How Probable is "Plausible"?

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ABSTRACT

Nearly every jurist who sets foot in federal court confronts Rule 12(b)(6) motions to dismiss. Each time they do, those jurists debate or determine whether the complaint states a claim to relief that is "plausible" on its face. That presents a huge problem, because no court or scholar has been able to offer an unambiguous definition of "plausibility," and so nobody knows the true height of what is likely the most commonly confronted legal threshold in federal litigation. This Article offers a normative solution to that problem and estimates that, on average, in order to be "plausible," a complaint should persuade a court that there is no less than a 12.2 percent chance that the defendant is truly responsible for that which they are being sued.

This Article's pleading-phase error-minimizing (PPEM) model formally defines the pleading threshold (also known as the "plausibility threshold") as a function of pleading merits, estimated continuation costs, estimated judgment value, and estimated likelihood of false verdicts/judgments. And it yields surprising results, including showing that, in certain circumstances, class size should have a bigger impact on the motion to dismiss decision than the merits of the claim itself, and rebutting the proposition that courts should be less inclined to dismiss cases at the pleading phase when defendants are in control of critically responsive discovery.

This Article then takes the same framework it uses at the pleading phase to establish the PPEM model and applies it at the discovery phase to establish the discovery-phase error-minimizing (DPEM) model, which jurists can apply to determine when discovery motions should be granted or denied. The PPEM and DPEM models use the same normative framework that underpins the preponderance of the evidence threshold (that is, the goal of error-minimization), which means that applying the PPEM and DPEM models unifies the (presently divergent) rules of decision for pleading, discovery, and verdict/judgment. And, as this Article explains, unifying the rules of decision could improve litigation efficiency by eliminating incentives for litigants to present dishonest and inconsistent assertions regarding the proper scope of discovery.

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INTRODUCTION

The Supreme Court's decisions in *Bell Atlantic Corp v Twombly*[1] and *Ashcroft v Iqbal*[2] (hereafter referred to collectively as "*Twiqbal*") ushered in a new pleading standard to replace the "notice pleading" standard that prevailed for decades after 1957's *Conley v Gibson*.[3] The *Twiqbal* standard demands that plaintiffs file "plausible" claims.[4] When plaintiffs fail to satisfy the "plausibility threshold," defendants' motions to dismiss (MTD) under Federal Rules of Civil Procedure (FRCP) 12(b)(6) will be granted.[5] But what exactly does it mean to be "plausible"? How high is that threshold? How probable is "plausible"? The answers to these questions remain a mystery.

Some aspects of "plausibility" are generally accepted. For example, the Court announced that discovery costs and specificity in pleading are relevant variables to which courts are supposed to apply their "judicial experience and common sense" in order to determine whether claims are plausible.[6] And it is widely accepted that pleadings must be more than just "conclusory"; they must include facts that—when considered in context—make the right to relief more than merely "conceivable."[7] But courts have not concluded that these are the only relevant variables, nor have they clearly explained how these variables weigh and interact, or how courts are supposed to apply their "judicial experience and common sense" to them.[8] As a result, the positive model of the plausibility threshold remains largely undefined—which may be one reason the new pleading regime seems to have fallen short of having the impact that many predicted.[9]

Normative models of the pleading threshold are less ambiguous than the positive model but have their own shortcomings. Professor Louis Kaplow (although not attempting to define

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1 550 US 544 (2007).

2 556 US 662 (2009).

3 355 US 41 (1957).

4 See *Twombly*, 550 US at 556–57, 570; *Iqbal*, 556 US at 678.

5 See A. Benjamin Spencer, *Understanding Pleading Doctrine*, 108 Mich L Rev 1, 12–14 (2009).

6 See *Iqbal*, 556 US at 679, 685–86; *Twombly*, 550 US at 558–59.

7 See *Twombly*, 550 US at 556–57, 570.

8 See *Iqbal*, 556 US at 663–64, 679.

9 See William H.J. Hubbard, *Testing for Change in Procedural Standards, with Application to* Bell Atlantic v. Twombly, 42 J Legal Stud 35, 53–59 (2013) (making an empirical argument that, contrary to many observers' predictions, *Twombly* has had no discernable impact on the rate of case dismissal).

"plausibility") has posited a model describing when litigation should continue and when it should be terminated.[10] Kaplow's model is as follows:[11]

$$Deterrence\ Gain \lesseqgtr Chilling\ Cost + Continuation\ Costs$$

When the left side is larger, litigation should continue (that is, the MTD should be denied), and when the right side is larger, litigation should terminate (that is, the MTD should be granted).[12]

Kaplow's is a welfare maximizing model that considers the feedback effect of continuation/termination decisions on primary behavior in society at large.[13] Kaplow's model is appealing insofar as it considers the system-level effects of continuation/termination,[14] but because it does not consider the probability that the defendant is liable and uses variables that are virtually impossible to estimate, it cannot be applied in a way that helps achieve the purpose of this Article—to normatively define and locate the plausibility threshold.

Professor Keith Hylton has a related model, in which he presents the optimal pleading threshold as a function of the summary judgment threshold, the likelihood of exceeding the summary judgment threshold after discovery, and the magnitude by which the pleading will fall short of the summary judgment threshold.[15] Hylton's model comes in two expressions:

10 See Louis Kaplow, *Multistage Adjudication*, 126 Harv L Rev 1179, 1196 (2013).

11 Id.

12 Id.

13 See id at 1187 & n 3.

14 See Kaplow, 126 Harv L Rev at 1196–1202 (cited in note 10).

15 Keith N. Hylton, *When Should a Case Be Dismissed? The Economics of Pleading and Summary Judgment Standards*, 16 S Ct Econ Rev 39, 50–52 (2008).

$$E(P_P^2 \big| P_P^1, \Psi) < \tau$$

and

$$\alpha < \frac{\tau - P_P^1}{\psi - P_P^1}$$

In the first expression, Hylton says that the court should grant the MTD when the expected value of the plaintiff’s prediction of their own probability that they will prevail at the summary judgment phase (P_P^2)[16]—conditioned on the probability that they will prevail at the MTD phase (P_P^1) and the information that is likely to come about during discovery and its impact on the merit of his case (Ψ)—is less than the threshold level of merit below which a suit should fail to survive summary judgment (τ).[17] In the second expression, Hylton says that the court should grant the MTD when the likelihood of reaching the “discovery-enhanced merit level ψ” (α) is less than the ratio of the amount by which the pleading falls short of the summary judgment threshold $(\tau - P_P^1)$ to the amount by which discovery enhances the probability that claim will prevail $(\psi - P_P^1)$.[18]

Hylton’s model does not explicitly consider continuation costs, judgment values, or risks of erroneous judgments. Nor does Hylton ignore them. Rather, Hylton assumes that the summary judgment merit threshold slides as a function of the total social cost of the type of litigation initiated by the plaintiff.[19] And because, under Hylton’s model, the pleading threshold is partially a function of the summary judgment threshold, the pleading threshold implicitly considers social costs. But this demands considerable faith that the summary judgment threshold properly incorporates these costs. And because the summary judgment threshold is itself an undefined function of social cost,

16 Hylton uses the plaintiff’s own prediction of prevailing (P_P) as a proxy for merit. Id at 47.

17 Id at 50–52.

18 Id.

19 Hylton supports this position by pointing to the fact that, under the common law, claim types that tend to produce more social cost (including erroneous judgments as well as litigation costs) had higher merit thresholds. Hylton, 16 S Ct Econ Rev at 39, 41–42, 52, 56–58, 62–63 (cited in note 15).

then so too is the pleading threshold effectively undefined.[20] Therefore, Hylton's model also does not satisfactorily define or locate the plausibility threshold.

In contrast to the ambiguous positive definitions of plausibility supplied by the courts and (for the purposes of defining the plausibility threshold) the inapplicable normative models that exist in the literature, the pleading-phase error-minimizing (PPEM) model described below is largely normative but not condemned to a purely theoretical existence. To that end, this Article advances the literature on pleading by: defining an optimal pleading threshold as a function of "the merits," estimated continuation costs, estimated judgment value, and estimated probability of false verdicts/judgments; offering a practically useful definition of plausibility; using empirical data to estimate the probabilistic location of the normative plausibility threshold's lower bound; and unifying the currently disconnected rules of decision for civil pleading, discovery, and verdicts/judgments.

20 Although Hylton did not suggest that his model should be mechanically applied in real cases, it is worth noting that the model does not account for variance of social cost within claim types—which ostensibly share the same summary judgment threshold. See id. But there *is* variance of social cost within claim types. Therefore, application of Hylton's model across multiple claims of the same type would not perfectly minimize error or maximize welfare.

I. MODELING ERROR MINIMIZATION AT THE PLEADING PHASE

For longer than we understood *why* the preponderance of the evidence threshold justifiably existed at 0.5, we knew *that* it existed there. In 1982, Professor David Kaye showed that (for simple cases) the preponderance threshold was optimally located to minimize error.[21] In other words, the legal world knew the threshold's location, but Kaye's advance was discovering the threshold's normative justification. This Article starts from where Kaye ended and works backward: assuming that—like the preponderance threshold—the plausibility threshold is optimally located to minimize error, where is it located? This Article creates a theoretical model that answers that question and then applies empirical data to the model to produce an estimate of the error minimizing plausibility threshold.

A. Defining Error

Error, in this context, comes in multiple forms. Error can be an overpayment by a defendant (Type 1 error/false positive), an underpayment by a defendant (Type 2 error/false negative), or a defendant's continuation costs (for example, discovery costs and trial costs). This definition of error reflects a "deterrence-oriented" approach and noticeably disregards *plaintiff* overrecovery, underrecovery, and continuation costs. This Article adopts the deterrence-oriented approach to be consistent with foundational works by Kaye and Professor Saul Levmore, and—as Levmore explains—because the deterrence-oriented approach produces results that in most cases more closely reflects the way our legal system operates.[22] Note, however, that there are other approaches (for example, "compensation-sensitive" and "bias-sensitive" approaches)[23] that do consider other sources of error and that may be worth considering in future research.

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21 David Kaye, *The Limits of the Preponderance of the Evidence Standard: Justifiably Naked Statistical Evidence and Multiple Causation*, 1982 Am Bar Found Rsrch J 487, 496–500.

22 See Saul Levmore, *Probabilistic Recoveries, Restitution, and Recurring Wrongs*, 19 J Legal Stud 691, 699 (1990) ("This approach is 'deterrence oriented' in its focus on the defendant, and it predicts both the dominance of the preponderance rule and the exceptions to it for certain mass tort cases.")

23 See id at 699–700.

B. Minimizing Error

In order to minimize error at the pleading phase, the decision of whether to grant or deny an MTD should weigh the expected error of dismissing a potentially legitimate claim against the estimated costs of continuation and the expected value of erroneous judgments rendered after continuation. When the expected error of dismissal is lower, the MTD should be granted. When the expected error of continuation is lower, the MTD should be denied. The error minimizing plausibility threshold exists at the point of indifference between denying and granting the motion to dismiss. This Article models that point.

C. Key Terms—Pleading Phase

C = in the scenario where the MTD is denied, the estimated continuation costs for the defendant

J = the estimated value of the judgment that the defendant would be ordered to pay if held liable

π = based on the pleadings, the estimated probability that the defendant is truly responsible for that which they are being sued

π_S = in the scenario where the MTD is denied and the defendant is found liable, the estimated probability that the defendant is in fact truly responsible (the "posterior strong case")

π_W = in the scenario where the MTD is denied and the defendant is *not* found liable, the estimated probability that the defendant is in fact truly responsible (the "posterior weak case")

ϕ_S = in the scenario where the MTD is denied, the probability that the defendant will be held liable

τ_P = the plausibility threshold

D. Assumptions—Pleading Phase

The PPEM model makes several assumptions. They are as follows:

Assumption 1:
Either the defendant is truly responsible or nobody is.[24]

Assumption 2:
Discovery will yield either a strong case (a case that satisfies the preponderance of the evidence threshold and results in liability) or a weak case (a case that does not satisfy the preponderance of the evidence threshold and does not result in liability).

Assumption 3:

$$\pi_S > 0.5$$

In other words, the posterior strong case will always satisfy the preponderance of the evidence threshold.

Assumption 4:

$$\pi_W \leq 0.5$$

In other words, the posterior weak case will never satisfy the preponderance of the evidence threshold.[25]

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24 This assumption makes the hypothetical case as simple as possible. If, for example, there was an individual not on trial who was truly responsible or if multiple individuals shared responsibility, the model may require modification to account for those who might be underdeterred or overdeterred.

25 Note that $(\pi_S + \pi_W)$ does *not* necessarily equal 1. For example, a pleading that is relatively persuasive on the merits may result in a π_S of 0.9 and a π_W of 0.4; and a pleading that is relatively unpersuasive on the merits may result in a π_S of 0.6 and a π_W of 0.1.

Assumption 5:

$$\pi = \phi_S(\pi_S) + (1 - \phi_S)\pi_W$$

The PPEM model is intended to be applied prior to discovery, and therefore judges must estimate the anterior and posterior states using the same set of information. As a result, the anterior estimate of true responsibility (that is, π) is equivalent to the estimate of true responsibility in the posterior state (that is, $\phi_S(\pi_S) + (1 - \phi_S)\pi_W$). π represents a more intuitive concept (the estimated probability that the defendant is truly responsible), but recognizing that it is equivalent to $\phi_S(\pi_S) + (1 - \phi_S)\pi_W$ is important because the factors comprising the estimate of true responsibility in the posterior state are the same factors comprising the estimated probability of posterior Type 1 and Type 2 error. As a result, π partially correlates with estimated probability of Type 1 and Type 2 error. This relationship is explored in depth in Part I.F, below.

Assumption 6:

Each dollar erroneously paid due to a false liability verdict/judgment contributes to error at the same rate as each dollar erroneously not paid due to a false no-liability verdict/judgment.[26]

Assumption 7:

Continuation costs cannot reduce error.[27]

E. Theory—Pleading Phase

The PPEM model, below, defines the threshold at which error is minimized. To do so, we must find the point at which the expected error from granting an MTD equals the expected error from denying an MTD.[28] The expected error from granting an MTD is expressed as follows:

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26 Kaye used the same assumption in proving that the preponderance of the evidence standard was error minimizing. Kaye, 1982 Am Bar Found Rsrch J at 496 (cited in note 21).

27 This assumption would not hold in instances when the award falls short of the amount that the plaintiff should have received (for example, when a responsible defendant is wrongly held not liable). In those instances, continuation costs borne by the defendant could actually reduce error by lessening the gap between what they should have paid and what they actually paid (that is, by reducing underdeterrence).

28 Appendix A serves as an illustrative guide for this section.

$$\pi(J)$$

It is the estimated probability that the defendant is truly responsible (π), multiplied by the estimated value of the judgment that the defendant would be ordered to pay if found liable (J).

The expected error from denying an MTD is expressed as follows:

$$C + (\phi_S)(1 - \pi_S)(J) + (1 - \phi_S)(\pi_W)(J)$$

That is the defendant's estimated continuation costs (C), plus—after allowing the case to proceed—the expected value of wrongly finding liability ($(\phi_S)(1 - \pi_S)(J)$), plus the expected value of wrongly *not* finding liability ($(1 - \phi_S)(\pi_W)(J)$).[29]

The above two expressions can be pitted against one another to reflect the choice between the expected error from denying an MTD and the expected error from granting it:

$$\pi(J) \lesseqgtr C + (\phi_S)(1 - \pi_S)(J) + (1 - \phi_S)(\pi_W)(J)$$

When the left side is smaller, granting the MTD yields a lesser expected error than denying would, and therefore the MTD should be granted. When the right side is smaller, denying the MTD yields a lesser expected error than granting would, and therefore the MTD should be denied.[30]

Changing the inequality to an equation describes the indifference point between granting and denying an MTD:

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29 $(\phi_S)(1 - \pi_S)$ is the estimated probability that the defendant will wrongly be held liable after the case is allowed to continue. It is the estimated probability of finding liability (ϕ_S) times the estimated probability that the defendant is not truly responsible $(1 - \pi_S)$. The estimated probability times the estimated magnitude of finding liability (J) yields the expected value of wrongly finding the defendant liable. Conversely $(1 - \phi_S)(\pi_W)$ is the estimated probability that the defendant will wrongly *not* be held liable after the case is allowed to continue. It is the probability of *not* finding liability $(1 - \phi_S)$ times the probability that the defendant is truly responsible (π_W). The estimated probability times the estimated magnitude of *not* finding liability (J) yields the expected value of wrongly *not* finding the defendant liable. Combined, $(\phi_S)(1 - \pi_S)(J) + (1 - \phi_S)(\pi_W)(J)$ equals the expected value of arriving at an incorrect result, despite allowing the case to continue.

30 This inequality can be reduced further, but doing so makes it harder to understand intuitively and impossible to swap in τ_P. Nevertheless, the reduced version appears as follows:

$$\pi_S \lesseqgtr \frac{C}{2J\phi_S} + 0.5.$$

$$\pi(J) = C + (\phi_S)(1-\pi_S)(J) + (1-\phi_S)(\pi_W)(J)$$

At the indifference point, π equals τ_P, so τ_P can swap in to yield the following equation:

$$\tau_P(J) = C + (\phi_S)(1-\pi_S)(J) + (1-\phi_S)(\pi_W)(J)$$

Dividing both sides by J yields the following equation:

$$\tau_P = \frac{C}{J} + \phi_S(1-\pi_S) + (1-\phi_S)\pi_W$$

This equation defines the error minimizing plausibility threshold. When $\pi > \tau_P$ the pleading exceeds the threshold, and the MTD should be denied. When $\pi < \tau_P$ the pleading falls short of the threshold, and the MTD should be granted.

By way of example, if, based on the pleadings, a judge estimates that there is a 20 percent likelihood that the defendant is truly responsible for that which they are being sued; that continuation costs will amount to $100,000; that—if ultimately found liable—judgment value will equal $1,300,000; that there is a 20 percent chance of ultimately finding liability if the MTD is denied; that, in the scenario in which liability is found, there is a 60 percent chance that the defendant is truly responsible; and that, in the scenario in which liability is not found, there is a 10 percent chance that the defendant is truly responsible; then the PPEM model would advise the following calculations:

$$\pi = 0.20$$

$$\tau_P = \frac{100{,}000}{1{,}300{,}000} + 0.20(1-0.60) + (1-0.20)0.10 = 0.24$$

$$0.20 < 0.24$$
$$\therefore$$
$$\pi < \tau_P$$
$$\therefore$$
$$\text{MTD should be granted}$$

If, however, the judge estimates that continuation costs will amount to $30,000, then the result would be the following:

$$\pi = 0.20$$

$$\tau_P = \frac{30{,}000}{1{,}300{,}000} + 0.20(1 - 0.60) + (1 - 0.20)0.10 = 0.18$$

$$0.20 > 0.18$$
$$\therefore$$
$$\pi > \tau_P$$
$$\therefore$$
$$\text{MTD should be denied}$$

In the simple example above, manipulating estimated continuation costs makes a dispositive difference on the MTD decision.[31]

F. A Numerical Estimate of the Plausibility Threshold's Lower Bound

Beyond pure theory, the PPEM model enables an empirical estimate of the normative plausibility threshold's lower bound. To forge that estimate, this Article uses data from the Federal Judicial Center's Civil Rules Survey, which contains information that allows for a rough estimation of C/J.[32] The survey (the data for which came from attorneys reporting various data related to specific cases on which they worked) includes estimates of the ratio of discovery costs to stakes and the ratio of discovery costs to total costs.[33] The survey shows defendant attorneys reporting their ratio of discovery costs to stakes (which this Article treats as equivalent to $Discovery\ Costs/J$) as the following:[34]

31 Note that some of the PPEM model's terms are correlated with one another, which influences their impact on the MTD decision. For a more detailed description of the PPEM model's dynamics, see Appendix B.

32 See Emery G. Lee III and Thomas E. Willging, *National, Case-Based Civil Rules Survey: Preliminary Report to the Judicial Conference Advisory Committee on Civil Rules* *38–40, 43 (Federal Judicial Center, October 2009), archived at http://perma.cc/3328-3B78.

33 "Stakes" measures the gap between the client's best and worst likely outcomes, as reported by their attorney. See id at *41 This Article uses "stakes" as a proxy for J, although—because in some cases the worst likely outcome may be greater than zero—"stakes" likely underestimates J by some amount.

34 Id at *43. Note that this Article assumes that the survey responses are representative of the full universe of civil cases.

Ratio of Attorneys' Estimated Discovery Costs to Attorneys' Estimated Stakes for Cases with One or More Reported Discovery Types			
	10th Percentile	Median	95th Percentile
Defendant Attorneys	0.002	0.033	0.305

Because discovery costs are only a portion of continuation costs, these ratios are a rough estimate of *Discovery Costs/J*, not *C/J*. But this Article uses *Discovery Costs/J* to estimate *C/J* by using the survey's data estimating the ratio of discovery costs to total costs (that is, *Discovery Costs/Total Costs*).[35]

The survey shows defendant attorneys reporting their estimated ratio of discovery costs to total costs as follows:[36]

Attorneys' Estimated Ratio of Discovery Costs to Total Costs for Cases With At Least One Reported Type of Discovery			
	10^{th} Percentile	Median	95^{th} Percentile
Defendant Attorneys	0.050	0.270	0.800

35 *(Discovery Costs/J)(1/(Discovery Costs/Total Costs) = Total Costs/J ≈ C/J*. Note, however, that unlike *(C)*, "total costs" includes costs incurred prior to the court's determination of the MTD. Future research may achieve a more precise estimate by applying data that excludes pre-MTD costs.

36 Lee and Willging, *National, Case-Based Civil Rules Survey* at *39 (cited in note 32). To calculate costs, defendant attorneys were asked "to estimate the total litigation costs for their firms and/or clients in the closed case, including the costs of discovery and any hourly fees for attorneys or paralegals. If the case was handled on a contingency-fee basis, they were asked to estimate the total litigation costs to the firm." Id at *35. Note that this Article assumes that, for cases handled on a contingency-fee basis, total litigation costs are equal to the contingency fee. In other words, this Article assumes no profits. This is necessary due to a lack of data, but it is also a common (albeit often unrealistic) assumption in economics research. Future research may achieve better estimates by incorporating contingency fees in excess of firm-incurred litigation costs.

These figures can be plugged into the following operation to estimate C/J:

$$\left(\frac{Discovery\ Costs}{J}\right)\left(1\ /\ \frac{Discovery\ Costs}{Total\ Costs}\right) = \frac{Total\ Costs}{J} \cong \frac{C}{J}$$

The result is as follows:[37]

Estimated C/J			
	Lower Bound	Middle	Upper Bound
Defendant Attorneys	0.004	0.122	0.381

According to these figures, for the vast majority of cases C/J likely falls between 0.004 and 0.381, with an average of approximately 0.122. That means that, if we accept error minimization as the goal of the pleading regime, then empirical data suggests that the lower bound of "plausibility" should on average be no less than 0.122. Or, said differently, a court applying the PPEM model should on average dismiss claims in which the court perceives the likelihood that the defendant is truly responsible to be less than 12.2 percent.

Note that this does not indicate that the normative plausibility threshold is fixed. It is not. It varies with the particulars of each case. Rather, 0.122 represents the plausibility threshold's *average* lower bound.

Note also that, under the PPEM model, the average plausibility threshold is almost certainly higher than 0.122, but, because there does not appear to be any research that allows for an estimate of $\phi_S(1-\pi_S)+(1-\phi_S)\pi_W$, the best that can be done at current is to use research that bears on C/J to estimate a lower bound for the plausibility threshold.

37 In applying data to the operation, this Article matched the 10th percentile *Discovery Costs/J* figures with the 10th percentile *Discovery Costs/J* figures, the median figures with the median figures, and the 95th percentile figures with the 95th percentile figures. However, it is not clear that the 10th/median/95th percentile *Discovery Costs/J* ratio cases correlate with the 10th/median/95th percentile *Discovery Costs/Total Costs* ratio cases. Future research may yield improved estimates of C/J by better matching *Discovery Costs/J* figures with *Discovery Costs/Total Costs* figures.

II. DISCUSSION—PLEADING PHASE

Although the plausibility threshold that *Twiqbal* ushered in is now approximately a decade old, its location and contours remain a mystery. There is little agreement between circuits (and, arguably, within circuits) regarding the specific variables that determine whether a pleading satisfies the plausibility threshold or how those variables interact.[38] Nor does current scholarship offer clarity on the matter. In the face of this ambiguity, the PPEM model advances pleading theory by suggesting an optimal normative definition of the plausibility threshold and showing that use of such a model in concert with empirical analysis could help us get closer to answering the question: How probable is "plausible"?

As described above, the PPEM model defines plausibility as a function of variables that heretofore have not all been considered together in making the MTD decision—namely, estimated continuation costs for the defendant (C), estimated value of the judgment that the defendant would be ordered to pay if held liable (J), and estimated probability of an erroneous result despite allowing the case to proceed beyond pleadings ($\phi_S(1-\pi_S)+(1-\phi_S)\pi_W$). By taking empirical data on some of those variables and plugging it into the PPEM model, this Article makes what I believe is the first ever formal probabilistic estimate of the plausibility threshold—or, perhaps more accurately, a formal probabilistic estimate of what the plausibility threshold's average lower bound *should* be if its goal is to minimize error. But, on top of a novel definition and estimate, the PPEM model yields some surprising suggestions that contradict premises previously taken for granted.

Consider the following: A plaintiffs' attorney initiates two federal class action suits against a single company. One suit is filed in Illinois and the other in Wisconsin. The law in both cases is identical, the pleadings are identical, and the MTDs are identical. The only difference is the size of the classes: the Wisconsin class has 100 claimants, and the Illinois class has 2000 claimants. The Wisconsin MTD is granted, but the Illinois MTD is

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38 Compare, for example, *Tamayo v Blagojevich*, 526 F3d 1074, 1083 (7th Cir 2008), with *Ridge at Red Hawk, LLC v Schneider*, 493 F3d 1174, 1177 (10th Cir 2007). See generally Nicholas Tymoczko, Note, *Between the Possible and the Probable: Defining the Plausibility Standard after* Bell Atlantic Corp. v. Twombly *and* Ashcroft v. Iqbal, 94 Minn L Rev 505 (2009) (describing various approaches courts and commentators have taken to define the *Twiqbal* plausibility standard).

denied. The plaintiff appeals the Wisconsin case and the defendant appeals the Illinois case. The Seventh Circuit receives both appeals, which have to be considered de novo. It is tempting to think that exactly one of the decisions was in error, but the PPEM model offers another option: that the size of the class—and therefore the size of the judgment relative to the estimated cost of continuation—can be a dispositive factor. And therefore, even though cases that were identical on the merits were oppositely decided, both lower court decisions could be correct, or both could be incorrect. In other words, the fact that the Illinois judgment value is likely to be 20 times larger than the Wisconsin judgment value is potentially a dispositive distinction, leading to the proper dismissal of one claim and the proper continuation of its fraternal twin.

The PPEM model also rebuts the suggestion that the pleading threshold should be lowered in cases when defendants control the information that plaintiffs would use in their pleading if only they had access to said information.[39] But the PPEM model ignores whether defendants control information, relying instead on the cost of producing it and the likelihood that it will reduce Type 1 and Type 2 error. To the extent control of information is relevant, it is only as a proxy for the way it impacts the defendant's estimated continuation costs and estimated probability of postpleading erroneous decisions. And when defendants control information (and all else is equal), their estimated cost of continuation is likely greater, which suggests that these types of cases should have *higher* thresholds, not lower.

Moreover, beyond pure theory, the PPEM model may be practically applied. The first and most obvious way it could be applied is by estimating case-specific values for π, C, J, ϕ_S, π_S, and π_W and plugging them into the PPEM model to see whether an MTD should be granted or denied. But estimating those values may be challenging or imprecise. A simpler alternative could be to use the PPEM model and lower bound estimate to rationalize granting an MTD in an average case in which the pleadings lead the judge to estimate that there is less than a 12.2 percent chance that the defendant is truly responsible. The naked probability alone would likely not be sufficient justification, but the judge could apply the same analysis that the PPEM model itself

39 See Tymoczko, 94 Minn L Rev at 525 (cited in note 38); Colleen McMahon, *The Law of Unintended Consequences: Shockwaves in the Lower Courts after* Bell Atlantic Corp. v. Twombly, 41 Suffolk U L Rev 851, 867 (2008).

uses to arrive at the conclusion that—because there is reason to believe that costs will amount to 12.2 percent of the potential judgment value—the pleadings did not state a claim that is plausible on its face.

Alternatively, the PPEM model could be used to justify dismissals or cost shifting in extreme cases in which the judge estimates that C exceeds J (and thus τ_P necessarily exceeds π). In those cases, even if there were a 100 percent chance that the defendant was responsible, continuation would create more error than would failing to remedy the original injury. In those instances, *good Samaritan* plaintiffs should move for summary judgment, undoubtedly winning a full remedy without triggering any continuation costs for the defendant. But *rational, profit maximizing* plaintiffs should use the specter of enormous continuation costs to extort a settlement from the defendant in an amount greater than J (and recall, overpayment constitutes error).[40] Applying the PPEM model in those instances—either to justify dismissal, or, more palatably, to trigger cost shifting—would prevent extortionate litigation.

Even without estimating any of its variables, the PPEM model could be used beneficially in court. Merely referencing the PPEM model in opinions may cast a shadow that incentivizes more efficient behavior from the litigants who operate beneath it. For example, a plaintiff appearing before a judge who considers only the specificity of pleadings when determining MTDs will have an incentive to plead with specificity but to simultaneously signal that there will be massive continuation costs for the defendant so as to extract as large a settlement as possible. But a plaintiff appearing before a judge who uses the PPEM model as a framework for MTD decisions will have an incentive to plead persuasively and to signal that continuation costs will be appropriate in relation to the estimated judgment value. And if the plaintiff is worried that estimated continuation costs appear disproportionate, they may stipulate to limited discovery (thereby reducing $\frac{C}{J}$) in order to reduce the likelihood of dismissal. Or, even better, litigants may negotiate to avoid MTDs altogether,

40 For example, if J were \$100, C were \$120, and π were 1.0, continuation would cost the defendant \$220. So a rational, profit maximizing plaintiff should offer to settle for \$219, and the rational, profit maximizing defendant should accept. That settlement would represent \$119 worth of error (because \$100 of that \$219 would be a true remedy). That exceeds the \$100 of error that would come in the form of defendant underpayment if the court simply dismissed the eminently legitimate claim (or, as Professor Levmore might say, if the court adopted a "no recovery rule").

which would reduce the burden on courts. For example, plaintiffs may commit to limit their discovery requests or to pay for portions of defendants' discovery in return for defendants' commitment to refrain from moving to dismiss. And in fact, the plaintiff's incentive to stipulate or negotiate would be greatest in the very cases that are currently most vulnerable to extortionate discovery.[41]

Moreover, merely stating the PPEM factors that the court considers and the way those factors interact with one another should be sufficient to influence attorneys on either side to use the model to make their arguments. So judges need not divine values themselves because the attorneys will likely do it for them, and then judges would just have to decide which values are more accurate—a decision framework to which judges are well accustomed.

Finally, there is another benefit to applying an error minimization framework at the pleading phase: it could unify prediscovery, intradiscovery, and postdiscovery rules of decision. To show how, this Article models the discovery-phase error-minimizing (DPEM) model.

III. Modeling Error Minimization at the Discovery Phase

In order to minimize error at the discovery phase, the decision of whether or not to allow specifically requested discovery (for example, via a motion to compel or motion for a protective order) should weigh estimated continuation costs and expected value of erroneous judgments if the requested discovery is denied against estimated continuation costs and expected value of erroneous judgments if the requested discovery is allowed. When the expected error from denying the discovery is lower, the discovery should be denied, and when the expected error from allowing the discovery is lower, the discovery should be allowed. This Part models that decision.

A. Key Terms—Discovery Phase

41 The cases that are most vulnerable to extortionate discovery are those with the highest values for C/J. Those cases are also the most likely to be dismissed under the PPEM model. And so plaintiffs who wish to avoid dismissal would have an incentive to reduce C/J by reducing C, which they could do by stipulating or negotiating limited discovery, or negotiating to pay for some of defendants' discovery costs.

C_0 = in the scenario when the discovery at issue is denied, the estimated continuation costs for the defendant

C_1 = in the scenario when the discovery at issue is allowed, the estimated continuation costs for the defendant

J_0 = in the scenario when the discovery at issue is denied, the estimated value of the judgment that the defendant would be ordered to pay if held liable

J_1 = in the scenario when the discovery at issue is allowed, the estimated value of the judgment that the defendant would be ordered to pay if held liable

π_{S_0} = in the scenario when the discovery at issue is denied and the defendant is found liable, the estimated probability that the defendant is in fact truly responsible (the "non-discovery posterior strong case")

π_{S_1} = in the scenario when the discovery at issue is allowed and the defendant is found liable, the estimated probability that the defendant is in fact truly responsible (the "with-discovery posterior strong case")

π_{W_0} = in the scenario when the discovery at issue is denied and the defendant is *not* found liable, the estimated probability that the defendant is in fact truly responsible (the "non-discovery posterior weak case")

π_{W_1} = in the scenario when the discovery at issue is allowed and the defendant is *not* found liable, the estimated probability that the defendant is in fact truly responsible (the "with-discovery posterior weak case")

ϕ_{S_0} = in the scenario when the discovery at issue is denied, the probability that the defendant will be held liable

ϕ_{S_1} = in the scenario when the discovery at issue is allowed, the probability that the defendant will be held liable

μ = the change in expected error from allowing the discovery at issue

B. Assumptions—Discovery Phase

The DPEM model makes several assumptions. They are as follows:

Assumption 1:
Either the defendant is truly responsible or nobody is.

Assumption 2:
Discovery will yield either a strong case (a case that satisfies the preponderance of the evidence threshold and results in liability) or a weak case (a case that does not satisfy the preponderance of the evidence threshold and does not result in liability).

Assumption 3:

$$\pi_{S_0} > 0.5$$
$$\pi_{S_1} > 0.5$$

In other words, for the posterior strong cases, the preponderance of the evidence threshold will always be satisfied.

Assumption 4:

$$\pi_{W_0} \leq 0.5$$
$$\pi_{W_1} \leq 0.5$$

In other words, for the posterior weak cases, the preponderance of the evidence threshold will never be satisfied.

Assumption 5:
Each dollar erroneously paid due to a false liability verdict/judgment contributes to error at the same rate as each dollar erroneously not paid due to a false no-liability verdict/judgment.

Assumption 6:
Continuation costs cannot reduce error.

C. Theory—Discovery Phase

To determine the DPEM model, this Article takes the expected error of denying additional discovery and sets it on the opposite side of an inequality from the expected error of allowing additional discovery. The expected error of denying additional discovery appears as follows:

$$C_0 + (\phi_{S_0})(1 - \pi_{S_0})(J_0) + (1 - \phi_{S_0})(\pi_{W_0})(J_0).$$

It is—in the scenario when the discovery at issue is denied—estimated continuation costs for the defendant (C_0), plus the estimated probability of finding liability (ϕ_{S_0}) times the estimated probability of doing so incorrectly $(1 - \pi_{S_0})$ times the estimated value of the judgment (J_0), plus the estimated probability of not finding liability $(1 - \phi_{S_0})$ times the estimated probability of doing so incorrectly (π_{W_0}) times the estimated value of the judgment (J_0). In other words, it is the expected value of continuation costs and of landing on an incorrect result after having denied additional discovery.

The expected error of allowing additional marginal discovery is calculated the same way, except in the scenario when the discovery at issue is allowed:

$$C_1 + (\phi_{S_1})(1 - \pi_{S_1})(J_1) + (1 - \phi_{S_1})(\pi_{W_1})(J_1).$$

It is the expected value of continuation costs and of landing on an incorrect result even though the additional discovery was allowed.

Pitting the two expressions against one another yields an error minimizing model for discovery-phase motions:

$$C_0 + (\phi_{S_0})(1-\pi_{S_0})(J_0) + (1-\phi_{S_0})(\pi_{W_0})(J_0)$$
$$\lesseqgtr$$
$$C_1 + (\phi_{S_1})(1-\pi_{S_1})(J_1) + (1-\phi_{S_1})(\pi_{W_1})(J_1)$$

When the left side is smaller, the expected error of denying additional discovery is smaller, and therefore additional discovery should be denied or the requesting party should pay for it.[42] When the right side is smaller, the expected error of granting additional discovery is smaller, and therefore additional discovery should be granted.

The model can also be expressed more elegantly by subtracting the left side from the right, which equals the change in expected error from allowing the discovery at issue, or μ.[43] The resulting inequality is as follows:

$$0 \lesseqgtr \mu$$

When μ is negative, the decrease in expected error from getting an incorrect result after allowing the additional discovery outweighs the increase in expected error from the cost of that additional discovery, and therefore the additional discovery is cost justified and should be allowed. When μ is positive, the increase in expected error from the cost of the additional discovery eclipses the decrease in expected error from getting an incorrect result after allowing the additional discovery, and therefore the additional discovery is not cost justified and should be denied, or the requesting party should pay for it.[44]

42 The court ordered such a cost-shift in *Boeynaems v LA Fitness International, LLC*, 285 FRD 331, 341–42 (ED Pa 2012).

43 $\left(C_1 + (\phi_{S_1})(1-\pi_{S_1})(J_1) + (1-\phi_{S_1})(\pi_{W_1})(J_1)\right) - (C_0 + (\phi_{S_0})(1-\pi_{S_0})(J_0) + (1-\phi_{S_0})(\pi_{W_0})(J_0)) = \mu$

44 Consider how this model could apply in a case like the one in *Moore v Publicis Groupe*, 287 FRD 182 (SDNY 2012). In *Moore*, the litigants agreed to computer-assisted review to score and rank the responsiveness of many thousands of potentially responsive documents. Id at 189. Defendants then proposed that they produce only the top 40,000 most responsive documents (as ranked by the computer and at an estimated cost to the defendant of $5 per document). Id at 185. The plaintiffs objected to that arbitrary stop-point and the court agreed, ruling that there needed to be additional analysis before further production could be halted. Id. The court outlined lessons for the future to take away from the its decision: first, that courts should look for the point at which "there is a clear drop off from highly relevant to marginally relevant to not likely to be relevant documents" to determine when to stop discovery; and second, courts should stage "discovery by starting with the most likely to be relevant sources." Id at 192. This sort of

By way of example, if a judge estimates that, if the discovery at issue is denied, continuation costs will amount to $30,000; that the probability of finding the defendant liable is 20 percent; that, if the defendant is found liable, the probability that they will be truly responsible is 60 percent; that, if the defendant is not found liable, the probability that they will be truly responsible is 10 percent; and that the estimated judgment value will equal $1,300,000; then the expected error of denying the discovery at issue will amount to $238,000.

$$C_0 + (\phi_{S_0})(1 - \pi_{S_0})(J_0) + (1 - \phi_{S_0})(\pi_{W_0})(J_0)$$
$$=$$
$$30{,}000 + 0.2(1 - 0.6)(1{,}300{,}000) + (1 - 0.2)(0.1)(1{,}300{,}000)$$
$$=$$
$$238{,}000$$

If the judge then estimates that, if the discovery at issue is allowed, continuation costs will amount to $150,000; that the probability of finding the defendant liable will be 20 percent; that, if the defendant is found liable, the probability that they will be truly responsible is 90 percent; that, if the defendant is not found liable, the probability that they will be truly responsible will be 10 percent; and that the estimated judgment value will equal $1,300,000; then the expected error of denying the discovery at issue will amount to $280,000.

analysis is similar to the marginal analysis that the DPEM model is designed for. Framed properly, it can minimize error by finding the point at which producing the $n + 1^{th}$ document is no longer justified because the probative benefit is outweighed by the impact on discovery costs and likelihood of producing erroneous judgments. That point can be found by finding the point at which $\mu = 0$. The court did not advocate for a one-by-one review in this case, instead establishing forty thousand documents as the point at which the plaintiff may have to start paying for the cost of additional discovery. Id at 202. However, without saying so explicitly, the court may have determined that forty thousand documents was the point at which $\mu = 0$, and even if the court did not make such a determination, the court in this case laid out a framework that would facilitate the use of DPEM in the future.

$$C_1 + (\phi_{S_1})(1 - \pi_{S_1})(J_1) + (1 - \phi_{S_1})(\pi_{W_1})(J_1)$$
$$=$$
$$150{,}000 + 0.2(1 - 0.9)(1{,}300{,}000) + (1 - 0.2)(0.1)(1{,}300{,}000)$$
$$=$$
$$280{,}000$$

Allowing the discovery at issue would yield a greater expected error than denying it, and the discovery should therefore *not* be allowed. Or, said differently:

$$238{,}000 - 280{,}000 = -42{,}000 = \mu$$
$$\therefore$$
$$0 > \mu$$
$$\therefore$$
the discovery at issue should *not* be allowed

If, however, the judge makes the exact same estimates except that this time continuation costs would be only \$70,000 if the discovery at issue is allowed, then the expected error of allowing the discovery at issue would amount to \$200,000.

$$C_1 + (\phi_{S_1})(1 - \pi_{S_1})(J_1) + (1 - \phi_{S_1})(\pi_{W_1})(J_1)$$
$$=$$
$$70{,}000 + 0.2(1 - 0.9)(1{,}300{,}000) + (1 - 0.2)(0.1)(1{,}300{,}000)$$
$$=$$
$$200{,}000$$

In this case, allowing the discovery at issue would yield a *lesser* expected error than denying it, and the discovery should therefore be allowed. Or, said differently:

$$238{,}000 - 200{,}000 = 38{,}000 = \mu$$
$$\therefore$$
$$0 < \mu$$
$$\therefore$$
the discovery at issue should be allowed

IV. Discussion—Unifying Rules of Decision Across All Phases

One would think that courts would approach MTD decisions in a way that is similar to the way they approach intradiscovery decisions (such as when to allow, or shift the cost of, certain discovery). After all, both decisions are (or should be) concerned with weighing continuation costs against the probative benefit of evidence. And yet pleading-phase MTDs and discovery-phase motions use different decision-making criteria. But explicitly applying an error minimizing approach to discovery-phase decisions the way this Article applied it to the pleading-phase MTD decision can unify the two as well as unify both with the error minimizing theory behind the preponderance of the evidence threshold.

Under a unified approach, the court would apply the PPEM model at the pleading phase to estimate whether proceeding with the case as a whole would minimize error; in the discovery phase, the court would apply the DPEM model to estimate whether allowing specifically requested discovery would minimize error; and at verdict/judgment, the court would apply the preponderance of the evidence threshold (which, as mentioned above, Professor Kaye showed was an error minimizing rule of decision).[45] Error minimizing approaches can be successfully applied in all three settings, and doing so would unify the decision-making criteria for prediscovery, intradiscovery, and postdiscovery decisions, thereby mending the peculiar disconnect between the doctrines governing pleading, discovery, and verdict/judgment.

Unifying the doctrines governing pleading and discovery is appealing from a theoretic standpoint, but it also has the potential to yield practical benefits. Consider instances when, in arguing for an MTD, defendants play up their expectation that discovery costs will be extortionately large; but then when the time comes to determine the scope of discovery, those same defendants flip-flop and argue for a scope that is far smaller than the terrifying one they argued would be inevitable at the pleading phase. In both phases, the defendant has an incentive to posit a discovery scope that diverges from what an honest assessment

45 See text accompanying note 21.

would suggest is appropriate.[46] Unifying the doctrines by adopting the PPEM and DPEM models would highlight the absurdity of defendants' flip-flopping and may incentivize them to posit more honest assessments, lest they risk losing credibility.

Alternatively, one could imagine a policy innovation whereby pleading-phase arguments that hinge on a specific scope of discovery presumptively lock the litigant into that posited scope at the discovery phase. So the defendant who in their MTD argues that dismissal is justified because the scope of discovery will be vast if the case continues would in effect waive the discovery-phase argument that vast discovery would be unjustified. The defendant might therefore have an incentive to posit an honest scope of discovery at the pleading phase.[47] That could be particularly helpful to courts, since the defendant is oftentimes in the best position to determine ex ante what the universe of responsive information actually looks like. In fact, it may even be helpful in cases like those discussed in Part II, above, in which courts have to determine MTDs based on pleadings that are relatively threadbare because defendants have exclusive control of critically responsive information. In those instances, although defendants would have exclusive control of responsive information, they may also have an incentive to provide an honest assessment of the scope of that information, which could help courts make MTD decisions from a more informationally advantaged position.

Finally, it is worth noting that the DPEM model looks strikingly similar to the recently revised FRCP 26(b)(1). The revision to Rule 26(b)(1) explicitly added concerns regarding the interplay of discovery costs, stakes, and merits, explaining that

46 Plaintiffs face similar incentives but pointed in the opposite direction. So they may play down the potential scope of discovery in order to survive MTDs, but then after the MTD is denied go on to argue for expansive discovery.

47 Professor Levmore has suggested a similar tack for revealing honest self-assessments of idiosyncratic property value. Levmore suggests that property owners could announce the value of their own property and that their announced value would be used to determine property tax assessments. Of course, considering that phase alone, owners would have an incentive to value their property at $0. But Levmore goes on to suggest that government or private parties could acquire the property at that announced price. So too low of a price ensures a low tax bill but also risks losing the property at a deficient price. Too high of a price could yield a surplus upon sale (or deter sale), but it spurs a high tax bill in the meantime. Owners, therefore, have an incentive to posit an honest assessment of the property's idiosyncratic value. See Saul Levmore, *Self-Assessed Valuation Systems for Tort and Other Law*, 68 Va L Rev 771, 778–779, 784–90 (1982).

> [p]arties may obtain discovery regarding any nonprivileged matter that is relevant to any party's claim or defense *and proportional to the needs of the case*, considering the importance of the issues at stake in the action, *the amount in controversy, the parties' relative access to relevant information*, the parties' resources, *the importance of the discovery in resolving the issues, and whether the burden or expense of the proposed discovery outweighs its likely benefit*.[48]

And, interestingly, some courts have interpreted the revised Rule 26(b)(1) as calling for a sliding scale analysis that appears to operate similarly to how the DPEM model would work. For example, in *Westfield Insurance Co v Icon Legacy Custom Modular Homes*,[49] the Middle District of Pennsylvania wrote the following:

> [A]pplying the proportionality mandate of amended Rule 26(b)(1) . . . the Rule contemplates a sliding scale analysis: demonstrably relevant material should be discoverable in the greatest quantities and for the most varied purposes; however, less relevant material should be incrementally less discoverable—and for more limited purposes, as the relevancy diminishes. This approach prevents district courts from imposing an inordinate and expensive burden only to obtain discovery materials that are likely to be marginally relevant at most.[50]

The similarity between the DPEM model and the revised FRCP 26(b)(1) suggests that error minimization may already be the dominant guiding principle for discovery-phase rules of decision. To the extent that is true, it makes for an even more compelling reason to adopt the PPEM model and unify pleading, discovery, and verdict/judgment phase rules of decision.

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48 FRCP 26(b)(1) (emphasis added).

49 321 FRD 107 (MD Pa 2017).

50 Id at 118 (quotation marks and citations omitted).

CONCLUSION

This Article set out to answer a question whose brevity belies its complexity: How probable is "plausible"? Despite being one of the most commonly touched concepts in all of federal civil practice, "plausibility" remains poorly defined. This Article has attempted to remedy that by starting from a normative standpoint (that is, error minimization), then taking a step forward by formally defining the optimal pleading threshold within that context (that is, defining the PPEM model), and then stepping forward once more by using empirical data in parallel with the PPEM model to make an actual numerical estimate that provides a sense of the normative plausibility threshold's location (on average, ≥12.2 percent). And in the process, this Article made some surprising revelations, including that it may not make sense to conceptually segregate "the merits" of pleadings from things like class size and asymmetric control of responsive information, and that there are instances in which even extremely persuasive pleadings should be dismissed.

Applying an error minimization framework at the pleading phase drew into high relief the strange reality that some courts seem to use different theories and approaches to address similar decisions at various case phases. This Article attempted to remedy that peculiar divergence by constructing the DPEM model, which could be used in concert with the PPEM model and preponderance rule to unify the rules of decision at the pleading, discovery, and verdict/judgment phases. Further, this Article showed how the unified theory could be used to manifest real world benefits, such as by incentivizing litigants to present at the pleading phase more honest assessments of their expected scope and cost of discovery.

Ultimately, unlike the preponderance of the evidence threshold, "plausibility" cannot be boiled down to a single number. But it nevertheless represents substantial progress to present a formal normative definition of "plausibility," to unify the theories of rules of decision, and to make the empirically-based estimation that the plausibility threshold should on average be no less than 12.2 percent.

APPENDIX

A. Illustration of the Motion to Dismiss Decision and Its Associated Expected Error

<table>
<tr><th>Pleading phase</th><th>Postpleading phase</th><th>Verdict/Judgment phase</th><th>Defendant is truly responsible
(probability = π_S OR π_W)</th><th>Defendant is truly not responsible
(probability = $1-\pi_S$ OR $1-\pi_W$)</th></tr>
<tr><td rowspan="2">Deny MTD</td><td rowspan="2">Expected error
=
Expected continuation costs
=
C</td><td>Find liable
(probability = ϕ_S)</td><td>TRUE POSITIVE
Expected error
=
0</td><td>FALSE POSITIVE
Expected error
=
(probability that defendant will be found liable)
*
(probability that defendant is truly not responsible)
*
(expected award)
=
$(\phi_S)(1-\pi_S)(J)$</td></tr>
<tr><td>Do not find liable
(probability = $1-\phi_S$)</td><td>FALSE NEGATIVE
Expected error
=
(probability that defendant will be found not liable)
*
(probability that defendant is truly responsible)
*
(expected award if the defendant had been found liable)
=
$(1-\phi_S)(\pi_W)(J)$</td><td>TRUE NEGATIVE
Expected error
=
0</td></tr>
<tr><td rowspan="2">Grant MTD</td><td rowspan="2"></td><td rowspan="2"></td><td>Defendant is truly responsible
(probability = π)</td><td>Defendant is truly not responsible
(probability = $1-\pi$)</td></tr>
<tr><td>FALSE NEGATIVE
Expected error
=
(probability that defendant is truly responsible)
*
(expected award if the defendant had been found liable)
=
$(\pi)(J)$</td><td>TRUE NEGATIVE
Expected error
=
0</td></tr>
</table>

Expected error if MTD is granted: $(\pi)(J)$

Expected error if MTD is denied: $C + (\phi_S)(1 - \pi_S)(J) + (1 - \phi_S)(\pi_W)(J)$

Expected error of granting vs. denying MTD: $(\pi)(J) \lesseqgtr C + (\phi_S)(1 - \pi_S)(J) + (1 - \phi_S)(\pi_W)(J)$

PPEM MODEL COMPARATIVE STATICS

Manipulating one variable at a time illustrates the dynamics of the PPEM model.

C has a positive linear relationship with τ_P and no relationship with π. So increasing C causes τ_P to increase (at a rate influenced by J) but has no impact on π. Therefore, all else equal, as C increases, so does the likelihood that τ_P becomes greater than π and thus that the MTD should be granted. This comports with intuition, as—all else equal—higher estimated continuation costs (which constitute error) should militate against continuation.

In contrast, J has a negative nonlinear relationship with τ_P and no relationship with π. So increasing J causes τ_P to decrease (at a diminishing rate influenced by C) and has no impact on π. Therefore, all else equal, as J increases, so does the likelihood that τ_P becomes lesser than π and thus that the MTD should be denied. This also jibes with intuition, as—all else equal—higher estimated judgment values (the wrongful dismissal of which constitutes error) should militate against dismissal.

π_W, π_S, and ϕ_S are different from C and J in that they are factors of both τ_P and π.[51] As a result, by definition it is always the case that $\pi \geq (\phi_S(1-\pi_S) + (1-\phi_S)\pi_W)$,[52] but the values of π_S and ϕ_S are nevertheless important because they impact the size of the gap between π and $(\phi_S(1-\pi_S) + (1-\phi_S)\pi_W)$.[53] And in order to figure out whether any given MTD should be granted or denied, all we need to know is whether or not C/J overcomes that gap. When it does, $\pi < \tau_P$ and the MTD should be granted. When C/J does not overcome the gap between π and $(\phi_S(1-\pi_S) + (1-\phi_S)\pi_W)$, then $\pi > \tau_P$ and the MTD should be denied. The bigger the gap, the less likely it is that any given $\frac{C}{J}$ will exceed it and thus the more likely it is that the MTD should be denied. The smaller the gap, the more likely it is that any given $\frac{C}{J}$ will exceed it and thus the more likely it is that the MTD should be granted. Understanding this dynamic helps to understand the comparative statics for π_W, π_S, and ϕ_S.

51 $\tau_P = \frac{C}{J} + (\phi_S(1-\pi_S) + (1-\phi_S)\pi_W$ and $\pi = \phi_S(\pi_S) + (1-\phi_S)\pi_W$. See Part I.D; Part I.E.

52 Given that, by definition, $\pi = \phi_S(\pi_S) + (1-\phi_S)\pi_W$ and $\pi_S > 0.5$, it is always the case that $\phi_S(\pi_S) + (1-\phi_S)\pi_W \geq \phi_S(1-\pi_S) + (1-\phi_S)\pi_W \therefore \pi \geq \phi_S(1-\pi_S) + (1-\phi_S)\pi_W$. See Part II.D.

53 π_W turns out to be unimportant for reasons described later in this Appendix.

π_W has an equally positive linear relationship with both τ_P and π, and therefore has no impact on the gap between π and $(\phi_S(1-\pi_S)+(1-\phi_S)\pi_W)$. Thus, although varying π_W varies the expected error of both dismissal and continuation, it does not directly impact the MTD decision. The intuition behind this is that, all else equal, the estimated anterior failure to find liability via a granted MTD represents an equal amount of error as the estimated posterior failure to find liability via an incorrect verdict/judgment.

π_S, on the other hand, has a negative linear relationship with τ_P, but a positive linear relationship with π. Increasing π_S expands the gap between π and $(\phi_S(1-\pi_S)+(1-\phi_S)\pi_W)$, making it less likely that any given C/J covers the gap, and thus makes it more likely that the MTD should be denied. So as the strength of the posterior strong case increases so too does the expected error of a premature dismissal, while at the same time the expected posterior error via a false liability verdict/judgment decreases.

Finally, ϕ_S has a complex relationship with τ_P—varying in sign and elasticity depending on whether π_S and π_W sum to be greater than, less than, or equal to 1—[54] but a simple positive linear relationship with the size of the gap between π and π_W. Simply put, as ϕ_S increases, the amount by which π exceeds π_W also increases, thereby decreasing the likelihood that any given C/J covers the gap. Thus, as ϕ_S increases, it becomes more likely that the MTD should be denied. Intuitively, this means that, all else equal, dismissal is less justifiable when courts are more confident that they will ultimately land on a verdict/judgment of liability and do so correctly.

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54 When $\pi_S+\pi_W>1$ the relationship between ϕ_S and τ_P is negative and linear. And the farther above 1, the steeper the slope of the negative linear relationship between ϕ_S and τ_P. When $\pi_S+\pi_W<1$ the relationship between ϕ_S and τ_P is positive and linear. And the farther below 1, the steeper the slopes of the positive linear relationship between ϕ_S and τ_P. When $\pi_S+\pi_W=1$ the relationship between ϕ_S and τ_P is absolutely inelastic. And in those situations when $\pi_S+\pi_W=1$, as the distance between π_S and π_W increases, τ_P decreases. This is because when π_S is closer to 1 and π_W is closer to 0, whether the court finds liability or no liability, it is less likely to do so erroneously than when π_S and π_W are closer to 0.5.