

On Uncertainty, Ambiguity and Contractual Conditions*

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1 Introduction

In the summer of 2007, weeks before credit markets betrayed a fragility that would later escalate into global crisis, two American chemical corporations executed a landmark merger. In a \$10 billion leveraged acquisition, Hexion Specialty Chemicals Inc. (“Hexion”)¹ agreed to purchase all outstanding shares of the Huntsman Corporation (“Huntsman”) for \$28 cash per share, a price representing an approximate forty percent premium over Huntsman’s trading value.² As is typical with such transactions, the written merger agreement contained a litany of warranties, representations, terms and conditions, including a cancellation fee, due diligence obligations, and assorted contingencies and exclusions related to Hexion’s financing, company solvency, regulatory clearance, and shareholder approval. The conditions also included a commonly-used *force majeure* provision known as a "material adverse change" / "material adverse event" clause (sometimes known

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¹Hexion is in turn owned by the private equity firm Apollo Management.

²More precisely, Huntsman had previously entered into an acquisition agreement with Basell A.F., which Hexion (itself a controlled subsidiary of Apollo Management LP) topped by 8%. The figure reported in the text reflects the premium over Huntsman’s stock price before it was "in play."

as a MAC/MAE), which expressly conditioned Hexion's obligation to close on "the absence of any ... occurrence, condition, change, event or effect that is materially adverse to the financial condition, business, or results of operations of [Huntsman] taken as a whole."³ Deal in hand, the two companies set course on a due diligence process that – while costly, arduous and time consuming – also promised lucrative results. Once closed, the Hexion-Huntsman merger would result in the world's largest specialty chemical company, a fact not lost on Hexion's CEO, who ebulliently described the acquisition as " 'a great opportunity to create a world-class company with leading-edge products and technologies' and a more global reach, especially 'in the high-growth Asia-Pacific region.' "⁴

A folk proverb from the American West teaches that timing is the most critical ingredient of a successful rain dance. If so, then Hexion and Huntsman began their proverbial dance – perhaps unwittingly – on the eve of an unprecedented drought. Within weeks of the announcement, worldwide credit tightened, acquisition targets lost value, and capital markets commenced a headlong swoon into deepening uncertainty and pessimism. Huntsman, evidently not immune to these trends, also began releasing extremely disappointing financial reports; so disappointing, in fact, that Hexion's attorneys started to scour the deal for plausible escape hatches. And so it came to pass that in June 2008 – eleven months after announcing the acquisition – Hexion appeared before the Delaware Chancery Court seeking declarations that (a) the combined company would be insolvent (thereby

³In addition the clause went on to list exceptions (or "carve outs") to the definition of an MAE:

provided, however, that in no event shall any of the following constitute a Company Material Adverse Effect: (A) any occurrence, condition, change, event or effect resulting from or relating to changes in general economic or financial market conditions, except in the event, and only to the extent, that such occurrence, condition, change, event or effect has had a disproportionate effect on the Company and its Subsidiaries, taken as a whole, as compared to other Persons engaged in the chemical industry; (B) any occurrence, condition, change, event or effect that affects the chemical industry generally (including changes in commodity prices, general market prices and regulatory changes affecting the chemical industry generally) except in the event, and only to the extent, that such occurrence, condition, change, event or effect has had a disproportionate effect on the Company and its Subsidiaries, taken as a whole, as compared to other Persons engaged in the chemical industry . . .

Id. Such carveouts are relatively common in these sorts of terms. See Section 4, *infra*.

⁴The Wall Street Journal, *Why Apollo Was So Keen To Acquire Huntsman*, by Kevin Kingsbury and Ana Campoy, 13 July 2007, at A7.

excusing its performance), (b) a material adverse event had occurred (also excusing its performance), and (c) that in any event, Hexion's maximal exposure for breaching the contract would be limited to the \$325 million cancellation fee in the merger agreement.

In late September 2008, following a six day bench trial, Vice Chancellor Lamb issued his much anticipated ruling on Hexion's declaratory judgment action.⁵ Its eighty-nine pages delivered a stunning rebuke. Lamb first rejected Hexion's assertion that the combined company would be insolvent, holding that Hexion had strategically doctored both companies' earnings projections, effectively engineering an insolvency opinion from its financial adviser, thereby rendering it unreliable. Second, he found that notwithstanding the language of the MAE clause – which bore the linguistic markers of a *condition precedent* – he would nonetheless construe it as a *condition subsequent*. The practical implication of this finding is that it placed the burden squarely on Hexion's shoulders (rather than Huntsman's) to prove that a material adverse event had occurred.⁶ Hexion, he concluded, had not met this burden. Finally, Lamb held that because Hexion's duties were not excused, it had knowingly and intentionally breached numerous covenants of the agreement, and consequently was subject to specific performance of the transaction (or in the alternative, damages unbounded by the cancellation fee, possibly exceeding the \$10 billion purchase price).⁷ Almost immediately, the ruling generated shock waves through the M & A community that continue to this day.⁸

In some respects, the Hexion-Huntsman saga may be little more than an aberration. As observers noted as far back as 2007, the deal contained a

⁵Hexion Specialty Chemicals, Inc., v. Huntsman Corp., C.A. No. 3841-VCL (Del. Ch. Sept. 29, 2008).

⁶Although the MAE provision was stated in the Representations and Warranties section of the merger agreement, compliance with the representations and warranties was later enumerated as one of many "Conditions Precedent" to closing. Merger Agreement para. 6.2(a).

⁷Id. at 4-5.

⁸Although far from a scientific inquiry, as of mid-November, 2008, there had been more than a quarter of a million Google searches related to the dispute between the companies.

The case also began toppling a string of high-profile litigation dominos between Hexion, Huntsman, and the debt capital providers for the deal, Deutsche Bank and Credit Suisse. After the Chancery Court ruling, both banks refused to fund the deal, citing their own MAE provisions with Hexion. The banks have since been sued by both Hexion (in New York) and Huntsman (in Texas) for their refusal to move forward. Both trials are slated for early 2009.

During this saga, Huntsman's shares have plummeted – By mid-November, 2008, it was trading at below \$9 per share.

number provisions that – while not unheard of individually – aggregated to an agreement that was peculiarly advantageous to the seller.⁹ These terms included a specific performance clause, a clause requiring Hexion to use best efforts to enforce financing commitments from third parties, relatively lax buyer-side covenants, and a “hell or high water” clause requiring Hexion to take all actions necessary to make the deal pass regulatory muster. In light of these provisions, Lamb’s unsentimental censure of Hexion was perhaps as unsurprising as it was understandable. After all, the parties had entered into a contract that they knew involved risks, and yet they chose to proceed in an expedited fashion and on seller-friendly terms. To excuse Hexion’s obligations now would be to violate the very risk allocation decisions that largely defined the deal. In short, Hexion had concocted a noxious stew of speculation, leverage and peril, and Vice Chancellor Lamb was now merely compelling it to eat its own cooking.

But if the facts of the case were so idiosyncratic, what explains the tremendous attention (and apprehension) that the case attracted within the business law community? Perhaps it had something to do with the financial stakes involved, the profile of the companies / law firms, or the morbid fascination that any public train wreck attracts. Yet, while the Hexion-Huntsman dispute had all these factors, so do many others. It is more likely, I conjecture, that notwithstanding its unique attributes (indeed possibly *because* of them), the Hexion-Huntsman deal provides a benchmark for the thousands of corporate and commercial transactions undertaken before the current financial crisis began, and which are now proceeding in an economic environment filled with unpredictability and ambiguity.¹⁰ The case gives us pause precisely because it raises the possibility that *any* contract, even a corporate acquisition negotiated by sophisticated attorneys, may have been ill equipped to deal with the wild gyrations that have char-

⁹See, e.g., New York Times, Huntsman-Hexion: A Deal Agreement to Applaud (January 11, 2008) (at <http://dealbook.blogs.nytimes.com/2008/01/11/huntsman-hexion-a-deal-agreement-to-applaud/>).

¹⁰As one notable firm’s client letter put it:

"While the Hexion Court has not created controversial precedent, the facts and circumstances of this case are nonetheless instructive to dealmakers and their deal counsel in drafting and negotiating merger agreement provisions, especially in the present environment of illiquid credit markets and extraordinary market occurrences."

Milbank Client Alert, October 13, 2008 (available at http://www.milbank.com/NR/rdonlyres/80BBC5CF-BAB0-4C88-8206-FEF197238729/0/Hexion_v_Huntsman.pdf)

acterized capital markets during the last year. At core, *Hexion* invites us to reevaluate the very nature of contracting itself, and how the law does (or should) excuse contractual commitments within environments of extreme unpredictability. The analytic domain of this question, in turn, may transcend the narrow (though important) boundaries of MAC/MAE clauses, applying to numerous other contract doctrines, such as constructive conditions, material breach, frustration of purpose, impracticability, and mutual mistake.

This essay uses the *Hexion* case to motivate some preliminary thoughts about how contract law should interpret contractual conditions in general – and MAC/MAE provisions in particular – within environments of extreme ambiguity. I advance the thesis that contract law and doctrine must be sensitive to two different sources of randomness: *risk* and *uncertainty*. "Risk" refers to randomness whose probabilistic nature is extremely familiar and can be characterized with objective probabilities (such as the outcome odds that attend the roll of a fair die). "Uncertainty," in contrast, refers to randomness whose probabilistic behavior is extremely unfamiliar, unknown, or even unknowable. Although this distinction was historically neglected in classical economics (and much of law and economics), it is now relatively common fare in the behavioral economics/finance literatures.¹¹ If an individual is willing to expend resources to avoid uncertainty (as distinct from risk), she is said to be *ambiguity averse*.¹²

I argue below that while ambiguity aversion bears some facial similarity to risk aversion, an optimal contractual allocation of uncertainty does not always track the optimal allocation of risk. Consequently, if ambiguity averse parties operate amidst both uncertainty and risk, they will prefer contract terms that are sensitive to both phenomena. In particular, the prospect of later uncertainty can dampen (sometimes substantially) the benefit that the parties perceive from carrying out their transaction. When such prospective uncertainty becomes extreme, moreover, an optimal contract can respond in an analogously extreme way, calling for complete contractual rescission (effectively reimposing autarky).

After establishing these intuitions as a conceptual proposition, I then endeavor to test them empirically, using a unique data set of 528 actual MAC/MAE provisions in corporate acquisitions transactions between 2007 and 2008. Using this data, I devise a simple set of "scores" meant to

¹¹In fact, the origins of the risk/uncertainty distinction trace back nearly a century, to Knight (1921).

¹²See Camerer & Weber (1992).

capture the breadth of MAC/MAE provisions within each deal. Consistent with an ambiguity aversion account, I find MAC/MAE breadth to be consistently responsive to market uncertainty prevailing at the time of negotiation: As the market uncertainty grows (controlling for other observable variables), the ensuing MAC/MAE provisions tend to become increasingly expansive.¹³ The positive relationship between MAC/MAE breadth and market uncertainty, moreover, appears robust across industries and as well as all combinations of public and private acquirers and targets. In contrast, conventional measures of risk used in corporate finance have little or no predictive power on the breadth of MAC/MAE provisions (although they do have a predictive effect on the value of consideration paid). These findings provide preliminary support for the proposition that acquisition agreements respond to the presence of "ambient" uncertainty by expanding the scope and coverage of MAC/MAE provisions.

Although the idea that MAC/MAE provisions are a means for allocating uncertainty is intuitive, it contrasts with the received wisdom in corporate law scholarship about the nature and purpose of such terms. In an important treatment of the topic,¹⁴ Ron Gilson and Alan Schwartz advanced the thesis that MAC/MAE terms serve not as an uncertainty allocation or risk allocation device, but rather as a means for providing incentives for sellers to make investments that complement the deal's "synergies." By arming the buyer with a credible threat to abandon the deal, they argue, MAC/MAE conditions impose an actuarial cost on sellers who fail to invest adequately. Their moral hazard account of MAC/MAEs has proven to be influential among numerous scholars and judges.¹⁵

Gilson and Schwarz's moral hazard story is not mutually exclusive with ambiguity aversion as a general matter. It is conceivable that MAC/MAEs serve both purposes (and perhaps others) simultaneously. The 2007-08 data I study here, however, do not appear to bear this possibility out, rendering

¹³To capture market uncertainty, I use the Chicago Board of Exchange's 'VIX' index, sometimes referred to as the "fear index". For a discussion of the relationship between VIX and market uncertainty, see TAN __ - __, *infra*.

¹⁴Gilson & Schwartz (2005).

¹⁵Outside of the Gilson & Schwartz framework, there may other plausible reasons for parties to adopt MAC/MAE provisions. A number of practitioners interviewed for this essay report that MACs create a reference point around which to encourage deal restructuring when necessary. Alternatively, MACs may create a counter-ballast against private information, misrepresentation, or fraud. Many of these alternative accounts are consistent with (and may even be complementary to) ambiguity aversion. See TAN __ - __, *infra*.

the moral hazard argument somewhat less convincing.¹⁶ In any event, the role of ambiguity aversion may prove to be significant over the months and years to come, as courts, practitioners and legal scholars increasingly confront the challenge of how to interpret analogous terms within an uncertain economic environment.

A few caveats deserve specific mention before proceeding. First, my conceptual analysis employs a somewhat familiar utilitarian/contractarian framework, albeit one that is rooted in behavioral economics. Specifically, I am interested in understanding the characteristics of an "optimal contract" between the parties, which I equate with the terms that maximize the parties' perceived payoffs as of the time of contracting. This characterization largely spawns both (a) a prediction of the express contract terms the parties adopt if bargaining / drafting were costless *ex ante*, and (b) a prescription about what implied (majoritarian) terms courts should employ to save the parties from the costs of such express contracting. I do not explore non-utilitarian normative frames, such as the morality of promise keeping, or corrective justice commitments. Nor do I explore (possibly) utilitarian normative frames concerning minimizing the workload of courts, or forcing information about prospective ambiguity from an informed party. While these too may be worthy alternative normative perspectives, I have nothing to say about them here.

A related point concerns the capability limitations of a utilitarian / contractarian approach as a normative frame within the realm of behavioral economics. As is well documented,¹⁷ the very notion of utilitarian "social welfare" can lose some / much of its meaning when parties' preferences do not remain constant through time or across cognitive domains. In such situations, a utilitarian normative goal would not only have to consider what policy choices maximize some measure of welfare for a given set of utility functions, but also would have to compare across different utility functions as they shift across domains and time (possibly in a manner that is endogenous to the legal rule itself). Not only is this reasoning complex (and possibly underdetermined), but in contractual settings it also raises the possibility that courts should resist simply effectuating the *ex ante* intent of the parties, and should instead entertain more paternalistic goals. This is complicated terrain for normative economic theory. Here, fortunately, my normative commitments are much more practical: Within contract law settings, if the application of a doctrine strays too far from the parties' *ex ante* interests (or

¹⁶I will speculate as to why in Section 4, *infra*.

¹⁷See, e.g., Heifetz, Segev & Talley (2007).

at least their perceptions of them), the parties can be expected to subvert it through substantially more detailed (and costly) express terms, seeking alternative adjudicative fora (such as arbitration), or simply choosing not to contract. Consequently, even if *ex ante* contractarianism within behavioral economics is a troubled normative frame, the volitional nature of contracting implies that courts may not be able to stray too far from it. Viewed in this sense, contractarianism still makes a great deal of sense, but on pragmatic (rather than ideal theory) grounds.¹⁸

The remainder of this essay proceeds as follows. Section 2 briefly describes the distinction between risk and uncertainty, and canvasses the current status of the ambiguity aversion literatures within behavioral finance, economics and law. Section 3 develops a simple numerical example of contracting in environments of risk and uncertainty. Using this example, I show that if one or more parties is ambiguity averse, and if the surplus from contracting is subject to uncertainty, then the terms of the resulting agreement will generally reflect those preferences. In cases where prospective ambiguity is particularly severe, an optimal contract / interpretive scheme may permit the contract to be voided entirely. In Section 4, I test the intuitions generated by this example empirically, using data from acquisitions agreements announced between 2007 and 2008. I find that the breadth and reach of MAE clauses appears consistently related to the market uncertainty during negotiations. This effect persists, moreover, when one controls for risk attributes, industry effects, acquirer characteristics, and financial control variables. Section 4 proceeds to discuss how one might apply the intuitions developed earlier to two well-known cases involving the interpretation of MAC/MAE provisions. Section 5 concludes.

2 A Brief Tour through Ambiguity Aversion

In order to set the stage for later discussion, this section presents a brief review of the distinction between ambiguity and risk, and the related concept of ambiguity aversion. Because this literature is now quite large (and still growing), I cannot canvass it in its entirety. I will instead concentrate on some of its core insights, particularly within law, economics and corporate finance.

Ambiguity aversion is a phenomenon that grows out of the distinction between *risk* and *uncertainty*. As noted in the introduction, "risk" refers to

¹⁸Cf. Triantis (1992) (noting that cognitive errors and biases may simply place a limit on the potential for contract law).

a type of randomness about which we are sufficiently familiar to characterize with objective probabilities. "Uncertainty" refers to randomness whose probabilistic behavior is extremely unfamiliar, unknown, or perhaps even unknowable. Perhaps the most cited example of this distinction (at least until recently¹⁹) is the canonical thought experiment originally proposed by Daniel Ellsberg.²⁰ An individual is asked to choose between two mutually exclusive gambles associated with selecting a ball at random from one of two urns: "Urn A" is known to contain 100 balls, consisting of 50 red balls and 50 blue balls; "Urn B" is also known to contain 100 red and blue balls, but their frequencies are left unspecified. Regardless of which gamble she chooses, the individual is told that she will win a monetary prize (say \$100) if and only if a *blue* ball is selected from her chosen urn. In this setting, Ellsberg conjectured that most subjects would strictly prefer the Urn A gamble over the Urn B gamble. Ellsberg further conjectured, however, that were the experimenter to reverse the stakes, so that the monetary prize in each gamble ensues if and only if a *red* ball is chosen, most individuals would continue strictly to prefer Urn A to Urn B. Although Ellsberg did not attempt to test the predictions of his thought experiment, they have been largely confirmed in experimental settings, in both within- and between-subject settings.²¹

Ellsberg's explanation for Urn A's persistent attractiveness is that it represents pure risk rather than uncertainty: That is, in Urn A it is clear that the probability of a blue ball is precisely 1/2, neither more nor less. Urn B's randomness, in contrast, is imprecise in a way that reflects uncertainty: That is, even the *probability* of drawing a blue ball from Urn B is itself unknown. All else constant, Ellsberg conjectured, most individuals would wish to avoid the unspecified form of randomness Urn B represents for the "known unknown" of Urn A. It is this persistent preference for risk over uncertainty that characterizes ambiguity aversion.

Ellsworth's conjecture, while intuitive, also poses a serious challenge to

¹⁹Ellsberg's formulation may have been recently eclipsed by former Defense Secretary Donald Rumsfeld's oft-quoted soliloquy on the Iraq war:

"As we know, there are known knowns. There are things we know we know. We also know there are known unknowns. That is to say we know there are some things we do not know. But there are also unknown unknowns, the ones we don't know we don't know."

Donald Rumsfeld, Department of Defense news briefing (Feb. 12, 2002).

²⁰See Ellsberg (1961).

²¹For a review, see Camerer and Weber (1992). Cf. Tversky & Fox (1995; 2000) (noting that for some between-subject specifications, the effect can dampen with experienced subjects).

the received expected utility paradigm, developed by von Neumann & Morganstern, Savage and others.²² Savage in particular was interested in decision making under uncertainty, and its relationship to the expected utility framework. He famously demonstrated that even when prior probabilities are left unspecified, expected utility theory (or something very close to it) is still a viable approach for modeling decision making. Rather than using "true" objective probability assessments, however, decision makers would be represented as assigning *consistent subjective probabilities* to all plausible outcomes. Using those subjective probabilities, decision makers could then simply act so as to maximize their expected utility treating their subjective probabilities as objective ones.

As applied to the domain of Ellsbergian urns, Savage's subjective expected utility (or SEU) framework delivers some important (though ultimately troubling) predictions. Most pertinently, SEU implies that an individual's observed strict preference for Urn A over Urn B in the "blue ball wins" condition reveals that she *must subjectively believe the ratio of blue balls in Urn B to be less than 50%*. At the same time, however, her continued strict preference for Urn A in the "red ball wins" condition reveals a subjective belief that *the ratio of red balls in Urn B must be less than 50%*. Those two beliefs cannot simultaneously be true for any set of consistent subjective probabilities, exposing a troubling contradiction. In effect, ambiguity averse behavior appears to violate one or more tenets of SEU theory, making it an unreliable tool for predicting and assessing behavior (at least in those contexts²³).

In the last four decades, Ellsberg's challenge to expected utility theory subsequently spawned hundreds of efforts among psychologists, philosophers, economists and others exploring more satisfying alternatives to the Savage framework in the presence of ambiguity.²⁴ These efforts have been largely directed to formulating alternative axiomatic representations of preferences, and what they imply for understanding choice under uncertainty. A particularly noteworthy branch of that literature focuses on what has become known as the *multiple priors* approach.²⁵ Put simply, this approach

²²See von-Neumann & Morganstern (1944) and Savage (1954).

²³This is not to say, of course, that SEU is categorically a poor theory, but rather that its predictive powers are likely domain specific. See Camerer & Talley (2007). Indeed, neuro-economists have begun to formalize ways in which behavior consistent with expected utility versus prospect theory may be context specific. See generally Arlen & Talley (2008).

²⁴For a good general review, see Machina (2008).

²⁵Gilboa et al (2008).

posits that in uncertain environments decision makers will assemble all plausible probabilistic attributes of an uncertain state, and then formulate a probability distribution over those environments (a probability distribution of probabilities, as it were). In the Ellsberg thought experiment, for example, one could imagine a decision maker formulating 101 different plausible priors about the number of blue balls in Urn B (and thus the probability of a blue ball selection).²⁶ Once these multiple plausible prior probabilities are assembled, the decision maker would attempt to assign a subjective likelihood to each one of them. An ambiguity neutral person might, for example, assign a uniform probability to each one of the 101 red-blue ball possibilities (at least in the absence of additional information). Such an assignment would be consistent with SEU, which effectively requires that one's prior probabilities be independent of the stakes assigned to any particular gamble. (It would be inconsistent, however, with the behavior predicted by Ellsberg).

An ambiguity-averse decision maker, in contrast, would tend to skew her priors *in a manner that is responsive to how the stakes in the problem are presented*. Consider, for instance, perhaps the most popular representation of ambiguity aversion in the behavioral economics literature: *Maximin Expected Utility* (or MEU).²⁷ Under the MEU approach, an ambiguity averse decision maker assigns full "weight" to the prior probability assessment that makes her *worst off* under the posited gamble. If one changes the stakes or nature of the gamble, worst-off assessment may change as well, which can generate inconsistent probabilistic assessments. Going back to the Ellsberg example, in the "blue ball wins" condition, the decision maker's assessment of Urn B would focus solely on her worst case scenario (i.e., that it contains 100 red balls and 0 blue balls). For this person, Urn A would clearly dominate. In the "red ball wins" condition, the stakes of the gamble are reversed, and so with them is the worst case; here, the decision maker would focus on the polar opposite assessment (i.e., that it contains 100 blue balls and 0 red balls), and Urn A persists as the dominant choice. Note that both the SEU and MEU decision makers assign prior probability distributions to different outcomes, assessing the expected utility of a candidate choice un-

²⁶That is {0 Blue; 100 Red}; {1 Blue; 99 Red}, {2 Blue; 98 Red}, and so forth.

²⁷The MEU approach has been developed (in various forms) by Gilboa & Schmeidler (1989), Schmeidler (1989); and Hurley (1992). For a review, see Gilboa et al. (2008).

Although it is the most focal, MEU is but one of many competing ways that have been suggested to formalize the concept of ambiguity aversion. For a good general overview see Machina (2008) and Susnein (2007); see also Klibanoff et al (2005; 2008) for an interesting extension. To some extent, no clear victor has emerged from this debate.

der those priors. Unlike her SEU counterpart, however, the MEU decision maker selects priors that are themselves potentially inconsistent, predicated in part on the underlying stakes of the gamble.²⁸

In some settings, ambiguity aversion can elicit behavior that resembles either (a) severe risk aversion, or (b) the presence of "cataclysmic" forms of risk.²⁹ Ambiguity avoiders, for example, shy away from environments that entail appreciable uncertainty. They discount upside relative to downside variations. They are willing to purchase insurance at substantial premia over actuarial cost. Many of these predictions hold for risk averse individuals too, at least for the right degree of risk aversion or magnitude of underlying risk. Nevertheless, ambiguity aversion is not only a distinct theoretical concept, but it can sometimes manifest itself in ways that are both distinguishable and independent from risk aversion. Experimental evidence of ambiguity aversion suggests that it is most likely to manifest in settings where the underlying random process is new or poorly understood. Once subjects gain greater familiarity and confidence with their environment (effectively building an experiential "data set" on which to base their priors), ambiguity aversion tends to dissipate.³⁰ Risk aversion, in contrast, should not. Moreover, in a number of documented cases, the correlation between risk attitudes and ambiguity attitudes appears notably low, and ambiguity aversion alone (controlling for risk aversion) appears responsible for substantial premia that experimental subjects have been willing to pay to avoid uncertainty independent of risk (in the neighborhood of 10% to 20% of expected value).³¹ Similar qualitative effects can be detected even in experimental market settings among experienced, sophisticated traders.³²

Outside of the laboratory, ambiguity aversion has begun to play a prominent role in empirical work, particularly within the behavioral finance literature on the limits to arbitrage.³³ Ambiguity aversion, for example, is thought to be a prime driver (perhaps one of many) of the "equity premium" puzzle: the observed stylized fact that average buy-and-hold returns in equity investments during the last 150 years have been so high as to defy

²⁸ Although MEU preferences were axiomatized by Gilboa and Shmeidler (1989) within economics, in at least a conceptual sense this approach also traces roots back to Rawls (1971); see e.g., Hurley (1992); Gardiner (2006).

²⁹ See, e.g., Talley (2006).

³⁰ See note __, supra.

³¹ Camerer & Weber (1992), at 340.

³² See, e.g., Camerer (1987); Camerer & Weber (1992). The magnitudes of such effects tend to decrease as subjects become more familiar with the random attributes of the underlying environment. Camerer and Kunruther (1989); Tversky & Fox (1995).

³³ See generally Barberis & Thaler (2003).

justification as a plausible artifact of risk aversion.³⁴ The observed premium is, however, is more consistent with the presence of both risk and ambiguity aversion (and in particular investors' fear that their specified beliefs about asset pricing relationships are wrong), which can cause investors to demand larger expected returns.³⁵ In addition, ambiguity aversion may help explain why some investors fail to diversify their investments in general,³⁶ and in particular the observed bias in both individual and institutional investors' portfolios towards "home field" issuers (i.e., companies traded on domestic markets and/or headquartered near investor's domicile).³⁷

More recently, financial economists have begun to amass evidence that market volatility may also be systematically related to ambiguity aversion. Consider, for example the Chicago Board Options Exchange's (CBOE's) volatility index 'VIX,' which captures average volatility implied from a collection of put and call option markets. VIX is popularly known as the "fear index," and is described by the business press as reflection of investors' sense of unease due to the uncertainty present in the market.³⁸ The value of VIX has generally fluctuated between 8 and 20 percent during the four years prior to summer 2007. As Figure 1 below suggests, VIX grew particularly erratic and large beginning in the third quarter of 2007. (Since September 2008, it skyrocketed to over 90 before settling back down somewhat).

Insert Figure 1 Here

Classical finance theory suggests that it should matter little whether volatility comes from upward market movements, downward market movements, or gyrations around a stationary point for determining the realized value of the VIX. However, a number of recent studies³⁹ have demonstrated VIX manifests an asymmetric response to market movements, growing disproportionately large when markets are falling. Such observations are not generally predicted by standard expected utility theory, but it would be a logical consequence of ambiguity aversion.⁴⁰

³⁴Mehra and Prescott (2003).

³⁵See, e.g., Maenhout (1999).

³⁶See Mukerji & Tallon (2001).

³⁷See, e.g., French and Poterba (1991); Huberman (2001); Benartzi (2001).

³⁸See Wall St. Journal, "What's Behind the Surge in the VIX?" (by Tom Lauricell and Aaron Lucchetti, Oct. 23, 2008)

³⁹E.g., Low (2004); Hibbert et al (2008).

⁴⁰Relatedly, a number of financial economists have begun to use VIX (or a transformation of it) as a basis for capturing market uncertainty. See Drechsler & Yaron (2008). Bollerslev & Zhou (2007).

Although ambiguity aversion has not colonized legal scholarship to the same extent that it has behavioral economics and finance, many have seized upon the concept to understand and/or criticize legal doctrines within numerous fields, including environmental law,⁴¹ administrative law, criminal law,⁴² and torts.⁴³ Contract law scholars too have taken on the topic within specific settings, predominantly focusing on the reticence that contracting parties frequently have towards experimenting with terms that diverge from widely accepted default rules or familiar terms.⁴⁴ Ambiguity aversion has garnered somewhat less attention among contracts scholars operating within other domains, including conditions / excuse doctrine.⁴⁵ However, some theoretical contributions in contract theory have demonstrated that ambiguity aversion (or prospective ambiguity aversion) can be a cause for contractual "incompleteness": i.e., parties may fail to specify contractual allocations in contingencies where uncertainty is especially pronounced.⁴⁶ In those contingencies, the argument goes, ambiguity aversion can swamp other gains from trade. This consequence of ambiguity aversion holds particular relevance for my inquiry, since within law, the doctrines of express/implied conditions represent a core mechanism with which a court can "un-complete" a contract. How and when this mechanism is activated is the question to which

⁴¹See Sunstein (2007) for a review.

⁴²See generally Segal & Stein (2006).

⁴³See generally Teitelbaum (2007).

⁴⁴Ben-Shahar & Pottow (2006); Korobkin (1999).

⁴⁵Although most of the literature here has focused on risk versus uncertainty (e.g., Posner & Rosenfield 1977), two exceptions warrant specific mention. First, Schwartz (2003) notes in passing that ambiguity aversion may induce the parties to a contract to desire to void / exit a contract. However, Schwartz then concludes that "filling gaps with state-created rules or standards would not advance the parties' objectives." While this conclusion might be true, it would depend on the nature of the gap-filling rule. A gap filler that simply reflected the contingent preferences of the parties would seemingly advance their objectives.

Triantis (1992) considers the role of the doctrine of commercial impracticability as a gap filler. His analysis draws on the then-emerging literature on risk versus uncertainty. Triantis is ultimately skeptical of implied conditions as a means for gap filling, concluding that market forces and evolutionary learning are a better mechanism for addressing poor uncertainty management.

At its core, Triantis's argument concerns how best to set a default rule, as opposed whether a court should enforce *express* conditions (such as MAC/MAE provisions). On the question of the optimal default rule, much of his argument appears to rest on faith that market forces and arbitrage will effectively debias decision makers or dissipate the effects of cognitive error. As noted above, recent contributions in behavioral finance have called this faith into question (at least as a universal proposition).

⁴⁶See, e.g., Mukerji (1998).

I now turn.

3 A Numerical Example

In order to make my arguments more concrete, this section develops and analyzes a simple numerical example to illustrate how contract design may attempt to allocate both risk and uncertainty. The goal here is not to offer a complete account of contracting with uncertainty, but rather use the example to expose some simple (and potentially testable) intuitions about (a) how ambiguity and aversion thereto may plausibly be reflected in contractual terms, and (b) how ambiguity averse parties may be willing (at least in certain circumstances) to make the contract's very enforceability contingent on the "ambient" amount of uncertainty they face.

3.1 Framework

Consider Bianca, a potential buyer, and Sam, a potential seller, who are negotiating a potential sales contract for a specified asset (say, a small bakery that Sam has inherited from his grandmother). The business asset is indivisible, and thus if a sale occurs, Bianca receives full control of the business (though the parties can decide to divide its cash flows with Sam). Should Bianca purchase the business, its future value under her stewardship is not certain: it could be a relative "success" (if, say, there is a sudden spike in donut demand), in which case it will have monetary value of \$500. Alternatively, it could be a relative "failure", and have monetary value of \$100. I presume that even Bianca does not know at the time of contracting what the value of her stewardship will be, but at the time of her decision to perform or breach, she will privately observe it. If Bianca does not purchase the business (i.e., her performance is later excused or she breaches), she can continue under the status quo ante and obtain an outside payoff of \$125.⁴⁷

In contrast to Bianca, Sam has little business acumen, and under his stewardship the business will simply be liquidated for \$50 (with certainty). However, outside of his negotiations with Bianca, Sam has an option of selling the business to a willing third party, who has offered him \$140 for it free and clear.⁴⁸ Passing up this outside offer may be risky for Sam: For he

⁴⁷Note that because Bianca's outside payoff exceeds the value of the business to her in the event of a "failure," it will be efficient for Bianca not to perform.

⁴⁸Note that this formulation assumes away the possibility of "common values" between Bianca and Sam. I do so for the sake of simplicity. Including the possibility of common values does not generally cause ambiguity aversion to dissipate, and can in some instances

can only keep the outside bidder in play for a limited amount of time, and if he waits too long the outside bidder will evaporate.⁴⁹

The contract between Sam and Bianca will have three chief functions – first, it may transfer control over the business asset to Bianca; second, it allows for Sam and Bianca to allocate risk; and finally it allows for Sam and Bianca to allocate uncertainty (to the extent that they wish to).

3.2 Risk Preferences

To distinguish the effects of risk alone, versus those of uncertainty, it will be instructive to allow for Sam and Bianca to be risk averse, so that each would strictly prefer a certain dollar payment over any risky asset with the same actuarial value. Such preferences, common within in the law and economics literature, can be represented by an increasing, concave utility function for each party, which I will denote $u_S(y)$ and $u_B(y)$, respectively, and where y denotes the party's wealth. Figure 2 below demonstrates this now familiar framework for Bianca, imagining that she owned the asset (and all cash flows) outright. In the figure, Bianca's utility function is pictured by the function $u(y)$. In the Figure (as well the ensuing example), I will suppose that Sam's and Bianca's preferences both take the form of a well known form of risk aversion, where $u(y) = \ln(y)$, where \ln denotes the natural logarithm.⁵⁰

Insert Figure 2 Here

Note that while Bianca's utility increases in wealth, it does so at a decreasing rate — the *sine qua non* of risk aversion. The payoff Bianca derives (in utility terms) from the low outcome (\$100) is pictured on the vertical axis, at $u(\$100)$. Similarly, her utility payoff from the high outcome (\$500) is pictured on the vertical axis, at $u(\$500)$. If we suppose a successful outcome occurs with probability 50% (a supposition I will return to below), then Bianca's expected utility is simply the midpoint of these two utilities,

exacerbates it. Cf. Turocy (2008).

⁴⁹Just how quickly this outside opportunity evaporates after Sam and Bianca contract with one another is taken up below.

⁵⁰This functional form is sometimes referred to as *constant relative risk aversion* (or CRRA). It is a special case of a more general class of functions with the form $u(y) = \frac{y^{1-\rho}-1}{1-\rho}$, where ρ is a constant representing the degree of risk aversion. Note that when $\rho = 0$, the utility function is linear, corresponding to risk neutrality. When $\rho = 1$, in contrast, this function collapses to $u(y) = \ln(y)$, as discussed in the text.

and is denoted on the vertical axis⁵¹ as $Eu|_{\pi=\frac{1}{2}}$.

One can also work backwards within this diagram, asking hypothetically how large of a fixed and certain monetary payment would make Bianca indifferent between the money and the risky cash flows from the business. In the diagram above, this "certainty equivalent" of the gamble to Bianca is approximately \$223.61. In other words, Bianca's aversion to risk alone would lead her to value the business at \$26.39 less than its actuarial value (\$250). This difference is sometimes called the "risk premium" that Bianca would associate with holding all the risk (though in this case, since Bianca is the prospective buyer, it might be more accurately called a "risk discount").

3.3 Risk / Uncertainty

In order to illustrate the chief claims in this paper, our running example must also have a way to think about uncertainty as distinct from risk. Thus, suppose that the probability that the business is ultimately a success (or π) is not known with precision, but instead is confined within some range centered at 50%. Specifically, suppose the probability of success could anywhere between $50\% - c$ on the low end or $50\% + c$ on the high end (as pictured in the figure below), where c captures the degree of ambiguity surrounding that probability. The larger the value of c , the less precision one has in bounding the "true" probability of success, though its plausible interval is always centered at 50%. Conversely, when c is very low (or zero), the probability of a high value collapses completely to the case of pure risk, at 50%.

Insert Figure 3 Here

Significantly, other than knowing c (which defines the range of plausible prior probabilities), neither Sam nor Bianca has any additional information about the actual probability of success. It is this lack of information about prior probabilities that gives rise to a central concern in the ambiguity aversion literature.

To the extent that Sam and/or Bianca cares about ambiguity, their contract may attempt to account for / accommodate those preferences. Thus, the following subsections will track two possible scenarios: In the first, I will consider the case of pure risk, where c is effectively 0%. This scenario corresponds to the analog of the proverbial Ellsbergian urn with a known fraction

⁵¹More generally, for asymmetric probabilities other than $\frac{1}{2}$, this would be the probability-weighted average of her respective the payoffs.

of blue and red balls. In the second scenario, I will consider what happens when c is strictly positive. This scenario corresponds with the uncertain urn.

3.4 Contracting Under Risk

Consider first how the parties would negotiate possible terms of a sales contract in an environment with risk but no ambiguity (i.e., where $c = 0$). Among other things, the contract will determine whether the asset is transferred to Bianca and how much she pays for it, as well as whether she will breach. Because only Bianca observes her true valuation of the asset, the contract will not be able to specify a price that hinges on that value. However, the parties can negotiate terms that turn on whether Bianca shows up to close the deal, or instead breaches. Accordingly, suppose that they agree to a contract price (denoted P) in the event that Bianca performs, but also include a cancellation fee, or liquidated damages amount (denoted D) if Bianca breaches.

What is the nature of the contract they will produce (if any)? The answer to this question can depend on many factors, including the bargaining protocols used by the parties. In what follows, I will not attempt to limit analysis to a specific bargaining protocol, but instead will simply posit that the parties' contract will *maximize the sum of their expected utilities at the time of contracting, subject to the condition that neither party can expect to be made worse off than her outside option by contracting (i.e., it is weakly Pareto improving)*. If a contract satisfies this property, I will refer to it as an "optimal contract."

As it turns out, our example yields a unique optimal contract, which calls for a contract price of $\frac{\$500}{2} = \250 , and cancellation fee of $\frac{\$125-\$50}{2} = \$37.50$ in the event of breach by Bianca. Brief inspection reveals that these terms literally divide the cash flows (and thus economic risks) in half. If the store turns out to be worth \$500, Bianca will not breach, and the parties will split the \$500 surplus. If it turns out to be of low value, however she will breach (efficiently), and will pay \$37.50 to Sam. In this case, the net result is that they both end up with \$87.50. This splitting of risks should not be surprising, given that there are two sources of gains from contracting. First, there may be productivity gains from trade when Sam transfers control of the business to Bianca; but there are also gains from risk allocation if Sam and Bianca coinsure one another against upside and downside risk. The optimal contract, in effect, seizes both sources of efficiency gain. The resulting expected payoff has a certainty equivalent of \$147.90 for each party, which

clearly exceeds the payoffs that Sam and Bianca would achieve through their *ex ante* outside options (\$140 and \$125, respectively). Thus, the optimal risk-sharing contract described above is also Pareto efficient.

Before moving on to thinking about uncertainty, it is perhaps worthwhile to take note of three features Sam's and Bianca's contract in the case of pure risk. First, note that the liquidated damages amount, \$37.50, need not reflect the usually conceived expectation damages that courts might apply. In particular, the optimal contract would not entitle Sam to a full action for the price (of \$250), nor would it entitle Bianca to walk from the deal. This potential divergence from the usual contractual remedies is well known in the literature on contractual risk allocation.⁵² Because of the benefits of coinsurance, they can do better than having Bianca fully ensure Sam against a breach (which is what an action for the price would entail). In essence, by agreeing to this lower quantum of damages, Sam receives a larger price from Bianca up front, and both are better off.

Second, note that the equal sharing of risks between Bianca and Sam emanates from the fact that they are assumed to be equally risk averse. If the parties were to have differential risk preferences, they might settle on different values for the price and cancellation fee, with one party effectively underwriting insurance for the other, according to their relative degrees of risk aversion.⁵³

Finally, note that even though the contract clearly envisions that Bianca will breach in the low profitability state, it does not allow her simply to walk away without paying anything to Sam (that is, the cancellation fee / liquidated damages amount is strictly positive). Indeed, a principal source of gains from trade in this example is the efficient allocation of risk *ex ante*; as such, part of the benefit from contracting comes from the damages payment Bianca makes to Sam.⁵⁴ Allowing her to abandon her contractual duties without paying damages would undermine this benefit.

3.5 Contracting Under Uncertainty

Now consider what might happen if the parties found themselves in a context of *uncertainty* instead of pure risk. If, for example, $c = 30\%$, then the plausible value of π could range anywhere between 20% and 80% (but otherwise little else is known about it). What sort of contracting behavior

⁵²E.g., Polinsky (1983); Shavell (1994).

⁵³See, e.g., Polinsky (1983). In addition, if one were to increase the extent to which Sam and Bianca are risk averse, the total gains from the proposed transaction would decline.

⁵⁴See, e.g., Polinsky 1983

can we expect? The environment of uncertainty requires us to enrich our running example in two respects. First, we must posit how decision makers might form subjective beliefs or conjectures about their environment. Second, we must posit how (if at all) the parties' deep preferences treat uncertainty/ambiguity in a different way than risk.

3.5.1 Ambiguity Neutrality

Let us first consider how one might analyze the Sam-Bianca contract in a situation where the parties are risk averse but ambiguity neutral. Within the Savage framework, one cannot proceed without first positing how Sam and Bianca assign values (or probabilistic assessments) to the true values of the underlying probability of high value.

It is important to note that there are no general constraints within the Savage framework on how parties form priors over priors, other than that the true probability π must range between $50\% - c$ and $50\% + c$. Nevertheless, for at least intuitive reasons many economists, statisticians and philosophers have (by turn) been attracted to one candidate (at least for uncertainty neutral decision makers): a prior belief assigning equal probability to each possible value of π – i.e., a "uniform" distribution on π over its plausible range. The intuition of equating uninformed with uniform priors is sometimes referred to as the "Principle of Insufficient Reason." It is in essence a conjecture, and it is not completely free from criticism.⁵⁵ However, it draws support from intuition, experimental evidence⁵⁶ and (in some domains) theory.⁵⁷ I therefore embrace it provisionally – at least for the purpose of illustration – though my arguments would work with a wide range of alternative prior distributions as well.

If Sam and Bianca are both ambiguity neutral, then the Principle of Insufficient Reason provides the last piece of the puzzle for locking in predictions about their contracting behavior: it immediately follows that the *expected* probability the high value state would simply be the midpoint between $50\% - c$ and $50\% + c$ – or 50% , just as in the pure risk state. Consequently, all aspects of the optimal contracting problem and resulting payoffs discussed in the previous section remain unchanged. Bianca receives a right

⁵⁵See Sinn (1980) (reviewing the criticism and offering a normative attempt at rehabilitation).

⁵⁶See, e.g., Sunstein 2007 at 166-7.

⁵⁷See deGroot (1972) 198-99 (advocating uniform uninformed priors assumption, describing a proper and improper uniform prior's statistical properties, and identifying other monikers for the assumption).

to the asset, paying a price $P = \$250$, but has the option of breaching and paying $D = \$37.50$. Each party receives a payoff in certainty equivalent terms $\$147.90$, just as before.

3.5.2 Ambiguity Aversion

Things do change, however, if at least one of the parties is ambiguity averse. Consider what might happen if one of the bargaining parties, (say, our buyer Bianca) harbored MEU preferences. In this case, for each possible set of contract that Bianca might agree to, she would assign prior probabilities of success that generate the minimal conceivable utility payoff that the contract could yield for her, equating that value to her perceived expected utility under the contract. She will then bargain for contractual terms (if any) that maximize this minimal utility. Within this example, Bianca's perceived payoff would generally attach the most pessimistic probability, or $50\% - c$, to a successful outcome.⁵⁸

Just as before, Bianca's and Sam's contract (if any) will determine (1) whether Bianca receives the right to control the asset; and (2) what the price and damages payment will be. Now, however, it will do so with reference to the sum of Bianca's maxmin expected utility. The effect of this substitution will tend to comport with one's intuition: that is, the large weight that Bianca puts on the worst case scenario implies that Sam may find it optimal to give Bianca "downside protection," in the form of a moderated cancellation fee should Bianca breach. In exchange for this downside protection, Sam may take a larger portion of the upside benefit if the asset turns out to be high value, in the form of a higher price. This makes sense, since Bianca – as an ambiguity averse party – cares less about upside payoffs.

Note, of course, that the prospect of giving Bianca some downside protection is potentially costly to Sam, since he is a risk averse party; but this protection may be necessary simply to get Bianca to participate in the contract (so long as Bianca is willing to pay enough for it).

Insert Table 1 Here

Table 1 illustrates the terms of an optimal contract between Bianca and Sam for various values of uncertainty, comparing the cases of (a) symmetric

⁵⁸Note that this statement would not hold for a contract that (counterintuitively) awarded Bianca *more* money when the project is unsuccessful than when it is successful. For such hypothetical terms, her MEU preferences would utilize a "worst case" prior of $50\% + c$. Given Sam's risk aversion, however, none of counterintuitive contracts is a reasonable contender in this example.

ambiguity neutrality, with (b) buyer-side ambiguity aversion. Note that as ambiguity rises (c goes up), the terms of the optimal contract for risk averse parties do not vary. On the other hand, when Bianca is ambiguity averse, the terms of the contract do change, in the manner suggested above. That is, the parties agree to a higher price, but a more moderated termination fee, with Sam implicitly underwriting "uncertainty insurance" for Bianca. However, once c grows sufficiently large (approximately 28% in this example), the optimal contract becomes no contract at all. In other words, once ambiguity grows sufficiently pronounced, Sam requires such a large premium for downside protection that Bianca is no longer willing to provide it. In this case, *autarky is strictly preferable to trade*.

Table 2 below extends this thought experiment to consider other permutations of ambiguity aversion between the parties. When only Sam is ambiguity averse (third panel), the dynamics are qualitatively similar (though directionally reversed). Here, as ambiguity increases, Bianca provides downside protection to Sam in the form of successively higher cancellation fees, but she simultaneously extracts a lower price. As with the case of buyer-side ambiguity aversion, once the value of c grows sufficiently large (around 23% in this case), Bianca is no longer willing to provide such downside protection, and once again *autarky is strictly preferable to trade*.

Insert Table 2 Here

In the case where both parties are ambiguity averse, a similar effect takes hold. Note that in this case, price and damages move in the same direction. Indeed, because both parties are ambiguity averse, they are both generally reticent to provide downside protection to each other. However, because Sam's outside option is more attractive than Bianca's, she may have to offer him better terms across the board to keep him in the deal. And thus, at least initially, both the price and cancellation fee increase with c . Nevertheless, just as in the previous permutations, uncertainty can reach a threshold at which autarky becomes strictly preferred to trade. In fact, due to the two-sided effects of ambiguity aversion, the autarky threshold is even closer than the other cases.

3.5.3 Hybrid Environments and Contingent Autarky

The analysis thus far has largely been confined to contractual environments where the ambient degree of uncertainty is fixed and known during negotiation. When uncertainty is sufficiently low, ambiguity averse parties may choose to contract, using the terms of the deal to allocate ambiguity (as well

as risk). When uncertainty is high, however, parties may simply choose not to contract. Limited to these two comparisons, there is not much of an interesting story to be told for contractual conditions, MAC/MAE clauses, or other forms of contract excuses. However, such interventions become more interesting in “hybrid” situations when the parties do not know for sure *ex ante* whether conditions will remain within the realm of known risks, or instead could evolve in uncertain directions.

In our running example, suppose that at the time of contracting, Bianca and Sam think they are plausibly executing their contract in an environment of pure risk (or $c = 0\%$); however, they recognize that with some probability (call it q), the environment is (or could become) typified by uncertainty so large as to deplete any gains from trade (e.g., $c = 50\%$). Suppose further that they will learn more about ambient uncertainty shortly after executing their deal (and before the Sam loses his alternative buyers). How might their contracting behavior respond to such a circumstance?

One possibility, of course, is that Bianca and Sam will simply wait for the uncertainty to resolve itself, and then contract (or not). Indeed, in some circumstances such a response would probably be a perfectly sensible response.⁵⁹ At the same time, however, waiting may not always be prudent or convenient. In many corporate deals, for example, a number of processes must pre-date closing, such as regulatory / tax clearance, shareholder approval, due diligence and other forms of miscellaneous planning. Many of these processes can delay the closing of a deal for months, and can often take as long as one year. Waiting for the resolution of uncertainty may leave little time to reconvene at the bargaining table, structure the deal, accelerate these processes, and close. In contexts where the *ex ante* likelihood of uncertainty is low, waiting can be prohibitively costly.

Consequently, there may be some situations where ambiguity averse parties prefer to contract straight away, but to make their contract contingent on the non-occurrence of significant uncertainty post-execution – at least for some period of time before the parties lose the ability to seek viable outside options. Suppose, then, that Sam and Bianca included an express condition in their contract that made enforceability contingent on later information revealing that they have stayed within the realm of risk ($c = 0\%$). If in contrast, it is discovered that conditions have evolved towards uncertainty ($c = 50\%$), the contract calls for autarky.

⁵⁹The current unavailability of credit, even for senior secured debt and for historically safe borrowers, may itself be an artifact of uncertainty in the credit markets. See Gretchen Morgenson, Darkness and Light at GE Capital, *New York Times* (December 5, 2008).

As it turns out, a contract that specifically treated uncertainty as an express condition would fare much better than either categorical contracting or categorical autarky. Figure 4 below illustrates this point graphically for the case where the buyer (Bianca) has MEU preferences.⁶⁰ In the Figure, the solid line represents the total welfare (in certainty equivalents) the optimal uncertainty-contingent contract would yield for the parties. The dotted line, in contrast, represents the welfare that a non-contingent (but otherwise optimal) contract would yield.⁶¹ Except for the case where the ex ante likelihood of uncertain conditions is zero, a contract with an uncertainty condition would yield strictly larger expected gains than would the non-contingent contract. Furthermore, these gains generally increase monotonically with as the ex ante likelihood of uncertainty, q , increases, up to (just under) 60%. When ex ante likelihood of ambiguity crosses this threshold, moreover, autarky dominates the non-contingent contract. Here, the *only* viable contract structure between the parties is ambiguity-contingent.

Insert Figure 3 Here

3.6 Intuitions & Corollaries

Despite its simplicity, the above example suggests a few core intuitions that likely extend to more general environments. In particular, it suggests that in the presence of ambiguity aversion, there are distinct gains that the parties perceive from fashioning terms of their contract in a manner that accounts for prospective uncertainty surrounding the deal. An encapsulation of these intuitions for contract drafting / interpretation / enforcement might go something as follows:

If the surplus available through contracting remains within the domain of well-understood risks, then contracts (and the judicial enforcement of them) should be relatively insensitive to ambiguity aversion. On the other hand, if (a) conditions may plausibly transition into a domain of uncertainty, and (b) either party is ambiguity averse, then contract terms (and the judicial enforcement thereof) should explicitly account for the possibility

⁶⁰Other permutations of buyer- and seller-side ambiguity aversion are qualitatively similar.

⁶¹In other words, such a contract would prescribe an allocation based on the expected *ex ante* likelihood (q) of being in the maximally uncertain state versus the purely risky one. For a given value of q , this would translate into an ex ante set of prior beliefs ranging along the interval from $(50\%-q/2)$ to $(50\%+q/2)$.

of uncertainty. In severe cases of realized ambiguity, it may be optimal for contractual duties to be excused altogether.

Although ambiguity aversion does not categorically prescribe contract avoidance in the face of uncertainty, it at least pushes in that direction (with varying degrees of strength). Consequently, if contracting parties are ambiguity averse, those preferences should be reflected in the terms of their deals (such as MAC/MAE provisions). This observation, in turn, provides a testable implication of ambiguity aversion in contractual settings: As the prospects for uncertainty increase, the breadth and scope of express conditions within the contract should expand as well. I shall return to this prediction below in section 4.

Before moving on, however, it may be worth pausing to consider how *courts* (as opposed to the parties) might attempt to make use of the arguments above. Indeed, even if the parties themselves have the intent to condition their duties on the absence of uncertainty, that intent is irrelevant if judicial actors are impervious to that fact. To be sure, judges frequently may not have the expertise to divine either when uncertainty is present, or whether the parties genuinely care about it. However, there may be some interpretive rules of thumb that courts can embrace when undertaking this task. I offer a few of them below.

The first corollary concerns how aggressive a stance courts should take *a priori* in determining ambiguity to be a significant issue. As noted above, the value of ambiguity-contingent contracts (or default rules) lies in their ability to address situations where prospective ambiguity is tangibly present in a contractual setting. Such factors may be difficult for adjudicators to observe directly in garden variety contract disputes. In the absence of direct observation, however, it is probably sensible for courts to start with a presumption that ambiguity is not a substantial problem. First, the very fact the parties executed a contract may itself reveal their belief that the danger of ambiguity with respect to contractual gains was low. This inference likely grows to the extent that the parties failed to include an express contractual provision – such as a MAC / MAE term – signaling a desire to alter/excuse performance in uncertain environments.⁶² Further still, to the extent that the parties interact in arenas where they have considerable expertise and familiarity, the effects of ambiguity are likely to be of second order importance. Finally, even if one is confident that the contractual surplus has become compromised by ambiguity, the parties' options outside

⁶²For a similar point, see Triantis (1992).

contracting may be similarly compromised. Allowing a party to void the deal may do more harm than good. As a practical matter, then, absent a clear indication otherwise, it makes sense for courts have a presumption against condition contractual duties on realized uncertainty.

Although this reasoning argues in the direction of judicial conservatism, it may only be a weak form of conservatism. There is a potential epistemic circularity between the parties' contractual choices on the one hand, and their revealed judicial expectations on the other. Suppose at the time of contracting that a buyer and seller anticipated that the danger of prospective ambiguity within the contract was large. The parties might nonetheless execute the contract with few express provisions accounting for prospective ambiguity, anticipating that a court could subsequently accommodate them should such contingencies materialize. In this circumstance, a court would be mistaken were it to conclude that the parties' prior contractual conduct evinces their indifference towards ambiguity. On the other hand, this circularity problem is not completely fatal. If even modest transaction costs attend the execution of a contract, at least those parties for whom prospective ambiguity is overwhelmingly likely gain little over autarky, and likely would not enter a contract. Thus, the court can probably rule out at least those cases where uncertainty is extremely likely (although perhaps only those cases) from the fact that the parties have bothered to execute a contract.⁶³ All told, this reasoning appears to counsel for a form of weak conservatism⁶⁴:

Corollary 1: Weak Conservatism Principle. *Courts should be conservative about finding ambiguity to be a substantial factor within a contract, and in the absence of other evidence should adopt a presumption that the danger of ambiguity is negligible.*

In a related fashion, an ambiguity aversion delivers predictions about the dynamic nature of conditions within an optimal contract. In particular, as contracting parties become more familiar with a particular domain of unpredictability, they are likely to begin treating it less like uncertainty and more like pure risk. Consequently, their comfort with and knowledge

⁶³Note that the absence of express condition, in contrast, probably has an even weaker inferential value for courts as an interpretive guide. Indeed, conditional on contracting, some set of rationalizable conjectures about the background rule could almost always justify the omission of an express condition (precedent or subsequent) in the contract.

⁶⁴The weak conservatism principle is in many ways similar to a nuanced form of the (so-called) "precautionary principle" in environmental policy. E.g., Gardiner (2006); Sunstein (2007).

about various contingencies matures, they are less likely to condition performance on the non-occurrence of those contingencies. Accordingly, courts should grow more reticent about granting relief upon the occurrence of a contingency that has become more familiar to population of the contracting parties. This reasoning gives rise to a second corollary:

Corollary 2: Familiarity Principle. *As parties become more (less) familiar with the characteristics of an unpredictable contingency, they will begin to treat it more (less) as a form of risk than of uncertainty. Consequently, courts should be most receptive excuse claims when predicated on the occurrence of an event whose characteristics are relatively unfamiliar.*

A third principle stems from the fact that judicial actors must rely (at least in part) on the parties themselves to provide information about whether an important ambiguity contingency has arisen after contract execution. One obvious danger with affording parties such an opportunity is that they will use it strategically, as a pretext to for undoing value-enhancing risk allocation decisions that have not gone in their favor. In the example from above, for instance, it more credible for Sam / Bianca to seek avoidance when it is still unknown to either party whether the business will be a success or a failure.

Perhaps a stronger reason to favor early over late asserters is that the other party's outside options are likely to wane or become more uncertain themselves as the time past execution increases. Soon after committing to a contract, alternative counterparties can lose interest, move on to other things, or otherwise become less accommodating. In the above example, recall that the parties learned about the existence of ambiguity at a point where both had the ability to salvage their outside options. The longer one waits, the less this is likely to be the case, and the attractiveness of allowing excuse shrinks. Consequently, there are good reasons to favor those who make early assertions of excuse rather than those who wait until a late stage of the game. This reasoning is reflected in a third corollary:

Corollary 3: Early Bird Principle. *Courts should be most receptive to excuse claims asserted before significant uncertainty has been resolved. Excuses asserted long after the executory stage, in contrast, should be treated with skepticism.*

A final corollary concerns the process by which ambiguity associated with a contract surplus might emerge. In the example explored above, ambiguity

emerged exogenously, independent of the actions of either party. In some situations outside of that explored here, however, the ambiguity creating event may have been within the control of the party now seeking excuse. In such circumstances, courts should be loathe to allow for excuse, given that the parties undoubtedly would have wanted to deter such conduct. In more familiar Calabresian terms, one might refer to this reasoning as the "low cost ambiguity avoider" principle⁶⁵:

Corollary 4: Low Cost Ambiguity Avoider Principle. *Courts should be reluctant to grant an excuse if that party could have taken reasonable steps to avoid or reduce ambiguity, but failed to take such steps.*

4 Evidence and Applications

Although the foregoing discussion has proposed a plausible story about how ambiguity aversion can "matter" for contractarian objectives, the practical significance of that story has remained unattended. It remains unclear whether ambiguity aversion is a "real" factor in contractual settings, or instead is largely irrelevant or peripheral. If the latter, then we would neither expect contracting parties to expend much effort accounting for it, nor would we wish courts to alter their behavior in a likewise fashion. Addressing this question is important, especially in light of the nature of the contracts that motivate this paper (acquisition agreements among sophisticated parties).

The enhanced attention that ambiguity aversion has garnered recently in the behavioral finance literature provides at least suggestive evidence that uncertainty constitutes an important limit to arbitrage in markets with sophisticated participants.⁶⁶ However, it is only indirect and circumstantial evidence that ambiguity aversion matters for the type of contract design issues envisioned here. In this section, I consider how one might go about testing more directly for the relevance of ambient uncertainty in the design of express contract terms – specifically MAC/MAE clauses. Finding preliminary evidence consistent with the ambiguity aversion account, I then briefly consider practical applications of the approach in specific legal settings.

⁶⁵Gilson & Schwartz (2005) and Posner & Rosenfield (1977) suggest a similar interpretive criterion as well.

⁶⁶See TAN __-__, supra.

4.1 MAC/MAE Provisions: An Empirical Test

Perhaps the best place to examine the claims made above empirically is in the very application that motivated this paper: the design and interpretation of MAC/MAE provisions in corporate acquisitions. In order to do so, I will make use of a unique data set of 528 recent MAC/MAE provisions from mergers and acquisitions deals executed between July 2007 and July 2008. A preliminary analysis of these provisions suggests that their structures do, in fact, respond to ambiguity in a manner consistent with the predictions above. In other words, the extent of ambient uncertainty appears to "matter" in predicting the reach and breadth of a MAC/MAE provision.

At the onset, it is important to realize that there are many plausible reasons parties might craft MAC / MAE provisions in practice, many of which need not be related to ambiguity aversion. As noted in the introduction, for example, Gilson and Schwartz posit that the key rationale for a MAC/MAE term is to address seller-side moral hazard: that is, a seller may be in a position to make "synergy-specific" investments in enhancing the value of the deal before closing. A MAC/MAE clause, they argue, gives the target an efficient incentive to make those investments when she otherwise would be underdeterred.⁶⁷ (I will return to this thesis below).

There may also be other plausible rationales behind MAC/MAE terms. A number of practitioners interviewed for this study, for example, suggested that (in addition to concerns about uncertainty), one of the key reasons for a MAC/MAE provision is to provide a backdrop for possible deal restructuring should market conditions change. A handful (albeit fewer) practitioners also maintained that such provisions can provide a helpful backstop against problems of adverse selection, permitting the buyer some added room to exit a deal if it begins to appear that the seller has misrepresented its current condition, future prospects, or some other material fact.

Significantly, ambiguity aversion may not only be consistent with these alternative motivations for MAC/MAEs, but it may even complement them. This seems particularly likely for the latter two rationales for MAC/MAEs described above. Indeed, even if a principal reason for a MAC/MAE provision is to provide a template for renegotiation, that rationale may be perfectly consistent with ambiguity aversion once one considers *why* a restructured deal is desirable to begin with. In the numerical example above, for instance, uncertainty justified autarky in "extreme" cases; but for more moderate levels of uncertainty, closing the deal likely remains efficient, albeit on restructured terms that are responsive to new information about

⁶⁷Gilson & Schwartz (2005).

ambiguity (See Table 2 above). Viewed in this sense, information about ambiguity itself may provide part of the rationale for restructuring, and the credible triggering of the MAC can provide a backdrop against which the parties attempt to seize those gains. Similarly, the presence of asymmetric information by a seller may plausibly exacerbate problems with ambiguity aversion. If a buyer knows a seller has significant private information, but is unsure about how that information is distributed across seller "types," then she may discount the value of trade significantly.⁶⁸

Ambiguity aversion may also be consistent with Gilson & Schwartz's moral hazard story, but if so to a more attenuated degree.⁶⁹ In theory, both phenomena may simultaneously motivate the adoption of MAC/MAEs; in practice, however, there is reason to believe that the two accounts are not fully parsimonious. For example, in cases of severe prospective uncertainty surrounding the gains from trade, ambiguity aversion suggests that the incidence and breadth of MAC/MAE provisions should rise. In those same environments, in contrast, the deal-preserving specific investments envisioned by Gilson and Schwartz seem unlikely to be very important at all (akin to Simonizing one's car on the eve of a Category 5 hurricane).⁷⁰ In the Gilson and Schwartz framework, in contrast, the breadth of a MAC/MAE provision should grow in circumstances where the target's moral hazard problem is most severe: They posit that high technology targets are likely to be a prime example of such a circumstance.

The raw data I utilize comes from the Nixon-Peabody LLP's annual analysis of MAC clauses, the summary statistics of which are published each November.⁷¹ Nixon Peabody has been producing this survey for seven

⁶⁸See Schwartz (2003). The joint occurrence of private information and ambiguity aversion, moreover, may jointly intersect meaningfully with the role of MAE/MACs in facilitating restructuring. If transaction costs from restructuring are high (due, say, to asymmetric information), then the background allocation of entitlements can affect bargaining. Here, the existence of a MAC (even one whose legal effect is unpredictable) may catalyze bargaining. See, e.g., Ayres & Talley (1995); Choi & Triantis (2008).

⁶⁹Indeed, Gilson and Schwartz's analysis, the sole focus is on specific investments, and thus both buyer and seller are presumed to be risk- and uncertainty-neutral. Moreover, Gilson and Schwartz do not allow for alternative contract terms (such as earn outs or cancellation fees) to allocate risk between the parties – in their theoretical approach (and the predictions it spawns), the allocation is accomplished solely through deal price and the MAC. *Id.*

⁷⁰See also Mukerji (1998), who analyzes incentive contracting with ambiguity aversion, and who makes a similar point that incentives may be less important for affecting the worst-case scenario outcomes.

⁷¹Nixon Peabody LLP, Seventh Annual MAC Survey, November 2008
Seventh Annual MAC Survey (Nov. 4, 2008).

years, and since 2005 their methodology has become sufficiently routinized and consistent to be usable in empirical investigations. As illustrated in the left panel of Table 3 below, the data consists largely of a set of binary variables describing the MAC/MAE terms of each deal. In the 2007-08 report, there were thirteen distinct categories of MAC/MAE clauses, including terms that deal with the target's financial condition, the seller's and/or buyer's ability to close the deal, benefits contemplated by the agreement, either party's ability to continue to operate business immediately after closing, and general prospects of the target. In addition to these MAC/MAE categories, the data also reflect the existence and scope of exceptions (or "carve outs") to the MAC/MAE. Carve outs create categorical nullifications of MAC/MAEs, specifying domains over which a material adverse event cannot occur.⁷² They therefore are a limiting factor on the scope and reach of a MAC/MAE provision. In the 2007-8 report, there were thirty one such exceptions, including a change in trading price or trading volume of Company's stock, changes in interest / exchange rates, war, terrorism, acts of God, political volatility, legal change, bankruptcy, and national/international calamities.⁷³ As is typical, virtually all of the MAC/MAE provisions were on the buyer side, perhaps an implicit nod to the observation that corporate law frequently mandates an asymmetric seller-side option to exit, via the *Revlon* doctrine and the statutory requirement of shareholder approval.⁷⁴

There are a number of advantages to the Nixon-Peabody sample over

http://www.nixonpeabody.com/publications_detail3.asp?ID=2488.

⁷²The Hexion case, for example, involved a relatively general MAC/MAE pertaining to the "financial condition, business, or results of operations" of Huntsman; but its carve-outs excluded among other things any "changes in general economic or financial market conditions" that did not have a "disproportionate effect on the Company". See note 3, *supra*.

⁷³Significantly, the absence of a MAC/MAE provision does not necessarily imply the absence of exceptions. Of the handful of deals that lacked a MAC, few nevertheless had specific exceptions written into them. Thus, the variable "nomac" enters as a miscellaneous variable in this coding scheme.

⁷⁴*Revlon, Inc. v. MacAndrews & Forbes Holdings, Inc.* 506 A.2d 173 (Del 1986). Del. Gen. Corp. Law §§ 251; 271. In some cases, buyers also have to obtain shareholder approval, but such constraints are often relatively simple to avoid through triangular mergers and asset sales. In stock deals, publicly traded buyers may have to seek shareholder approval to dilute current voting shares by 20% or more. NYSE Rule 312.03. Even that requirement, however, can be waived if in extreme cases if a delay would seriously jeopardize the company's viability. See NYSE Rule 312.05. Cf *In re Bear Stearns Litigation*, No. 600780/08 (Dec. 2008) (dismissing a shareholder complaint against a target who sold lock-up block to an acquirer amounting to a 39.5 percent dilution, and declaring that the court "will not second guess" the board's decision).

other existing MAC/MAE databases.⁷⁵ First, although it covers only a fraction of deals announced each year, the Nixon-Peabody data still samples a relatively large swath of cash mergers, stock mergers, asset sales, equity sales and tender offers (skewed somewhat towards larger cash and stock deals). In addition, the data set also contains all combinations of public and private targets and acquirers. A third advantage to the data set is that it was created by practicing lawyers, and thus both its classificatory scheme and actual coding are more likely to reflect the judgment of practitioners who negotiate these instruments. But perhaps most significantly, the time period available for study here is particularly interesting, because it covers MAC/MAE provisions that were executed commencing in early summer of 2007, before the sudden meltdown of the private equity wave, through mid summer of 2008. This is a time span in which significantly greater uncertainty entered financial markets.

A downside of the Nixon-Peabody data is that it is largely limited to the deal value and the MAC/MAE characteristics of the transactions. There are no additional coded attributes related to the deal,⁷⁶ firm-level controls, or market controls. Such information is obviously helpful if one is interested in how such variables predict the existence and structure of MAC/MAE terms within the overall deal. In order to consider the effects of market conditions and firm-specific attributes, I merged the Nixon-Peabody sample with deals recorded in the Thompson's SDC Platinum M&A database. SDC is an extremely broad database that contains not only information about the structure of each deal (its financing, structure, etc.) but also firm-specific characteristics of both the buying and selling firms. (It does not, however, include an analysis of MAC terms). In areas where the SDC data was incomplete or appeared unreliable, I supplemented the data when possible with hand-collected information through press reports and SEC filings.

Table 3 below describes the cross sectional attributes of the data set, and how it measures the various terms of both MAC/MAE provisions and exceptions of the original 528 deals, as well as the 452 records with a successful name-date match in the SDC data set. The third panel of the table

⁷⁵Both Gilson & Schwartz (2005) and Macias (2008), collected and coded MAC provisions from public target acquisitions from before 2005.

⁷⁶Typical acquisitions agreement will contain a litany of terms beyond the MAC/MAE and pricing terms. Examples of such terms include cancellation fees, "bring down" clauses, no-shop and go-shop clauses, earn outs, asset lockups, topping fees, and voting trust agreements. Although the SDC database (described in the text) covers some of these other provisions, its coverage was too erratic to be helpful for this study. In future efforts, I hope to augment this spotty SDC data through hand collection.

also displays the MAC/MAE characteristics for the 247 matched deals involving public targets. (It is the public sellers for which the largest amount of information is available).

Insert Table 3 Here

Because I am interested in understanding how various factors (including a measure of ambient market uncertainty) affect the structure of an agreement, it is necessary to have a strategy for evaluating (or "scoring") the terms of a deal. The bottom panels of Table 3 consider a number of plausible scoring algorithms for the Nixon Peabody data. Each score captures a measure of the extent of MAC/MAE coverage and/or carve out coverage. The MERatio, MEperc and MERelCov algorithms are particularly worth noting, as they attempt to capture both MAC/MAE terms and carve outs. In each, a larger number of MAC/MAE provisions increases the overall score, while a large number of exceptions decreases it. Because these scoring functions are atheoretic, I have no reason to believe that one of them is better than another. For brevity and concreteness, however, I will focus below on MEperc, which measures the total number of MAC/MAE provisions relative to the total number of provisions total (MAC/MAEs plus exceptions). MEperc is a convenient scoring rule, as it is bounded theoretically below by zero and above by (approximately) one, thereby facilitating the interpretation of coefficients.⁷⁷

For those interested in how the Hexion Huntsman deal compares, the last column of Table 3 presents the coding for that transaction (which is one of the 528 deals captured in the data set). Consistent with popular zeitgeist,⁷⁸ the Huntsman MAC/MAE provision does appear limited in the number of affirmative MAC/MAE provisions granted to the buyer, and its scores generally reflect this characterization. At the same time, however, the difference between the Huntsman deal and the remaining sampled population falls well short of extreme. Under each scoring rule, for example, Hexion-Huntsman falls within a standard deviation of the mean (and it is

⁷⁷It also appears to be distributed approximately normally within the sample, which suggests ordinary/generalized least squares estimation is an appropriate approach. As a robustness check, in unreported regressions I have estimated all the specifications reported below with the other two comprehensive scores (MRatio and MECoverage). Both cases produce qualitatively similar results.

There are undoubtedly countless approaches for scoring these contractual provisions. The scoring approaches offered here represent a first (but almost certainly not final) stab at the issue.

⁷⁸See note __, supra.

barely distinguishable from other public targets).⁷⁹

In addition to firm-level characteristics, I matched the deals with external market data relating to factors that could influence the attractiveness of the transaction, through the time value of money, risk environment, and ambient uncertainty. To reflect an economy-wide benchmark for time value, I included measures of the risk-free rate of return. The actual costs of capital that firms face, however, is above the risk free rate, due to the undiversifiable risk that investors may bear. I therefore also included a number of risk adjustment factors, including (a) the industry-wide β for the target's industry group⁸⁰; (b) the market risk premium, defined as the difference between the return on the risk free rate and the return on a value-weighted market portfolio; and (c) the cross product of the market risk premium and industry-wide β . Because the deals in the data set are generally negotiated during a period of weeks leading up to the announcement date, both the risk free rate and the market risk premium are computed using the lagged two-week means for each predating the announcement date.

Finding a good proxy for uncertainty (as separate from time value and risk) is more challenging. There is not, to my knowledge, a consensus measure that captures the extent/degree of market uncertainty. Nevertheless, one candidate measure of uncertainty that has been quickly growing in popularity during the last few years: the Chicago Board Options Exchange's (CBOE's) volatility index 'VIX,' which reflects average implied volatility implied from a collection of put and call option markets. VIX is often known as the "fear index," and is described by the business press as reflection of investors' sense of unease due to the uncertainty present in the market.⁸¹ The value of VIX generally rises as expected volatility in the market rises. As noted above, whether expected volatility comes from upward market movements, downward market movements, or gyrations around a stationary point should not – at least in theory – matter for the value of the VIX index. However, a number of studies⁸² have demonstrated that VIX is systematically larger when markets are falling than when they are rising, an observation that is not generally predicted by standard expected utility

⁷⁹Of course, some of the attributes of the deal that made it appear seller friendly concerned non-MAC/MAE provisions. See note __, supra.

⁸⁰The risk metric β comes from the Capital Asset Pricing Model (or CAPM), and reflects the risk that a specific financial asset (such as a stock) has relative to a market portfolio. A low value of β (below 1.0) reflects low risk relative to the market, while a high value (above 1.0) reflects greater risk. See Grinblatt & Titman (2002).

⁸¹See Wall St. Journal, "What's Behind the Surge in the VIX?" (by Tom Lauricell and Aaron Lucchetti, Oct. 23, 2008)

⁸²E.g., Low (2004); Hibbert et al (2008).

theory. Such observations are, however, consistent with accounts within various accounts prospect theory (including ambiguity aversion). Relatedly, a number of financial economists have begun to use VIX (or at derivative of it) as a basis for measuring uncertainty.⁸³ As with the market risk premium, to allow for the time to negotiate a deal, I recorded the lagged two-week means of VIX closing values leading up to each deal's announcement date.

As a preliminary matter, Gilson and Schwartz posit that their moral hazard story is most salient in areas where unobservable investments by targets in "deal synergies" are important. In particular, the conjecture that high technology industries represent an area that is susceptible to this phenomenon, and thus we should expect more MAC/MAE coverage related to investment specific risk. Table 4 compares high technology to other firms, along various measures of MAC/MAE and exclusion breadth. High tech deals appear, on the whole, to be quite comparable to other firms in the number of MAC/MAE provisions they include, yet they have nearly 1.3 more carve outs. In terms of the scoring algorithms described above, the additional number of carveouts is reflected in slightly narrower overall MAC/MAE breadth, though this difference is statistically significant in only one of the three measures (MERelCov). As an initial matter, then, MAC/MAE provisions in high technology deals appear to to be mildly narrower than those in other deals, which runs contrary to the Gilson and Schwartz account (albeit weakly).

Insert Table 4 Here

At the same time, one must be cautious about making inferences about high tech deals generally (or the moral hazard argument specifically) without attempting to control for other variables of interest. Many factors (including ambiguity and uncertainty) may also play a unique role in industries like technology, where a significant component of firm value comes from intangible rather than tangible assets. Attempting to correct for this unobserved variable bias requires – at the very least – the inclusion of additional controls, a task to which I attend below.

Two aspects of each deal are broadly observable in the data: (a) the total deal value and (b) the MAC/MAE scores. It is important to keep in mind

⁸³See Dreschler & Yaron (2008), Bollerslev & Hao (2007). VIX may not reflect solely ambiguity, and may have risk perceptions embedded within it as well. Thus, some caution is warranted in interpreting the extent to which VIX appears to predict deal structure. Nevertheless, given that I have also included a number of conventional measures of risk (and given that VIX is not conventionally viewed as one of them), it becomes more plausible to attribute the explanatory power of VIX to implied ambiguity / uncertainty.

that just as with the numerical example from Section 3, price and non-price terms are determined simultaneously, as a byproduct of negotiation. Consequently, it would be inappropriate to include deal price and/or premium as an right hand side variable in predicting the intensity of a MAC/MAE provision. Nor, for that matter, would it be desirable simply to ignore the information on deal value, since shocks that affect price would likely also affect non-price terms, and vice versa. Thus, my empirical strategy in what follows is to estimate price and MAC/MAE score regressions jointly, using a seemingly unrelated regressions approach.⁸⁴

Table 5 contains results from the full collection of matched deals involving both public and private acquirers and targets. Each panel of the table reflects jointly estimated coefficients for (1) the deal value (logged); and (2) the score associated with the MAC/MAE terms (captured by MEPerc). There is limited data coverage of firm-specific control variables for private companies, beyond the basic terms of the deal terms, a fact reflected by the relatively modest number of controls and goodness for the regressions in the table. Nevertheless, at least for the larger specifications, both the price and non-price estimations generate coefficients that are jointly significant at the 0.01 level or better.

Insert Table 5 Here

Recall from the earlier analysis of ambiguity aversion Section 3, uncertainty will have an ambiguous effect on price, but a positive predicted effect on the attractiveness (and thus breadth) of a MAC. Interpreting VIX as a measure of uncertainty, this prediction appears to be born out. Specifically, VIX has a consistently positive and statistically significant predictive effect on the MAC/MAE score. Although the practical significance of the coefficient's size may appear small on first blush, corrected for their respective ranges, a 1.0 standard deviation increase in VIX would predict an approximate 0.35 standard deviation increase in the MAC/MAE score. This corresponds to an appreciable (though not overpowering) degree of economic significance. In comparison, VIX has a statistically insignificant predictive effect on logged deal value (trivially consistent the predictions of ambiguity aversion).

In contrast to the estimated VIX coefficients, more conventional risk measures – and particularly β – appear to play a much different predictive role. Higher values of β predict a lower deal value (albeit with sporadic statistical significance), and virtually no effect on MAC/MAE structure.

⁸⁴See, e.g., Zellner 1962.

One plausible interpretation of this finding is that fluctuations in risk tend to be reflected in price terms (if at all), while fluctuations in uncertainty tend to be reflected in non-price terms, such as MAC/MAE structure.

A few other features of these regressions are worth noting. First, strategic buyers appear on average to pay less than financial buyers, and demand slightly broader MAC/MAE terms (though the latter effect is not statistically significant). In addition, the accounting value of the acquirer (one of the few financial variables broadly represented across SDC matched deals) predicts a higher deal value and no discernible effect on MACs. This possibly reflects both the fact that larger acquirers are better organizational matches for larger targets, as well as the possibility that larger acquirers are less likely to be risk averse. Acquisitions of public targets by private buyers (principally private equity deals) are more likely both to have higher deal values and narrower MAC/MAEs relative to any other public-private dyad.⁸⁵

Finally, after controlling for other factors, there appear to be few differences in MAC/MAE when the target is a high technology firm. (In fact, in this set of regressions, a high tech target appears to predict a *lower* MAC/MAE score⁸⁶). Compared to Table 4, then, the possibly distinct structure of tech deals dampen considerably when one controls for other possible factors (including market uncertainty). One possible reason for the reduced evident power of the Gilson & Schwartz story⁸⁷ is that the sample of MAC/MAE provisions they study comes from announced public acquisitions in 1993, 1995 and 2000, a period of significant market advances. The data studied here, in contrast, correspond with a period of notable market declines. Within behavioral finance, ambiguity aversion has been found to be most prevalent during market downturns than during booms – an observation that suggests the relative importance of ambiguity aversion may be

⁸⁵If the reduced investor diversification within private buyers proxies for greater organizational risk and ambiguity aversion, this effect seems inconsistent with both a risk- and uncertainty-based account of MAC/MAE provisions. On the other hand, financing of these deals is still often syndicated more broadly, and the acquirers may immediately realize significant and immediate upside benefits (e.g., elimination of agency costs, deregistration, etc.). Moreover, since incumbent management frequently works with private equity investors, the attributes of the firm may already be familiar to the acquirer, dampening the effects of ambiguity aversion. It bears noting that most of the deals in this dyad reflected cash acquisitions, and thus the pressure to close quickly perhaps reduces the need for a broad MAC/MAE.

⁸⁶This finding is robust to the score used, including MERelCov, where tech deals appeared to have the strongest measurable difference.

⁸⁷Ultimately, this remains a question that admits considerable speculation, and is the target of future research.

counter-cyclical.

The sparsity of controls in Table 5 may give some cause for concern, suggesting that it may be fruitful to repeat the above exercise with public targets only, for which more firm-specific controls are available. Table 6 below reports on the results of this narrower — but deeper — inquiry, adding controls that include the target’s pre-bid equity value (logged), the target’s total assets (logged), the targets total liabilities (logged), the target’s 4-week return on equity, and the target’s and acquirer’s earnings per share.

Insert Table 6 Here

Note that limiting the inquiry to public targets immediately reduces the usable sample size by around fifty percent while adding a number of control variables, a combined effect that can reduce precision of the estimated coefficients. Nevertheless, even with this reduction in usable data, the overall explanatory power of regression specifications in Table 6 jumps considerably from Table 5. Both the pricing and MAC score coefficients are jointly significant at either the 5% or the 1% levels across all specifications, and a number of financial asset and income variables have significant explanatory power.

More to the point for the instant inquiry, the estimated coefficients on VIX remain quite solid and consistent, barely changing from Table 5. In all specifications, the VIX coefficient is statistically significant at either the 5% or the 1% level. In addition, the economic magnitudes of the estimated VIX coefficients are, if anything, larger than they were in Table 5. Also consistent with the previous iteration, the key measure for transaction risk, average target-industry β , generally tends — all else constant — to predict lower values but not the breadth of MAC/MAE provisions.

As before, private acquirers of public targets tend to pay more (controlling for target-level variables) than do private acquirers. However, there does not appear to be a statistically significant difference between public and private purchasers in their proclivity to execute broad or narrow MAC/MAE provisions.

The inclusion of target-level financial control variables (such as assets and liabilities) in specifications [3] - [5] also appear to have explanatory power in predicting the deal value. Somewhat curiously, in specifications [3] and [4], total target liabilities appears to have a *positive* predictive effect on value. Total assets, in contrast, appear to enter negatively, and with paltry statistical significance. These observations appear curious on first blush (e.g., they suggest that companies with greater debt relative to equity should

command a higher price). A means for resolving this curiosity is to note that each of the first four specifications in Table 6 also include a control for *pre-announcement equity value of the target*, which itself is likely endogenous to other right hand side variables, and may in particular reflect public investors' assessment of the target's acquisition value. Moreover, it may be that part of the economic gains from the transaction (particularly private equity deals) comes from the inability of targets to realize the tax advantages of leverage, and the view (at least from the acquirer's perspective) that the target's existing debt load was overly penalized by public investors. When one drops pre-announcement equity value from the joint regressions (specification [5]), the total assets coefficient in the price equation becomes strongly positive, and the total liabilities coefficient becomes strongly negative,⁸⁸ as *a priori* intuition would suggest. Greater target-level assets predict narrower MAC coverage and a smaller score, while greater liabilities predict a larger score. While this observation is likely consistent with ambiguity aversion, it is also consistent with other theories.⁸⁹

Finally, whether a deal involves a high tech target is not terribly predictive of MAC/MAE structure. Across the specifications in Table 6, tech deals manifest effects that are mildly positive in sign, but uniformly insignificant statistically.⁹⁰ Thus, the public target deals from 2007-08 also do not appear to provide strong support for the moral hazard thesis of Gilson and Schwartz.⁹¹ It may be that both the adverse selection and ambiguity stories have explanatory power, but that in the last year the former account has been of first order importance. If so, then the systematic relationship between uncertainty and MAC/MAE coverage may not hold over longer periods of time. Further investigation may be able to test this conjecture.⁹²

All told, a preliminary empirical assessment of recent MAC/MAE struc-

⁸⁸Dropping pre-announcement equity value, in contrast, does not affect the VIX coefficient at all.

⁸⁹Including common sense: people pay more for things that are likely to be worth more, and vice versa.

⁹⁰This lack of predictive power is even more pronounced measured against alternative MAC/MAE scores, such as MERelCov.

⁹¹As another robustness check, in unreported regressions I interacted both the VIX uncertainty measure and the various risk measures with the high technology dummy variable and re-ran the regressions. There, MAC scores of high technology targets appear *even more* responsive to market uncertainty than other types of firms, and no more sensitive than other firms to target level risk measurements. This finding is also consistent with ambiguity aversion even within (indeed particularly within) high technology firms in 2007-08.

⁹²In future work, I plan to include the entire panel of MAC/MAE provisions from 2005 through 2008, which may allow for testing longer term time trends.

tures yields evidence that is consistent with the claim that ambiguity (or the prospective anticipation of it) plays a significant role in determining deal structure.

4.2 Legal Applications

The previous sections have argued that ambiguity aversion provides both a plausible and empirically supportable account of why contracting parties might adopt express conditions of performance (such as MAC/MAEs), and how they might structure them. In light of these arguments, below I consider a few brief applications within "real world" cases. Ultimately, these applications are more tentative, but they nonetheless help to lay out how, as a practical matter, my thesis might be fruitful for understanding actual disputes. In the following subsections, therefore, I will first return to the *Hexion v. Huntsman* decision, assessing how the opinion fares through the lens of ambiguity averse contractarianism. I then briefly consider the same exercise in the context of *IBP v. Tyson Foods*, a well-known predecessor to *Hexion*. In both cases, I argue, the analyses offered by the Chancery Court is consistent with an ambiguity account (as defined above), though *Hexion* more so than *IPB*.

4.2.1 *Hexion v. Huntsman*

Recall that in *Hexion*, Vice Chancellor Lamb rejected a pre-trial claim that a material adverse event had transpired, and instead required *Hexion* to exercise its best efforts to close the transaction. How would his opinion fare through the lens of ambiguity aversion? On first blush, the prospects might not look particularly good. Given the magnitude of uncertainty that typified the market by the late spring of 2008, one might argue (with some justification) that Lamb was insensitive about how this uncertainty might have compromised the likely gains from the deal. Viewed from this perspective, Lamb may have been too quick to conclude that no MAE had transpired.

On the other hand, numerous other factors in this case likely justify its outcome, even within the framework of ambiguity aversion. As noted above, the MAC provisions combined with the other terms of the deal made for a discernibly unforgiving instrument. This narrow scope has information content about the parties' situation. Vice Chancellor Lamb's resulting response to this signal, in turn, bears some similarity to the principle of Weak Conservatism. Indeed, in the opinion Lamb specifically recognized of

the relatively narrow berth provided Hexion by the terms of the deal, and accordingly placed a higher burden for overcoming that presumption.

In a related vein, one of the more interesting doctrinal aspects of the case involves how the court effectively treated the clause as a condition subsequent (notwithstanding the express language in the deal that strongly suggested a condition precedent). In practice, this distinction is more than rhetorical, since it determines the (often dispositive) question of who bears the burdens of proof. For conditions precedent, the non-breaching party must prove by a preponderance that the nominated condition occurred, only after which would the defendant have a duty to breach. In a condition subsequent, it is the (allegedly) breaching who must prove that the nominated condition occurred, as a means for excusing his obligation. As Lamb's opinion appears to make clear, absent a clear indication from the parties, the linguistic presentation of the MAE/MAC will not determine its interpretation:

[MAC/MAEs] are strange animals, *sui generis* among their contract clause brethren. It is by no means clear to this court that the form in which a material adverse effect clause is drafted (i.e., as a representation, or warranty, or a condition to closing), absent more specific evidence regarding the intention of the parties, should be dispositive on the allocation of the burden of proof. Typically, conditions precedent are easily ascertainable objective facts, generally that a party performed some particular act or that some independent event has occurred. A material adverse effect clause does not easily fit into such a mold, and it is not at all clear that it ought to be treated the same for this purpose. Rather ... it seems the preferable view, and the one the court adopts, that absent clear language to the contrary, the burden of proof with respect to a material adverse effect rests on the party seeking to excuse its performance under the contract.⁹³

Given the degree to which M&A attorneys obsess over linguistic minutiae, Lamb's skepticism about the deterministic nature and plain meaning of language is curious (and borderline Traynoresque⁹⁴). Nevertheless, while

⁹³Hexion v. Huntsman, Del Ch. C.A. No. 3841-VCL, at 41-42 (September 29, 2008).

⁹⁴See Pacific Gas & Electric v. Thomas Drayage, 442 P.2d 641 (Cal. 1968) (Traynor, C.J.) (reversing the application of the parol evidence rule, and holding: "If words had absolute and constant referents, it might be possible to discover contractual intention in the words themselves and in the manner in which they were arranged. Words, however, do not have absolute and constant referents.")

this part of the opinion may offend doctrinal purists, his interpretational presumption may also be consistent with the principle of Weak Conservatism. As noted above, the relatively seller friendly terms of the deal were a plausible signal that the parties viewed ambiguity aversion to be relatively unimportant *ex ante*. Construed in this way, it economizes on judicial resources and litigation costs for the court to place the burden on the party who is claiming that the least plausible (*ex ante*) state has now come to pass. As applied here, then, it makes considerable sense to require the party seeking excuse (i.e., Hexion) to demonstrate that the uncertain contingency had occurred: the very fabric of a condition subsequent.⁹⁵

Two other factors appear further to justify the Hexion outcome. First, as has been noted numerous times (including Lamb's opinion) Hexion did not come forward to attempt to trigger the MAE/MAC clause until nearly a year after deal's announcement. Even by the standards of large corporate acquisitions, this is very late in the game. Viewed in this light, the Early Bird Principle suggests that Lamb was rightly skeptical of Hexion's position, particularly given that they came at a point where Huntsman's outside prospects were sufficiently compromised. Second, Lamb reserved considerable disapprobation for the fact that while Hexion was ostensibly under a duty to use best efforts to close the merger, it instead proactively attempted to engineer an insolvency opinion in order to trigger the MAE/MAC, providing its financial advisor with self-serving (negative) projections of potential synergies, and possibly even managing their own accounting practices to lead to render that result. Given that the seeds of the alleged uncertainty about the deal were at least in part sown by Hexion's own behavior, the Least Cost Ambiguity Avoider Principle may also support the outcome.

4.2.2 IBP Inc. v. Tyson Foods

The Hexion case is but a recent shot in a decade-long volley of MAC/MAE jurisprudence. (Interestingly, no Delaware case to date has actually found

⁹⁵ Another potentially important consideration would involve identifying which party has better access to information that would verify / disprove the emergence of the uncertainty contingency, and to assign initial presumptions to force that party to come forward. (In many ways, this point parallels the famous Prosser (1941) / Wigmore (1940) debate in *res ipsa loquitur* doctrine).

The Hexion case does not seem clear cut in either direction; however, it seems at least plausible that a strategic buyer (like Hexion) may have better information about the nature and predictability of synergistic gains.

a MAE to have occurred⁹⁶). The doctrinal pedigree of these cases, while perhaps modest by comparative standards, contains a number of notable entries, perhaps none more so than *In Re IPB Inc. Shareholders Litigation*,⁹⁷ which involved a 2000 merger agreement that was the by-product of an auction for control of IBP between Tyson Foods (the ultimate winner) and a management buyout group. Unlike in Hexion, the merger agreement contained a MAC/MAE that was notable in its breadth, containing few of the exceptions that typify many similarly situated deals. Months after the deal was announced, IBP began to experience poor earnings (due to a combination of an impairment to a subsidiary and cyclical revenue downturns). Tyson then sought to trigger the MAC/MAE provision to excuse performance.

Using conventional contract interpretation doctrines (though applying New York law), Vice Chancellor Strine found the MAC had not been triggered, on what was self described as a "close" call. One of the more controversial aspects of Strine's opinion was that it narrowed the scope of the MAC/MAE beyond its apparently broad text, holding that "a buyer ought to have to make a strong showing to invoke a material adverse effect exception to its obligation to close."⁹⁸ To make such a showing, Strine held, a buyer would have to demonstrate the occurrence of a significant event that could not have been easily foreseen at the time of contracting.

[E]ven where a Material Adverse Effect condition is a broadly written as the one [here], that provision is best read as a backstop protecting the acquiror from the occurrence of unknown events that substantially threaten the overall earnings potential of the target in a durationally-significant manner. A short-term hiccup in earnings should not suffice; rather the Material Adverse Effect should be material when viewed from the longer-term perspective

⁹⁶Given the nature of settlement, this is not necessarily dispositive about the non-receptivity of Delaware courts to MAC / MAE provisions. In late 2007, for instance, KKR and Goldman Sachs invoked a MAE clause to escape an \$8 billion buyout of Harman International. The case did not go to litigation, but instead resulted in a settlement whereby the parties terminated the acquisition, replacing it with a much smaller private debt placement. See Dana Cimilluca & Dennis Berman, "KKR, Goldman Cancel \$8 Billion Harman Deal," *The Wall Street Journal* (Sept. 22, 2007).

⁹⁷*In re IPB, Inc. Shareholders' Litigation*, 789 A.2d 14 (Del. Ch. 2001). Other well known entries include *Frontier Oil Corp. v. Holly Corp.*, C.A. No. 20502 (Del. Ch. Apr. 29, 2005); *S.C. Johnson & Son, Inc. v. Dowbrands, Inc.*, 167 F. Supp. 2d 657, 670 (D. Del. 2001); *North Point Communications Group, Inc. v. Verizon Communications Inc.* (2000, Civ No 00C-11-240).

⁹⁸789 A.2d at 68.

of a reasonable acquiror.⁹⁹

Ultimately, after admitting to considerable ambivalence about the case, Strine found that Tyson failed to make this showing. The court then (again somewhat surprisingly) granted a specific performance remedy, and the deal closed a few months later (on altered terms).¹⁰⁰

Viewed through the lens of ambiguity aversion, Strine's opinion in IBP is also somewhat of a close call. In interpreting the MAE, the court both narrowed its reach and imposed the burden of demonstrating its occurrence on Tyson. Given the evident breadth of the MAE's language, both of these moves are curious, and do not seamlessly follow from the principle of Weak Conservatism. Unlike in terms of the Hexion deal, IPB involved a broad, open-ended MAE that plausibly signaled to the parties' intent for the MAE trigger to be relatively sensitive. By narrowing the scope of this term, the Court effectively disregarded this signal.

At the same time, other parts of the opinion provide a few potential avenues for reconciliation. For example, Strine placed significant weight on the fact that Tyson's statements and actions showed that it had long been aware of the problems in one of IPB's subsidiaries. In fact, most analysts and even Tyson's own financial advisor still considered the terms of the deal to be fair.¹⁰¹ The fact that IBP's performance had been comparable to its track record (though barely so) suggests, consistent with the Principle of Familiarity, that the parties may not have entered a realm uncertainty that was significant enough to be reflected in the companies' performance.

5 Conclusion

Using material adverse event / change provisions as an animating template, this paper has argued that the behavioral economics concept of "ambiguity aversion" is a helpful device for understanding contractual conditions and excuses. I have argued that if one or more parties is ambiguity averse, and if the surplus from contracting is subject to uncertainty, then the terms the resulting agreement (as well as the law's interpretation of them) should reflect those preferences. In cases where prospective ambiguity is particularly severe, an optimal contract / interpretive scheme could allow the contract to be voided entirely, reimposing autarky.

⁹⁹ 789 A.2d at __.

¹⁰⁰ Interestingly, Listoken (2005) detects positive abnormal returns for both IBP and Tyson upon the release of Strine's opinion.

¹⁰¹ 789 A.2d at 72.

In addition to arguing for the plausibility of this account, I have endeavored to test it empirically. Using data from acquisitions agreements announced between 2007 and 2008, I found that the breadth and reach of MAE clauses appears consistently responsive to a measure of "ambient" market uncertainty during negotiations. This effect persists, moreover, when one controls for risk attributes, industry effects, acquirer characteristics, and financial control variables. Evidently, at least in the most recent crop of merger agreements, ambiguity "matters" for contract design. The way that it may matter, in turn, provides insights about recent cases that have attempted to interpret MAE clauses.

Though I have not endeavored to explore them here, the intuitions developed above may also have applications to other domains within contract law. One such domain might be the set of doctrines associated with implied conditions, such as mutual mistake. For instance, Kull (1991) reports that the most predictive element of outcome of mistake case is whether the contract at issue was still executory or substantially performed. Courts appear much more willing to void executory agreements based upon a mistake than they are to rescind fully performed agreements, regardless of whether the formal elements of mutual mistake appear present. While generally considered to be a curiosity, Kull's finding is actually consistent with the Early Bird Principle noted above, in which excuse claims are more likely to be credible products of realized ambiguity (and less likely to be strategic) if made early on after execution rather than late in the game. Another area for extension might be in corporate law, and the design of *Revlon* auctions. When a seller's shareholders are ambiguity averse, the optimal design may turn critically on the extent to which the distribution of buyer values is itself subject to ambiguity. In contexts of extreme uncertainty, a proverbial "bird in the hand" (i.e., a reliable initial bidder) may be substantially more valuable than two (or more) in the bush. Accordingly, deal lockups that are ordinarily viewed with suspicion (such as no-shops, poison pill protections, large cancellation fees, and topping fees) may be more acceptable in such contexts.¹⁰² I leave these questions (and potentially others) for another

¹⁰² A recent New York case involving the Bear Stearns rescue arguably demonstrates this sort of reasoning. In it, the court dismissing a shareholder complaint that the Bear board impermissibly sold JP Morgan a 39.5 percent dilutive stake in new shares without first obtaining a shareholder vote (as would ordinarily be required under NYSE rules). The court invoked a little used exception to the rules, and implicitly signaled a lighter touch in judging boards' actions in a time of uncertainty:

In response to a sudden and rapidly-escalating liquidity crisis, Bear Stearns' directors acted expeditiously to consider the company's limited options.

day.

The constructive thesis offered here is meant to be neither exclusive nor dismissive of alternative accounts of express or implied conditions. To the contrary, there are undoubtedly many reasons that parties include force majeure provisions in their contracts, some of which are perfectly consistent with (and even complementary to) ambiguity aversion. At the same time, however, within the current financial climate, one can reasonably expect that the challenge of allocating uncertainty will increasingly come to confront courts, practitioners, and legal scholars. Developing an appreciation for such challenges, as well as the analytical tools for addressing them, is an investment whose return is significant, practically relevant, and (hopefully) unambiguous.

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They attempted to salvage some \$1.5 billion in shareholder value and averted a bankruptcy that may have returned nothing to the Bear Stearns' shareholders, while wreaking havoc on the financial markets. The Court should not, and will not, second guess their decision.

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Figure 1: VIX Close, Feb. 2007-Oct. 2008
 (Source: CBOE)

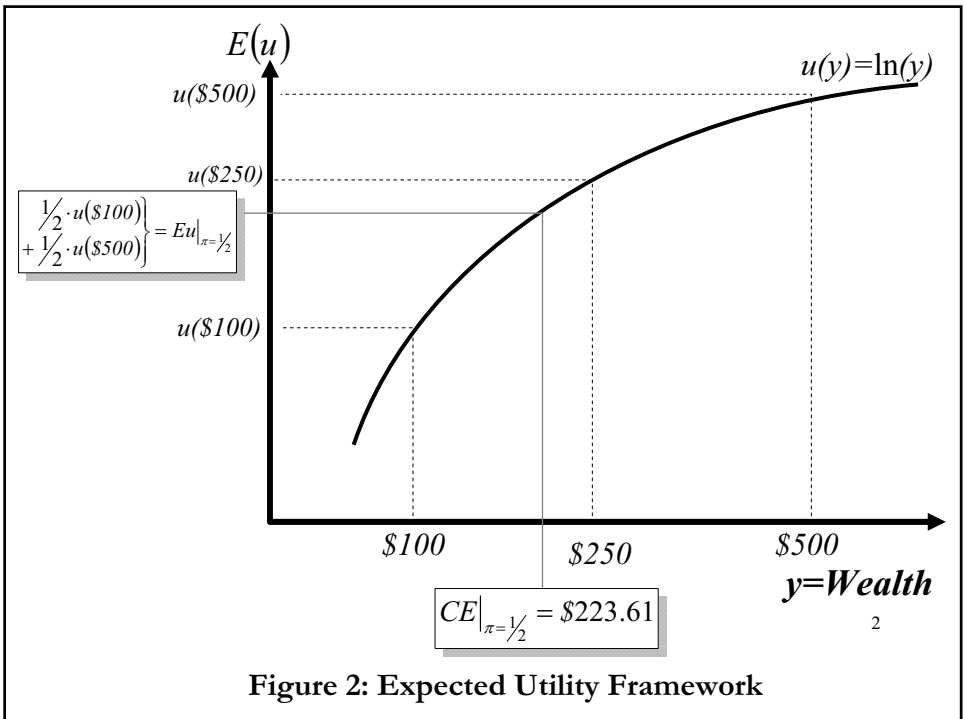


Figure 2: Expected Utility Framework

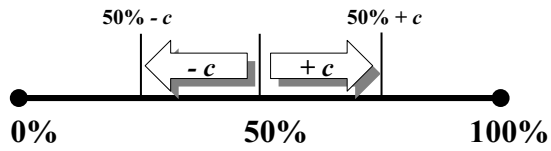


Figure 3: Interval of Prior Probabilities

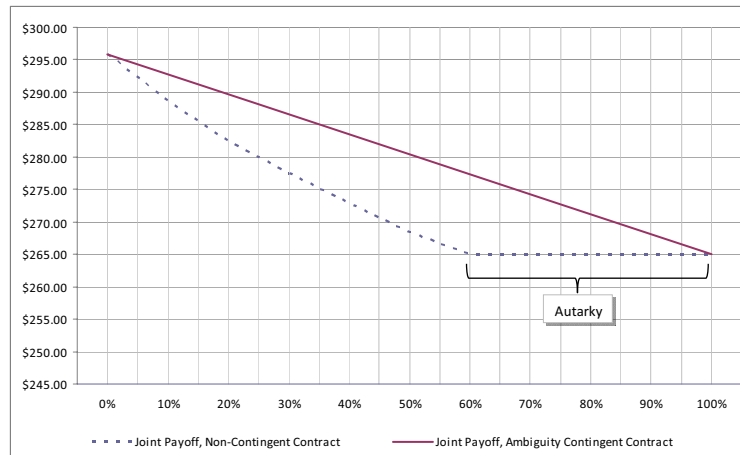


Figure 4: Gains from Ambiguity-Contingent Contract (in certainty equivalents)

Ambiguity Aversion					
		Neither is A.A.		Buyer is A.A.	
		Price	Damages	Price	Damages
Degree of Ambiguity ($=c$)	0%	\$250.00	\$37.50	\$250.00	\$37.50
	5%	\$250.00	\$37.50	\$263.16	\$33.33
	10%	\$250.00	\$37.50	\$277.78	\$29.55
	15%	\$250.00	\$37.50	\$294.12	\$26.09
	20%	\$250.00	\$37.50	\$307.50	\$21.12
	25%	\$250.00	\$37.50	\$318.55	\$14.60
	30%	\$250.00	\$37.50	Autarky	Autarky
	35%	\$250.00	\$37.50	Autarky	Autarky
	40%	\$250.00	\$37.50	Autarky	Autarky
	45%	\$250.00	\$37.50	Autarky	Autarky
	50%	\$250.00	\$37.50	Autarky	Autarky

Table 1: Optimal Contract Terms; Ambiguity Neutrality vs. Buyer-Side Ambiguity Aversion

Ambiguity Aversion

		Neither is A.A.		Only Buyer is A.A.		Only Seller is A.A.		Both are A.A.	
		Price	Damages	Price	Damages	Price	Damages	Price	Damages
Degree of Ambiguity (= c)	0%	\$250.00	\$37.50	\$250.00	\$37.50	\$250.00	\$37.50	\$250.00	\$37.50
	5%	\$250.00	\$37.50	\$263.16	\$33.33	\$236.84	\$41.67	\$250.00	\$37.50
	10%	\$250.00	\$37.50	\$277.78	\$29.55	\$233.75	\$49.48	\$262.85	\$41.99
	15%	\$250.00	\$37.50	\$294.12	\$26.09	\$229.89	\$57.19	Autarky	Autarky
	20%	\$250.00	\$37.50	\$307.50	\$21.12	\$223.88	\$58.73	Autarky	Autarky
	25%	\$250.00	\$37.50	\$318.55	\$14.60	Autarky	Autarky	Autarky	Autarky
	30%	\$250.00	\$37.50	Autarky	Autarky	Autarky	Autarky	Autarky	Autarky
	35%	\$250.00	\$37.50	Autarky	Autarky	Autarky	Autarky	Autarky	Autarky
	40%	\$250.00	\$37.50	Autarky	Autarky	Autarky	Autarky	Autarky	Autarky
	45%	\$250.00	\$37.50	Autarky	Autarky	Autarky	Autarky	Autarky	Autarky
50%	\$250.00	\$37.50	Autarky	Autarky	Autarky	Autarky	Autarky	Autarky	

Table 2: Optimal Contractual Terms for Various Permutations of Ambiguity Aversion

Category	Variable	Description of Variable	All Deals (N=528)			SDC Matches (N=452)			Pub. Targ. Matches (N=247)			H-H				
			Mean	SD	Min	Max	Mean	SD	Min	Max	Mean		SD	Min	Max	
Financial	price	Approximate Purchase Price (\$ mil)	1,460	2,960	100	27,300	1,420	2,600	100	23,000	1,960	3,160	102	23,000	9,910	
	MAC/MAE	MAC on the business, operations, financial condition, etc.	88.26%	-	0	1	91.59%	-	0	1	95.14%	-	0	1	1	
	Terms	mselabil	MAC on Seller's ability to close the deal	44.13%	-	0	1	48.45%	-	0	1	54.66%	-	0	1	0
		mbuyabil	MAC on Purchaser's ability to close the deal	23.48%	-	0	1	24.56%	-	0	1	23.48%	-	0	1	0
		maxloss	Losses over a specified threshold deemed to be a MAC	3.22%	-	0	1	3.10%	-	0	1	1.62%	-	0	1	0
		mbentcont	MAC on the benefits contemplated by the agreement	0.95%	-	0	1	0.88%	-	0	1	0.81%	-	0	1	0
		mbuybiz	Ability of Purchaser to continue to operate business immediately after closing in substantially same manner as immediately before closing	0.95%	-	0	1	0.44%	-	0	1	0.81%	-	0	1	0
		mtarbiz	Ability of Target to continue to operate business immediately after closing in substantially same manner as immediately before closing	0.76%	-	0	1	0.88%	-	0	1	1.62%	-	0	1	0
		mspserts	MAC on prospects of the Company/Target	3.22%	-	0	1	2.88%	-	0	1	2.02%	-	0	1	0
		msassets	MAC on the securities or purchased assets	23.11%	-	0	1	25.00%	-	0	1	24.29%	-	0	1	0
		menfable	MAC on validity or enforceability of agreement	2.08%	-	0	1	2.65%	-	0	1	2.02%	-	0	1	0
		mtaeasxp	Reasonable expectation of event to have a material adverse effect/change	15.34%	-	0	1	15.04%	-	0	1	13.36%	-	0	1	0
	mnodel	MAC out with no definition of "MAE" or "MAC"	7.01%	-	0	1	5.53%	-	0	1	3.64%	-	0	1	0	
	mdispsfct	Disproportionate Effects Language	51.14%	-	0	1	53.98%	-	0	1	64.37%	-	0	1	1	
	Misc	nomac	No MAC (Note: does not guarantee absence of force majeure, exclusion, etc. below)	3.79%	-	0	1	3.54%	-	0	1	4.45%	-	0	1	0
	Exclusion Terms	echcon	Change in the economy or business in general	75.38%	-	0	1	77.88%	-	0	1	82.19%	-	0	1	1
		echgen	Change in general conditions of the specific industry	69.51%	-	0	1	72.57%	-	0	1	76.11%	-	0	1	1
		echscm	Change in securities markets	44.89%	-	0	1	44.25%	-	0	1	47.77%	-	0	1	1
echprvol		Change in trading price or trading volume of Company's stock	33.14%	-	0	1	37.61%	-	0	1	57.49%	-	0	1	0	
echintr		Change in interest rates	15.91%	-	0	1	15.93%	-	0	1	20.24%	-	0	1	0	
echexch		Change in exchange rates	11.74%	-	0	1	10.62%	-	0	1	13.36%	-	0	1	0	
ewar		Acts of war or major hostilities	60.04%	-	0	1	64.38%	-	0	1	70.04%	-	0	1	1	
eterror		Acts of Terrorism	59.47%	-	0	1	64.60%	-	0	1	70.45%	-	0	1	1	
egod		Acts of God	24.81%	-	0	1	26.33%	-	0	1	31.98%	-	0	1	1	
epolcond		Change in political conditions	37.69%	-	0	1	40.93%	-	0	1	44.94%	-	0	1	0	
enatal		National Calamity	12.31%	-	0	1	13.50%	-	0	1	11.34%	-	0	1	0	
entical		International calamity directly or indirectly involving U.S.	7.39%	-	0	1	8.19%	-	0	1	6.88%	-	0	1	0	
echlvreg		Change in Laws or Regulations	62.88%	-	0	1	68.36%	-	0	1	75.30%	-	0	1	0	
echintp		Change in interpretation of laws by courts or govt entities	27.46%	-	0	1	31.19%	-	0	1	36.44%	-	0	1	0	
echbnkr		Changes resulting from bankruptcy or actions of a bankruptcy court	3.22%	-	0	1	2.88%	-	0	1	2.43%	-	0	1	0	
echtax		Change in applicable taxes/tax law	3.41%	-	0	1	3.10%	-	0	1	3.64%	-	0	1	0	
eeact		Employee attrition	12.50%	-	0	1	12.61%	-	0	1	14.57%	-	0	1	0	
elayoffs		Lay-offs	1.14%	-	0	1	1.33%	-	0	1	1.62%	-	0	1	0	
MAC/MAE "Score"	echlabor	Changes in the Target's relationship with any labor organization/unions	0.76%	-	0	1	0.88%	-	0	1	0.81%	-	0	1	0	
	erecust	Reduction of customers or decline in business	10.98%	-	0	1	13.05%	-	0	1	17.00%	-	0	1	0	
	ecustbr	Commencement of a proceeding in bankruptcy with respect to a material customer	0.38%	-	0	1	0.44%	-	0	1	0.40%	-	0	1	0	
	eredrev	Adverse effect resulting in seasonal reduction in revenues	2.27%	-	0	1	4.20%	-	0	1	4.86%	-	0	1	0	
	edclaysp	Delay or cancellation of orders for services or products	3.22%	-	0	1	2.65%	-	0	1	2.02%	-	0	1	0	
	efctdscf	Developments arising from any facts that were expressly disclosed to the Parent/public	4.92%	-	0	1	5.31%	-	0	1	4.45%	-	0	1	0	
	cantran	Effect of announcement of transaction	63.83%	-	0	1	65.04%	-	0	1	70.04%	-	0	1	1	
	exptran	Expenses incurred in connection with transaction	5.11%	-	0	1	5.31%	-	0	1	6.88%	-	0	1	0	
	echaction	Changes caused by the taking of any action required or permitted or in any way resulting from or arising in connection with the agreement	55.87%	-	0	1	59.96%	-	0	1	65.59%	-	0	1	0	
	echgap	Changes in GAAP	60.04%	-	0	1	64.82%	-	0	1	77.33%	-	0	1	1	
	ergrfail	Failure by the Target to meet revenue or earnings projections	35.04%	-	0	1	39.16%	-	0	1	53.44%	-	0	1	0	
	elactran	Any action required to be taken under any law or any existing contract by which the Target is bound	6.63%	-	0	1	7.74%	-	0	1	7.29%	-	0	1	0	
	elactran	Litigation resulting from any law relating to the agreement or the transactions contemplated	14.93%	-	0	1	18.36%	-	0	1	28.34%	-	0	1	0	
	totmac	Total Number of MAC/MAE Terms	2.63636	1.308	0	7	2.75	1.28	0	7	2.878543	1.173	0	6	2	
	totexc	Total Number of MAC/MAE Exclusions	8.01894	4.711	0	19	8.57522	4.475	0	19	9.813765	4.077	0	18	7	
	MERatio	Quasi-Ratio of MAC/MAE terms to exclusions = totmac / (totexc + 1)	0.48121	0.61	0	4	0.45101	0.585	0	4	0.350489	0.362	0	3	0.25	
	MERperc	Quasi-Percentage of total MAC/MAE provisions to total of all provisions = totmac / (totmac + totexc + 1)	0.26397	0.164	0	0.8	0.25547	0.153	0	0.8	0.229093	0.123	0	0.75	0.2	
	MCoverage	Total MACs Relative to total coded = totmac / (Total # MAC Categories)	0.2197	0.109	0	0.5833	0.22917	0.107	0	0.58333	0.239879	0.098	0	0.5	0.167	
ECoverage	Total exceptions Relative to total coded = totexc / (Total # Exclusion Categories)	0.25868	0.152	0	0.6129	0.27662	0.144	0	0.6129	0.316573	0.132	0	0.5806	0.226		
MERelCov	Relative coverage of MAC/MAE terms to exceptions = MCoverage - ECoverage	-0.03898	0.162	-0.53	0.371	-0.04745	0.157	-0.53	0.35753	-0.07669	0.148	-0.41	0.3522	-0.06		

Table 3: Summary Statistics of MAC / MAE Provisions. Source: Nixon Peabody LLP

	Non-High Tech Target	High Tech Target	Difference
Total # of MAC/MAEs	2.749333 [1.320789]	2.753247 [1.065683]	-0.003914 [0.1603062]
Total # of Exclusions	8.357333 [4.453598]	9.636364 [4.454179]	-1.279031 [0.5572227]*
MERatio	0.4627165 [0.5913538]	0.3940101 [0.5503312]	0.0687064 0.0731455
MEPerc	0.2600616 [0.1556253]	0.2331057 [0.141436]	0.0269559 [0.0191827]
MERelCov	-0.0404803 [0.1553072]	-0.0814132 [0.1635743]	0.0409329 [0.0196097]*
Number of Targets	375	77	

Table 4: Comparison of High Tech to non-High Tech Targets in Matched Sample (N=452; Std. Errors in brackets); * significant at 5%; ** significant at 1%.

Dependent Variable:	[1]		[2]		[3]		[4]		[5]	
	ln(Deal Value)	MEPerc	ln(Deal Value)	MEPerc	ln(Deal Value)	MEPerc	ln(Deal Value)	MEPerc	ln(Deal Value)	MEPerc
Pre-Announcement VIX (10-Day Ave)	-0.038932 [0.020076]	0.005324 [0.002166]*	-0.036951 [0.019964]	0.005399 [0.002163]*	-0.036307 [0.019781]	0.005369 [0.002165]*	-0.020687 [0.018646]	0.004383 [0.002139]*	-0.020044 [0.018660]	0.004593 [0.002133]*
Pre-Ann. Mkt Risk Prem (10-Day Ave)	-0.712834 [1.396309]	0.078647 [0.150648]	-0.60955 [1.389936]	0.090377 [0.150610]	-0.800415 [1.377800]	0.092467 [0.150807]	-0.334127 [1.291228]	0.065382 [0.148154]	-0.363195 [1.291222]	0.055912 [0.147580]
Target Industry β	-0.233522 [0.179521]	-0.036485 [0.019368]	-0.213236 [0.244524]	-0.013303 [0.026496]	-0.217246 [0.242637]	-0.012762 [0.026558]	-0.459923 [0.230119]*	0.000002 [0.026404]	-0.46415 [0.230077]*	-0.001375 [0.026297]
(Target Ind. β) x (Mkt Risk Prem)	0.107718 [0.530192]	-0.021346 [0.057202]	0.258521 [0.531089]	-0.027112 [0.057548]	0.258261 [0.526736]	-0.026099 [0.057654]	-0.043928 [0.494962]	-0.009697 [0.056792]	-0.040025 [0.498174]	0.003303 [0.056939]
(Pre-Ann VIX) x (Mkt Risk Prem)	0.030204 [0.054890]	-0.0021 [0.005922]	0.016676 [0.054828]	-0.002202 [0.005941]	0.025571 [0.054428]	-0.002335 [0.005957]	0.021787 [0.050958]	-0.002059 [0.005847]	0.021265 [0.050935]	-0.002229 [0.005822]
Percentage Sought by Acquirer	0.010666 [0.003643]**	-0.000505 [0.000393]	0.01043 [0.003626]**	-0.000472 [0.000393]	0.010421 [0.003591]**	-0.000469 [0.000393]	0.014952 [0.003416]**	-0.000748 [0.000392]	0.015028 [0.003416]**	-0.000723 [0.000390]
Risk Free Rate	14.829565 [18.883097]	3.912929 [2.037296]	16.830725 [18.794380]	3.806878 [2.036518]	19.368907 [18.629090]	3.806773 [2.039046]	18.262247 [17.446902]	3.91237 [2.001856]	18.545554 [17.442346]	4.004662 [1.993573]*
Acquirer is Strategic Buyer	-0.730625 [0.209667]**	0.032398 [0.022621]	-0.722676 [0.209756]**	0.028864 [0.022729]	-0.757902 [0.208322]**	0.028802 [0.022802]	-0.689116 [0.217720]**	0.016891 [0.024981]	-0.662451 [0.221121]**	0.025578 [0.025273]
Target Industry: Energy			0.189304 [0.222211]	0.028805 [0.024078]	0.184312 [0.220290]	0.028465 [0.024112]	0.373106 [0.208001]	0.016392 [0.023866]	0.372247 [0.207891]	0.016112 [0.023761]
Target Industry: Finance			-0.365233 [0.228603]	0.030012 [0.024771]	-0.390937 [0.226684]	0.029838 [0.024812]	-0.684654 [0.215730]**	0.046565 [0.024753]	-0.683059 [0.215625]**	0.047085 [0.024645]
Target Industry: High Tech			-0.196744 [0.210960]	-0.006728 [0.022859]	-0.189222 [0.209717]	-0.007359 [0.019936]	-0.143765 [0.196623]	-0.010774 [0.022560]	-0.139151 [0.196633]	-0.009271 [0.022474]
Number of Bidders (Inc. Acquired)			0.281636 [0.424848]	-0.011182 [0.046502]	-0.281636 [0.424848]	-0.011182 [0.046502]	-0.617751 [0.406146]	0.014242 [0.046601]	-0.670895 [0.413411]	-0.003071 [0.047251]
ln(Acquirer's Accounting Value)			0.521098 [0.182135]**	-0.004119 [0.019936]	0.521098 [0.182135]**	-0.004119 [0.019936]	0.477592 [0.171307]**	-0.019656 [0.019656]	0.483009 [0.171399]**	0.001465 [0.019590]
Acquirer Private and Target Public					1.040902 [0.135204]**	-0.061267 [0.015513]**	0.987442 [0.156422]**	-0.061267 [0.015513]**	0.987442 [0.156422]**	-0.078682 [0.017878]**
Acquirer Public and Target Private							-0.002985 [0.159545]	0.012985 [0.018306]	-0.101531 [0.291545]	-0.019119 [0.024652]
Both Acquirer and Target are Private										
Constant	6.720385 [0.749347]**	0.148239 [0.080847]	6.698525 [0.776723]**	0.113333 [0.084164]	4.715305 [1.189852]**	0.14275 [0.130235]	4.186715 [1.122193]**	0.164433 [0.128760]	4.29634 [1.133155]**	0.200145 [0.129514]
Observations	420	420	420	420	420	420	420	420	420	420
R ²	0.0829	0.0316	0.0956	0.0367	0.1139	0.0369	0.2235	0.0726	0.2243	0.0808
χ^2	37.98**	13.72	44.4**	16.01	53.96**	16.11	120.86**	32.87**	121.45**	36.9**

Table 5: Simultaneous (SUR) Estimation of Value of and MAC "score" for all SDC-matched deals. Dependent variables are ln of Deal Value (left column of each panel) and MEPerc score (right column). Standard errors appear below coefficient estimates in brackets. * significant at 5%; ** significant at 1%

Dependent Variable:	[1]		[2]		[3]		[4]		[5]	
	In(Deal Value)	MEPerc	In(Deal Value)	MEPerc	In(Deal Value)	MEPerc	In(Deal Value)	MEPerc	In(Deal Value)	MEPerc
Pre-Announcement VIX (10-Day Ave)	-0.007348 [0.007392]	0.00639 [0.002399]**	-0.004306 [0.007263]	0.006576 [0.002416]**	-0.005489 [0.006368]	0.006361 [0.002366]**	-0.004664 [0.006733]	0.00572 [0.002449]*	0.00937 [0.015953]	0.005489 [0.002441]*
Pre-Announcement Mkt Risk Prem (10-Day Ave)	-0.393661 [0.490173]	-0.040833 [0.159108]	-0.490611 [0.478858]	-0.046778 [0.159251]	-0.463931 [0.418975]	0.018304 [0.155671]	-0.544632 [0.431034]	0.017728 [0.156760]	-0.382318 [1.024864]	0.013824 [0.156791]
Target Industry β (3-dig SIC)	-0.297843 [0.091097]**	0.015937 [0.029570]	-0.290573 [0.088863]**	0.016383 [0.029552]	-0.16698 [0.078263]*	0.009415 [0.029079]	-0.168035 [0.081117]*	-0.003086 [0.029510]	0.026677 [0.192407]	-0.005648 [0.029436]
(Target Ind. β) x (Mkt Risk Prem)	-0.142362 [0.195622]	-0.017327 [0.063498]	-0.07294 [0.191855]	-0.013071 [0.063804]	-0.086653 [0.166490]	-0.025651 [0.061860]	-0.048036 [0.171838]	-0.017747 [0.062495]	0.340864 [0.402976]	-0.026158 [0.061650]
(Pre-Ann VIX) x (Pre-Ann Mkt Risk Prem)	0.025826 [0.019499]	0.00161 [0.006329]	0.026997 [0.019018]	0.001682 [0.006325]	0.026902 [0.016763]	-0.000839 [0.006228]	0.028171 [0.017301]	-0.001349 [0.006292]	0.012583 [0.040733]	-0.000829 [0.006232]
Percentage Sought by Acquirer	0.025749 [0.01054]**	-0.000431 [0.000342]	0.025848 [0.01028]**	-0.000425 [0.000342]	0.027077 [0.009947]**	-0.000375 [0.000352]	0.026888 [0.00988]**	-0.000576 [0.000359]	0.02287 [0.002317]**	-0.000539 [0.000354]
Risk Free Rate	-8.158361 [7.053910]	2.416646 [2.289666]	-6.313468 [6.900195]	2.529747 [2.294749]	-7.64246 [6.023683]	2.754175 [2.238115]	-7.233766 [6.306542]	2.930707 [2.293593]	27.651508 [14.764397]	2.472145 [2.258763]
In(Target's Pre-Ann Equity Value)	0.999614 [0.016998]**	-0.003621 [0.005517]	1.001516 [0.016586]**	-0.003504 [0.005516]	0.947616 [0.044322]	-0.004515 [0.016468]	0.93668 [0.046524]	-0.012107 [0.016920]	0.028285 [0.110227]	-0.000354 [0.016863]
Delaware Incorp. Target	-0.050902 [0.052134]	-0.02815 [0.016922]	-0.053055 [0.050844]	-0.02947 [0.016909]	-0.068253 [0.044322]	-0.009206 [0.016468]	-0.074721 [0.046524]	-0.012742 [0.016920]	-0.090004 [0.110227]	-0.013102 [0.016863]
Acquirer is Strategic Buyer	-0.040453 [0.071836]	-0.014473 [0.023318]	0.11133 [0.083032]	-0.005168 [0.027613]	0.149037 [0.074120]**	0.011797 [0.016468]	0.130491 [0.078710]	-0.000449 [0.035173]	-0.178862 [0.185757]	0.003611 [0.028418]
Target Macro Industry: Energy	0.016795 [0.108650]	0.049109 [0.035267]	0.030677 [0.106033]	0.049961 [0.035263]	0.01736 [0.091934]	0.052108 [0.034158]	0.000829 [0.096712]	0.059705 [0.037109]	0.173346 [0.223447]	0.054545 [0.034184]
Target Macro Industry: Finance	-0.304764 [0.080517]**	0.061099 [0.026135]*	-0.292954 [0.078595]**	0.061824 [0.026138]*	-0.477029 [0.080079]**	0.039653 [0.028695]	-0.498672 [0.080079]**	0.037092 [0.029124]	-1.273127 [0.181078]**	0.047239 [0.027703]
Target Macro Industry: High Tech	-0.072042 [0.074431]	0.012639 [0.024160]	-0.050143 [0.072869]	0.013981 [0.024233]	-0.016672 [0.065743]	0.030549 [0.024427]	-0.016755 [0.069446]	0.045817 [0.025256]	0.014103 [0.165166]	0.045613 [0.025268]
Acquirer is Private	0.0209278 [0.061460]**	0.01283 [0.020439]	0.209278 [0.061460]**	0.01283 [0.020439]	0.154882 [0.054199]**	0.009567 [0.020138]	0.153284 [0.055927]**	0.014613 [0.020340]	0.252747 [0.132826]	0.01345 [0.020321]
In(Target's Total Assets)	-0.072042 [0.074431]	0.012639 [0.024160]	-0.050143 [0.072869]	0.013981 [0.024233]	-0.016672 [0.065743]	0.030549 [0.024427]	-0.016755 [0.069446]	0.045817 [0.025256]	0.014103 [0.165166]	0.045613 [0.025268]
In(Target's Total Liabilities)	0.0209278 [0.061460]**	0.01283 [0.020439]	0.209278 [0.061460]**	0.01283 [0.020439]	0.154882 [0.054199]**	0.009567 [0.020138]	0.153284 [0.055927]**	0.014613 [0.020340]	0.252747 [0.132826]	0.01345 [0.020321]
In(Acquirer's Total Accounting Value)	-1.707442 [0.314916]**	0.09875 [0.102220]	-1.820326 [0.308887]**	0.091829 [0.102724]	-2.736197 [0.384013]**	0.159925 [0.142681]	-2.797672 [0.427408]**	0.205419 [0.155442]	-2.87495 [1.015657]**	0.209113 [0.155383]
Target's Earnings per Share	0.9511 [4374.24]**	0.1013 25.37*	0.9535 4611.26**	0.1029 25.81*	0.9607 5383.99**	0.1783 47.72**	0.9599 4982.56**	0.1971 51.05**	0.7721 708.22**	0.1919 49.64**
Acquirer's Earnings per Share	0.9511 [4374.24]**	0.1013 25.37*	0.9535 4611.26**	0.1029 25.81*	0.9607 5383.99**	0.1783 47.72**	0.9599 4982.56**	0.1971 51.05**	0.7721 708.22**	0.1919 49.64**
Target's Return on Equity (1 month)	0.9511 [4374.24]**	0.1013 25.37*	0.9535 4611.26**	0.1029 25.81*	0.9607 5383.99**	0.1783 47.72**	0.9599 4982.56**	0.1971 51.05**	0.7721 708.22**	0.1919 49.64**
Constant	-1.707442 [0.314916]**	0.09875 [0.102220]	-1.820326 [0.308887]**	0.091829 [0.102724]	-2.736197 [0.384013]**	0.159925 [0.142681]	-2.797672 [0.427408]**	0.205419 [0.155442]	-2.87495 [1.015657]**	0.209113 [0.155383]
Observations	225	225	225	225	220	220	208	208	209	209
R ²	0.9511	0.1013	0.9535	0.1029	0.9607	0.1783	0.9599	0.1971	0.7721	0.1919
χ^2	4374.24**	25.37*	4611.26**	25.81*	5383.99**	47.72**	4982.56**	51.05**	708.22**	49.64**

Table 6: Simultaneous (SUR) Estimation of Value of and MAC score for public target deals. Dependent variables are logged deal value (left column of each panel) and MEPerc score (right column). Standard errors appear below coefficient estimates in brackets. * significant at 5%; ** significant at 1%.