable investor should be able to read a balance sheet and know enough to evaluate a prospectus.[327]

With this investor profile in mind, we accept Justice White's views on the judiciary's lack of market expertise[328] and look instead to the value investing philosophy popularized by Warren Buffett, widely recognized for his investing acumen.[329] Buffett considers six company-specific factors that we list here with acronyms to facilitate the Part V.C. discussion: (1) consistent performance over time, evidenced by return on investment (ROI) for the most recent 5-10 years; (2) avoidance of excess debt (modest debt-to-equity ratio or D2E); (3) profit consistency and growth (CONGRO); (4) years of public-company status (PUBSTAT) (more is better); (5) competitive advantage (avoidance of commoditized goods or services) (COMP); and (6) excess of "intrinsic value" over current market capitalization (XINT).[330] In addition to these six factors, a seventh requires recognition. Chuck Myers, head of the Fidelity Small Cap Discovery Fund, calls it "patience," defined as divesting only where an alternative investment "orders of magnitude better" is available.[331] Patience (PAT) is supported by empirical findings indicating that lower turnover in investment portfolios leads to higher returns over time.[332] While we think regulatory policy should favor patient investment, our objective here is to ensure that the model explicitly accounts for patience whether or not policy requires investors to exercise it.

In the proposed model, these seven factors determine the "context of similar items"[333] against which the individual item in question (here, the omitted merger talks or MERGE) will be assessed to determine whether, under *TSC-Basic*, there is a substantial likelihood[334] that the merger talks would have been viewed at the time by a reasonable investor as significantly altering the total mix of information.[335]

Factors 1-4 are relatively easy to quantify using data in published financial statements. However, factors 5-7 are more complicated composites. In this connection, we emphasize that the proposed model assumes "bounded rationality" by which we mean that the model is intended

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[327] *See supra* note 234 and accompanying text.

[328] *Basic*, 485 U.S. 253–57 (White, J., dissenting).

[329] *See* Warren Buffett: How He Does It, Investopedia, http://www.investopedia.com/articles/01/071801.asp. Academic research validates value investing. *See* Qian et al. *supra* note ___; Jack P. Mo and Xiao Qiao, *Value Investing through the Lens of Campbell-Shiller*, 41 J. PORTFOLIO MANAGEMENT 59 (2015) (comparing value investing to the Campbell-Shiller identity).

[330] *Id*. These factors were designed for making investment (purchase), not divestment (sale) decisions; however, we assume for illustration that *holding* owned shares is psychologically and financially equivalent to buying shares not owned. Intrinsic value equals the discounted cash flow extractable over the remaining life of the company. *See* Warren E. Buffett, An Owner's Manual (1999), http://www.berkshirehathaway.com/owners.html; Ben McClure, *Discounted Cash Flow Analysis*, INVESTOPEDIA (Sept. 20, 2104), http://www.investopedia.com/university/dcf/ (defining discounted cash flow and providing an illustrative tutorial). Market capitalization equals market price per share multiplied by the number of outstanding shares of stock.

[331] *See* Larrabee, *supra* note 319 (citing Chuck Myers' endorsement of patience).

[332] *See id*. (referring to supporting Morningstar fund data); Emma Wall, *Patience May Pay Off for Investors in the Wake of Election*, MORNINGSTAR (Nov. 9, 2016), http://www.morningstar.com/cover/videocenter.aspx?id=779903 (urging investors to avoid "the classic mistakes" of being "pulled along by the herd" to sell in a falling market or buy to "capture a bounce," which are essentially gambling strategies); Park, *supra* note 5, at 539 (arguing that the materiality of financial statement misstatements should consider only events that have a "persistent" impact on the financial statements). *But see generally* Huang, *supra* note 5 (calling for recognition of irrational or "moody" investing in materiality determinations).

[333] Accounting Directive, art 2 (16).

[334] *TSC Industries*, 426 U.S. at 450 (1976) ("there *must* be a substantial likelihood . . ." (emphasis added)).

[335] *Id*. at 449.

to serve as a practical and parsimonious heuristic, not a theoretically elegant verisimilitude of the financial universe. The model does not and should not include all possible variables or all value levels.[336] In fact, as discussed in Part V.C., while the model can accommodate numeric variable values, it does not require them. Some factors may be nearly universally applicable (e.g., ROI) but the Bayesian framework can also accommodate local or case-specific factors (e.g., MERGE). When combined, the initial probabilities assigned to values of the chosen factors serve as the basis for the overall prior probability of the transaction in question which, in turn, is the benchmark against which materiality should be measured.

C. Bayesian Model Illustration

We begin by assigning prior values to the model factors and structuring the causal relationships among them to support a *prior* odds ratio for the contemplated stock sale. The factor values are then updated by correcting alleged misstatements or disclosing omitted information and the *posterior* odds ratio is calculated based on the updated values. Finally, prior and posterior odds ratios are compared, with the magnitude of the difference between them used to decide whether the misstatement or omission would significantly alter the total mix of information in a reasonable investor's mind. *TSC-Basic* and the Prospectus Directive revolve around *a* reasonable investor, suggesting a random (stochastic) distribution of reasonable investors, not a single, deterministic investor.[337] This stochastic assumption will impact the probabilistic structure of the proposed model, as explained in more detail in relation to Scenario 2 below.

Building on the stock transaction introduced in Part V.B., the following paragraphs apply the proposed Bayesian materiality framework in modeling two hypothetical scenarios. For each, using Equation 3, we first formulate a prior probability that the Investor sells the stock conditioned on the factfinder's beliefs as to reasonable investor valuations of the Buffett List factors *without* information about the misleading omission or misstatement. In a real case, variable values, weights, and causal relationships should be chosen by the factfinder informed by available data, industry standards, and expert opinion.[338] Here, we use hypothetical prior Buffett List values represented by $X_1 \ldots X_7$,[339] plus X_8 (MERGE) representing knowledge (or no knowledge) of the merger negotiations.

$$Prior\ Probability = p\left(H_S \middle| X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8\right) \quad \text{(Equation 3)}$$

To demonstrate the model in (mostly) non-numeric mode, we require binary values (e.g., yes/no, high/low, or long/short) for all variables, as shown in Table 1. For rhetorical simplicity,

[336] *See* GERD GIGERENZER, PETER M. TODD AND ABC RESEARCH GROUP, SIMPLE HEURISTICS THAT MAKE US SMART 8-15 (1999) (contrasting models based on bounded and unbounded rationality and advocating "fast and frugal" heuristics as the only models for real decision-making).

[337] *See* http://mathworld.wolfram.com/Stochastic.html (defining "stochastic" and "deterministic" and contrasting the two).

[338] *See* FENTON at 411 (using a Bayesian jury instruction to emphasize that instructions should not force particular priors on the jury but should ensure that jury members can draw correct conclusions from their own potentially diverse priors).

[339] Priors are sometimes thought of as a *tabula raza*, but there is no requirement that they be so.

Scenario 1 assumes a solo, deterministic reasonable investor. In contrast, Scenario 2 simulates a more realistic stochastic distribution of reasonable investors.[340]

Table 1 – Scenario 1 deterministic factor values ("total mix of information")

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
Acronym	ROI	D2E	CONGRO	PUBSTAT	COMP	XINT	PAT	MERGE
Priors	Low	High	Low	Short	No	No	Little	**No**
Posteriors	Low	High	Low	Short	No	No	Little	**Yes**

We further assume the causal structure portrayed in Figure 1. That is, Investor's Sell or Hold decision is directly tied to the values of X_1, X_2, X_4, and X_6 - X_8, while X_3 and X_5 directly impact only X_1 (ROI).[341]

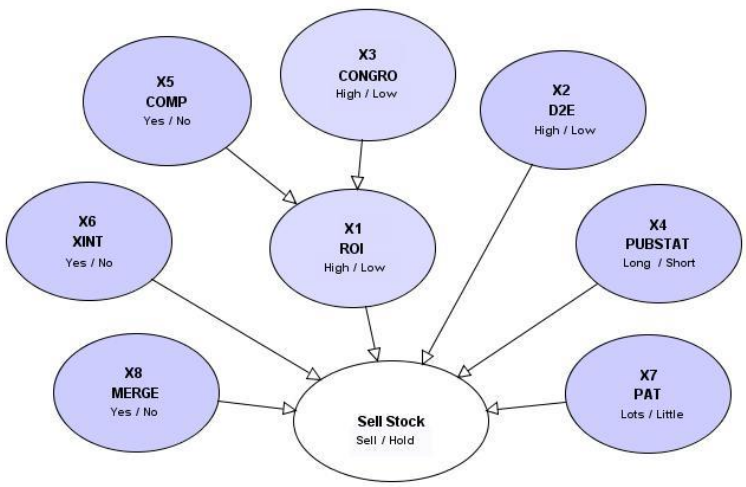

Figure 1 – Bayesian materiality model with causal relationships and binary factor values. Sell Stock = Sell if factor variables are as shown on the Priors row of Table 1.

With this causal structure in mind, Equations 4.1 and 4.2 give the *likelihoods* (*L*) that serve as numerator and denominator in the *likelihood ratio* (*LR)* in Equation 4.3. The *LR* is the probability of observing a specific collection of factor values (evidence) when H_S is true divided by the probability of observing that same evidence when H_S is false.[342] An *LR* greater than 1.0 signifies that the evidence is more likely to be observed when H_S is true than when H_{NS} is true; less than 1.0 signifies the evidence is less likely to be observed when H_S is true than when H_{NS} is

[340] The stochastic behavior of real reasonable investors has motivated German scholarly commentary suggesting that criminal liability under the German Commercial Code should result only where the impact of the new evidence or information is "striking." *See supra* note 211 and accompanying text.

[341] This is only one among multiple feasible structures. In litigation, one would ideally be agreed upon pre-trial, perhaps with assistance of a court-appointed expert. Bayesian network analysis requires that all causal dependencies among variables appear as "arcs" or "edges" (i.e., directed lines connecting factors). *See* FENTON at 140. For illustration, we assume that the Fig. 1 structure accounts for all dependencies, while acknowledging that some may remain hidden (e.g., between ROI and the existence of merger talks).

[342] *See* FENTON at 409 (defining the likelihood ratio in the legal context).

true, while 1.0 ("even odds") indicates the evidence is equally likely to be observed when either H_S or H_{NS} is true.

$$L(H_S) = p(\mathrm{X}_1 \ldots \mathrm{X}_7, \mathrm{X}_{8-yes} | H_S) \qquad \text{(Equation 4.1)}$$

$$L(H_{NS}) = p(\mathrm{X}_1 \ldots \mathrm{X}_7, \mathrm{X}_{8-yes} | H_{NS}) \qquad \text{(Equation 4.2)}$$

$$LR = \frac{p(\mathrm{X}_1 \ldots, \mathrm{X}_{8-yes} | H_S)}{p(\mathrm{X}_1 \ldots \mathrm{X}_{8-yes} | H_{NS})} \qquad \text{(Equation 4.3)}$$

In Equation 4.3, we intuitively expect the numerator, $L(H_S)$, to be less than the denominator, $L(H_{NS})$, because the probability of finding values Low, High, No, Short, No, Yes, Little, and Yes for $X_{1\text{-}8}$ should be *lower* when Investor sells her stock (meaning H_S is true) than when Investor does *not* sell (meaning H_{NS} is true and H_S is false). This size differential means that *LR* differs from 1. Therefore, the inclusion of the missing merger information would be relevant under FRE § 401 because multiplying the *prior* odds ratio by *LR* produces a *posterior* odds ratio that *differs* from the prior odds ratio, as in Equation 5:

$$\frac{p(H_S | X_1 \ldots X_7, \mathrm{X}_{8-yes})}{p(H_{NS} | X_1 \ldots X_7, \mathrm{X}_{8-yes})} = \frac{p(H_S | X_1 \ldots X_7, \mathrm{X}_{8-no})}{p(H_{NS} | X_1 \ldots X_7, \mathrm{X}_{8-no})} * LR \quad \text{(Equation 5)}$$

In other words, "Sell" is somewhat less probable *with* than *without* the merger talks included in the total mix of information. How much less probable—substantially,[343] significantly,[344] or strikingly[345]—determines the materiality of the merger talks.

In Scenario 1, relevance is relatively intuitive but materiality—which asks not *whether* the Sell probability changed but *how much* it changed—is a bigger challenge. Muchness is relative and inherently numeric. Thus, except in the simplest cases, some math is required to assess materiality. Probabilities and their related odds ratios are numeric and typically continuous, meaning that they can take any real numeric value within their respective ranges.[346] Here, we introduce the simple math of Scenario 1.

Scenario 1 contemplates a deterministic reasonable investor with a prior Sell probability of nearly 1.00[347] where MERGE = "No."[348] Toggling MERGE to "Yes" shifts the investor's mindset to "Hold"[349] with a probability of nearly 1.00.[350] These probabilities and resulting odds ratios[351] are shown in Table 2.

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[343] *TSC Industries*, 426 U.S. at 449 (1976).
[344] MAR, art. 7 (1) (a).
[345] *See* Sorgenfrei, *supra* note 158, at 72.
[346] Ratios range from 0 to near infinity; probabilities range from 0 to 1.
[347] Neither value (Sell or Hold) can take a prior probability of 1.00 which, through Bayes' Rule, would force a prior probability of zero on the complement, meaning that the posterior could (illogically) only be zero.
[348] This is because, under Buffett's value investing rubric, the stock promises little in the way of expected future value growth.
[349] For discussion, we assume that (a) a reasonable investor will "Sell," only so long as $X_1 \ldots X_8$ all take their Table 1 prior values and, otherwise, will "Hold," and (b) ROI = High only if CONGRO = High and COMP = "Yes."
[350] Typically, knowledge of merger negotiations increases the expectation of future value growth and, therefore, discourages reasonable investors from selling immediately.
[351] The odds ratio is the probability of a sale, $p(H_S)$, divided by the probability of no sale, $p(H_{NS})$, which equates to $\frac{p(H_S)}{1-p(H_S)} = \frac{p(H_S)}{p(H_{NS})}$.

Table 2 – Scenario 1 p(H_S) and odds ratios

	p(H_S)	Odds Ratio	X_1- X_7	X_8
Prior	≈ 1.00	≈ ∞	As shown in Table 1	**No**
Posterior	≈ 0.00	≈ 0.00	As shown in Table 1	**Yes**

Table 2 confirms our intuition that adding merger knowledge (evidence) to the prior total mix of information decreases the Sell odds ratio from close to infinity (prior) to nearly zero (posterior). Any change in the odds ratio is evidence of relevance under FRE 401. Ultimately, however, relevance and materiality remain judgment calls for bench and factfinder, respectively, who need the best information available. Table 2 is a step in the right direction but its deterministic character is too blunt an instrument.

Importantly, *whether* the odds ratio changes depends on the likelihood ratio (*LR*), not on the prior probability. Why, then, should we not compute the *LR* and use it to assess materiality directly? The answer is twofold. First, while relevance is driven only by the *LR* (i.e., LR ≠ 1.0 implies relevance), materiality is a function of how much the posterior odds differ from the prior odds and of the proximity of the prior odds to "even" or 1.0. The closer the prior odds to even (meaning investor indifference between Sell and Hold), the smaller the change required to impact investor decision-making. For these reasons, the posterior and prior odds are required in order to judge materiality. Second, appropriate software—like AgenaRisk[352]—makes it easier to use the prior and posterior odds to compute the *LR* than to compute the *LR* directly.[353] The software also helps more closely model behavioral realities, as Scenario 2 requires.

Scenario 2 assumes a stochastic population of reasonable investors whose prior values for each Buffet List factor are distributed across that variable's possible values and whose factors are weighted by their perceived importance. Thus, in modeling Scenario 2, we distribute the prior probability according to the percentage of reasonable investors that the factfinder believes[354] would assign each value to each variable. For example, if the factfinder believes that 80 percent of reasonable investors would perceive the company's debt-to-equity ratio (D2E or X_2) as "High," then "High" takes a probability of 0.80 while "Low" takes 1 – 0.80 = 0.20.[355] Factors, priors, and weights are entered into AgenaRisk which easily calculates the resulting *prior* probability of "Sell." We then enter the new evidence (MERGE = "Yes") and calculate the resulting *posterior* probability as shown in the AgenaRisk "risk map" shown in Figure 2.

[352] *See* FENTON at 131. AgenaRisk 7.0 is a software package designed for analysis and visualization of risk, http://www.agenarisk.com/. Some alternatives to AgenaRisk are Bayes Server, http://www.bayesserver.com/ and R, https://www.r-bloggers.com/bayesian-network-in-r-introduction/.

[353] *See* FENTON at 411. The likelihood ratio equals posterior divided by prior.

[354] The belief is a probability and obtainable from data analysis or expert opinion or both. Hypothetical Scenario 2 priors were judgmentally chosen by the authors.

[355] Because ROI is a function of CONGRO and COMP, ROI's prior was calculated by AgenaRisk from CONGRO and COMP priors.

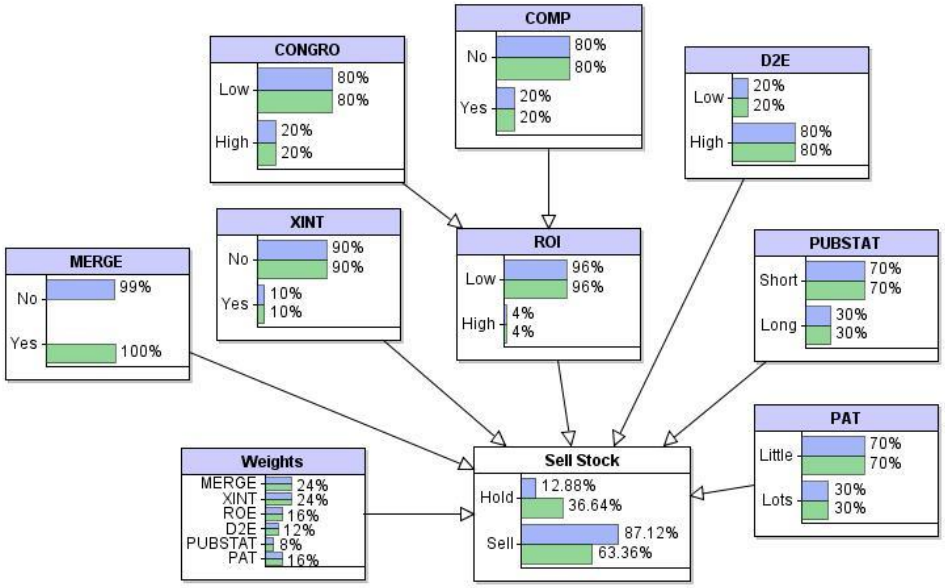

Figure 2 - AgenaRisk 7.0 Scenario 2 risk map. Within each box or "node," the top bar in each value pair reports the prior probability (e.g., in the Sell Stock node, 87.12% is the prior probability of Sell); the bottom bar reports the posterior (e.g., 63.36% is the Sell posterior).

We used Figure 2 to build Table 3, which indicates that adding the merger talks to the total mix decreases the odds of a reasonable investor selling the stock from nearly 7:1 (prior) to less than 2:1 (posterior). While such a large change might seem prima facie material, we do not recommend using Bayesian analysis to set arbitrary materiality thresholds.

Table 3 - Scenario 2 – stochastic priors and posteriors

	p(Hs)	Odds Ratio[356]	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
Acronym			ROI	D2E	CONGRO	PUBSTAT	COMP	XINT	PAT	MERGE
Weight			0.16	0.12	Na	0.08	Na	0.24	0.16	0.24
Value	Sell		Low	High	Low	Short	No	No	Little	**No**
Prior	0.87	**6.69**	0.96	0.80	0.80	0.70	0.80	0.90	0.70	**0.99**
Posterior	0.63	**1.70**	0.96	0.80	0.80	0.70	0.80	0.90	0.70	**0.00**

The materiality threshold should lie along a continuum running from the Prospectus Directive's "necessary," to "beyond reasonable doubt," "striking,"[357] "substantial," and the BGH's "more likely than not[358] or "preponderance of the evidence." It should reflect local

[356] The Scenario 2 prior odds ratio is given as follows: $\frac{p(H_S)}{1-p(H_S)} = \frac{0.87}{0.13} = 6.69$.

[357] *See* Sorgenfrei, *supra* note 158, at 72 (citing scholarly commentary on German criminal and constitutional law).

[358] BGH, XI ZR 344/11 (Sept. 18, 2013) p. 24.

preferences, the procedural posture of the case[359] and, perhaps, its civil or criminal nature.[360] We believe, in the context of Scenario 2, that a reasonable factfinder could conclude that a shift in the odds from 7:1 to 2:1 meets or exceeds the *striking*, *substantial*, and *more likely than not* tests. However, *beyond a reasonable doubt* may require a larger shift in the odds.

While Scenarios 1 and 2 avoid numeric variable values, quantification may help in evaluating the impact of the missing merger information. For example, transforming XINT (X_6) into a continuous or high-level ordinal variable[361] would increase the model's resolution or sensitivity to both relevance and materiality such that any change in intrinsic value or market cap would separate prior and posterior odds ratios. In contrast, if X_6 remains binary, modest movements in intrinsic value or market cap may not be detected and, therefore, would be irrelevant under FRE § 401 and also, therefore, immaterial.

VI. CONCLUSION

Since its appearance in 1976, the Supreme Court's *TSC-Basic* materiality rubric has suffered from inconsistent interpretation, willful misapplication, and scholarly challenges. We argue that much of the disharmony can be reconciled by a Bayesian materiality framework. The proposed framework would operate within existing U.S. case law and E.U. legislation to facilitate and improve factfinder judgment through richer, more focused information than that offered by the current rubric. The proposal offers a boundedly rational, probabilistic heuristic that explicitly recognizes key decision factors whose values comprise the total mix of information required by *TSC-Basic*. The framework enhances intellectual accountability, reduces bias-inducing subjectivity, and improves outcome consistency.

While Bayesian reasoning is widely accepted among evidence scholars[362] and has been used successfully in courts both in and outside the United States,[363] it faces resistance in some quarters.[364] Some argue that the difference between prior and posterior probabilities cannot equate to probative value because of the multitude of available "reference classes" or denominators for prior probabilities and likelihoods that must themselves be proven[365]—i.e., that Bayesian analysis is *too subjective*. Others suggest that lay juries cannot understand the complexities of Bayesian analysis,[366] are incapable of forming "correct" priors,[367] or will bias

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[359] *See, e.g.*, *TSC Industries*, 426 U.S. at 450 (1976) (holding that only facts so "obviously unimportant . . . that reasonable minds cannot differ" on their immateriality may be ruled *immaterial* on *summary judgment* but that at *trial* facts must meet the higher "substantial likelihood" test to be ruled *material*). The magnitude may also depend on whether the case is criminal (beyond reasonable doubt) or civil (preponderance of evidence), but it is not clear how the criminal threshold interacts with the underlying materiality threshold.

[360] *See* Sorgenfrei, *supra* note 158, at 72.

[361] Ordinal variables change in discrete increments (e.g., units, tens, twenties). A "high-level" ordinal uses smaller increments and, therefore, more "levels," eventually approaching mathematical continuity.

[362] *See supra* notes 268-270.

[363] *See supra* notes 276 and accompanying text.

[364] *See, e.g.*, Laurence H. Tribe, *Trial by Mathematics: Precision and Ritual in the Legal Process*, 84 HARV. L. REV. 1329 (1971); Fenton et al. *supra* note 20 at 63-69 (summarizing cases in which U.K. courts have questioned or criticized the use of Bayesian analysis).

[365] *See e.g.*, Tribe, *supra* note 364 at 1359-61; Ronald J. Allen and Michael S. Pardo, *The Problematic Value of Mathematical Models of Evidence*, 36 J. LEGAL STUD. 107, 115-19 (2007).

[366] *See, e.g.*, People v. Nelson, 48 Cal. Rptr. 3d 399, 416 (Ct. App. 3 Dist. 2006), *affd*, 185 P.3d 49 (Cal. 2008) (bemoaning the complexity of Bayesian analysis and misreading McCormick on Evidence as stating that Bayesian analysis is "often misleading," Kaye 2009 at 481 n. 231).

[367] *See e.g.*, Tribe *supra* note 364, at 1358-59.

their judgments in favor of "mathematically powerful" evidence over "soft variables"[368]—i.e., Bayesian analysis is *too objective*.

Much of this opposition appears to be broadly directed at a strawman: reliance on mechanical, judgment-free "mathematics" or impersonal "statistics" in the courtroom.[369] In truth, while experts can incorporate math and statistics into a Bayesian analysis, Bayesian reasoning is not inherently mathematical or statistical.[370] Rather, it is a probabilistic analytical framework that contributes intellectual discipline—independent of statistics—to otherwise vague and amorphous legal constructs like materiality or proof beyond a reasonable doubt.[371] More specifically, appropriate reference classes can be proven at trial,[372] and software can deal with Bayesian math just as calculators deal with simple arithmetic.[373] Recent research suggests that counsel can educate juries to effectively apply Bayesian reasoning[374] and that juries are generally more likely to bias their reasoning against "hard" evidence than "soft."[375] Whatever the dispute resolution venue, courts, counsel, and corporate officers can learn to use the Bayesian materiality framework with a modest investment in training, software, and expert advice.

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[368] *Id.* at 1361-62.

[369] *See* Peter Tillers, *Trial by mathematics—reconsidered*, 10 LAW, PROBABILITY AND RISK 167, 170-71 (2011) (characterizing arguments against evidentiary use of formalistic (e.g., Bayesian) reasoning as strawman arguments in that

> [I]t was a mistake to suppose that Bayesian analysis is equivalent to objective or statistical analysis; . . . that formal or mathematical analysis is necessarily 'mechanical' or that formal mathematical analysis necessarily amounts to an 'algorithm'; . . . that . . . ordinary human beings could never be made to understand Bayesian logic . . .; that the debate over trial by mathematics was really only a debate about the uses of mathematics . . . rather than (as Tribe himself recognized) a debate about the broader question of uses and limits of formal argument about evidence, factual inference and factual proof in legal proceedings.)

[370] *See id*.

[371] *See* Peter Tillers and Jonathan Gottfried, Case comment—*United States v. Copeland, 369 F. Supp. 2d 275 (E.D.N.Y. 2005): A Collateral Attack on the Legal Maxim That Proof Beyond a Reasonable Doubt is Unquantifiable?*, 5 LAW, PROBABILITY & RISK 135, 142-43 (2006) (asserting that while a juror can "formulate an opinion of the odds of a defendant's guilt" without mathematically analyzing evidence, "numbers are not inherently evil," and their use to "express the degree of a person's uncertainty about a factual possibility" requires less than" intermediate mathematics").

[372] After arguing that reference classes are an insurmountable obstacle, Allen and Pardo counter-argue that reference classes can be "reasonably personalized." Allen and Pardo, *supra* note 365, at 133.

[373] *See* FENTON at 438 (arguing that factfinders need not understand the Bayesian calculations performed by software any more than they must know the details of "circuit level calculations" of simple calculators).

[374] *See* Nance and Morris (2002), *supra* note 278, at 403 (finding that "careful use of Bayesian methods" can help juries reach more accurate verdicts, where study subjects were drawn from the Kane County, Illinois jury pool); Dale A. Nance and Scott B. Morris, *Juror Understanding of DNA Evidence: An Empirical Assessment of Presentation Formats for Trace Evidence with a Relatively Small Random-Match Probability*, 34 J. LEGAL STUD. 395 (2005) (finding that effective presentation of DNA evidence can reduce the jury's undervaluation thereof "without inducing significant inferential fallacies"); William C. Thompson, Suzanne O. Kaasa, and Tiamoyo Peterson, *Do Jurors Give Appropriate Weight to Forensic Identification Evidence?*, 10 J. EMPIRICAL LEGAL STUD. 359, 388 (2013) (finding that study subjects' "judgments were generally consistent with Bayesian expectations").

[375] *See e.g.*, Nance and Morris (2002), *supra* note 278, at 403 (finding, consistent with "most previous empirical research," that "jurors tend to undervalue the scientific evidence when measured against a Bayesian norm"); Nance and Morris (2005), *supra* note 374, at 400-401. *But see* Thompson et al., *supra* note 374, at 359 (finding that "people overvalued the DNA evidence when the probability of a false report of a match was high relative to the random match probability").

Finally, *TSC-Basic*'s focus on *a* reasonable investor tacitly endorses a blend of objectivity and subjectivity. Subjectivity manifests itself as a stochastic distribution of credible decision outcomes, all based on identical facts and all available to a reasonable (i.e., "rational" or "objective") investor. Objective, subjective, quantitative, and qualitative evidence coexist and cross-inform each other within the proposed Bayesian analytical framework which, importantly, is adept at objectively modeling the sensitivity of materiality to a range of investor behaviors or subjective priors.[376] Thus, subjectivity- and objectivity-based objections must fail.

The validity of our conclusions is subject to limitations. The cases on which we base the conclusion that *TSC-Basic* is dysfunctional may not empirically represent the reference population.[377] Like *TSC-Basic*, our proposal relies on reasonable investors, whose existence is challenged by recent research in behavioral economics and psychology. Whether Bayesian analysis is a feasible alternative is based, in part, on the availability of reliable, user-friendly software.

These limitations suggest questions for further inquiry. For example, the frequency with which jury instructions omit or change *TSC-Basic*'s elements, like the total mix of information or the reasonable investor, could be investigated empirically. Are reasonable investors illusory and, if yes, what should replace them? Should "reasonable investor" be explicitly redefined, through case law, statute or regulation, along AICPA or IASB lines requiring minimum acumen and diligence?[378] To what extent should "a reasonable investor" be tailored to the circumstances of the actual investors in each case? Finally, the reliability and user-friendliness of available software could be investigated experimentally.

Procedurally, how should Bayesian factors, priors, and causal relationships be chosen in the courtroom? Should U.S. courts use special masters to structure Bayesian materiality analyses or substantively advise courts on the materiality of particular items?[379] Should continental European courts permit some discovery of facts required to prove materiality?[380] How do Article III courts and SEC administrative courts compare in terms of process and materiality outcomes?[381]

We note that the vast majority of securities cases in the United States are either settled or dismissed before trial.[382] Similarly, the number of instances in which materiality must be

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[376] *See* FENTON at 409-12 (illustrating Bayesian network sensitivity analysis with respect to vastly differing prior "random match" probabilities in the DNA identification context).

[377] *See* Cornerstone Research, Class Action Filings Index, http://securities.stanford.edu/litigation-activity-indices.html (reporting 944 class action securities filings in the 2012-2016 interval).

[378] IAS 1, para. 7; AICPA, AU-C § 320.

[379] *See* ACADEMY OF COURT APPOINTED MASTERS, APPOINTING SPECIAL MASTERS AND OTHER JUDICIAL ADJUNCTS: A HANDBOOK FOR JUDGES AND LAWYERS 5 (2nd ed. 2009) (explaining the use of trial masters, expert advisors, and technology masters for clarifying complex topics).

[380] *See* Michael Halberstam, *The American Advantage in Civil Procedure? An Autopsy of the Deutsche Telekom Litigation*, 48 CONN. L. REV. 817, 867-69 (suggesting that German civil procedure is incapable of giving plaintiffs a real opportunity to develop a securities fraud case, primarily because of the lack of discovery power).

[381] *See* Sue Reisinger, *Vindicated SEC Likely to Bring More Cases on Home Turf*, CORPORATE COUNSEL (Aug. 10, 2016), http://www.corpcounsel.com/id=1202764822607/Vindicated-SEC-Likely-to-Bring-More-Cases-on-Home-Turf?slreturn=20170124185036; C. Ryan Barber, *Investment Adviser's Challenge to SEC In-House Judges Fails in D.C. Circuit*, LAW.COM (Aug. 9, 2016); Jean Eaglesham, *SEC Wins With In-House Judges*, WALL STREET JOURNAL (May 6, 2015), http://www.wsj.com/articles/sec-wins-with-in-house-judges-1430965803 (noting the SEC's increasing avoidance of Article III courts and juries by litigating cases in its own administrative courts where its success rate is about 90 percent).

[382] *See* SECURITIES CLASS ACTION FILINGS 2012 YEAR IN REVIEW 8-9, CORNERSTONE RESEARCH (2013), http://securities.stanford.edu/research-reports/1996-2012/Cornerstone-Research-Securities-Class-Action-Filings-

evaluated by corporate financial reporting officers is far larger than the number of lawsuits filed. Thus, the proposed Bayesian framework should see more use outside than inside courtrooms in financial reporting, case evaluation, and administrative or alternative dispute resolution settings. Future research should account for inside and outside usage of the framework.

2012-YIR.pdf (reporting that roughly 92 percent of 2,472 resolved securities class actions filed from 1996 to 2010 were settled or dismissed prior to summary judgment). Because securities claims have been so rare in civil-law countries, any frequentist estimate of the probability of out-of-court settlement would be misleading; however, Bayesian analysis relying on expert priors might suggest a probability between 10 and 25 percent. *See also* Halberstam, *supra* note 380, at 820 (noting the 2005 settlement of U.S. securities claims against Deutsche Telekom while claims in German courts remain unresolved, after initial dismissal in 2012).