The Merger Game: Designing Optimal Strategies for Electric Utilities

The use of game theory can provide decision makers with clear guidance for making informed, rational strategic decisions about mergers, acquisitions, and partnerships.

Paul Papayoanou

Paul Papayoanou *is the founding president of Strategic Bargaining Group, a consulting firm based in Cambridge, MA, that specializes in using game theory to help clients develop optimal business, litigation, negotiation, and governmental strategies. A former professor at Harvard University and the University of California, San Diego, he has published extensively in game theory, political economy, and international relations, and has designed and copyrighted a proprietary game-theoretic computer program that his firm uses in consulting.*

Restructuring in the electric utility industry is occurring at a dizzying pace. One after another, utilities are acquiring, being acquired, or partnering with others. More and more, it seems, electric utilities are jumping on the consolidation bandwagon. The environment faced by electric utilities is complex and dynamic, if not frenzied, and so it is worth asking whether consolidation is the optimal strategy.

In many cases, it probably is the best choice. In others, it may not be. To make sweeping generalizations would be wrong. Each company is faced with a unique situation. No two companies are the same size or share identical capabilities. Rules and regulations that govern the utility industry, the structure of competition, weather patterns, and consumers' electricity requirements vary regionally. For these and other reasons, companies are differentially situated and their optimal strategic choices may vary. Jumping on the consolidation bandwagon may or may not be the best course of action. Moreover, the optimal terms for negotiated agreements will differ markedly among utilities.

Whether, and on what terms, an electric utility should choose to acquire, be acquired, or partner with another is a complex and important strategic question. For any given utility company, much is at stake, there is a great deal of risk and uncertainty, and the interac-

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tion of a utility company's choices with the choices of other companies, as well as those of regulators and other government bodies, determine how beneficial a merger will be for a utility company. How should such a complicated strategic question be answered? A game-theoretic approach is the most appropriate method.

I. Game Theory

Game theory is the science of strategic thinking. It is the most sophisticated mathematical tool for analyzing strategic situations—situations in which the choices of two or more actors interact. Game theory provides a logical, clear structure for understanding strategic situations, and helps predict and prescribe optimal strategic behavior. Though game theory is a relatively new science, it has made substantial advances that enable analysts to model complex situations that involve risk, uncertainty, varying sequences of play, signaling and bluffing by players, and even irrationality. Such advances have led to substantial insight in various parts of academia, changing widely held beliefs in economics, business, law, the social sciences, and other disciplines. Recognizing the import of game theory, three game theorists were awarded the Nobel Prize in Economics in 1994.

There has, nonetheless, been little in the way of applied game theory in the "real world." Although more and more students and practitioners in business, economics, law, and government have learned and use basic lessons from game theory, game-theoretic modeling is seldom applied in a serious fashion.

This is understandable but need not be the case. Although the mathematical calculations behind game-theoretic models can be extensive, they are not particularly complex. Many solution algorithms basically entail a rigorous algebraic process. Moreover, game-theoretic modeling imposes a simple yet elegant structure; it requires answers to just five basic questions, as indicated below. Using the answers to these questions and their modeling expertise, game theorists can then make use of computers to deal with the necessary calculations. Although game-theoretic computer programs are few in number, they are being developed, and applied game theory is becoming a reality.

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A good computer program enables well-trained game-theoretic consultants to solve more complex games than would be attempted otherwise. They can also model and solve several different games quickly to see the effects of varying assumptions, which provides substantial analytical leverage. Thus, the elegantly simple structure of game theory, modeling expertise of consultants, and computerization make applied game theory a realistic possibility. Moreover, the value added for clients is typically substantial.

II. The Approach and Value Added

In a game-theoretic approach to consulting, five questions need to be addressed to understand and model strategic situations such as those faced by electric utilities.

1. Who are the key players?
2. What choices do these players have?
3. In what sequence do the players make these choices?
4. What uncertainties and risks are there? That is, what uncertainties do the players have about one another's payoffs? What chance events can influence the payoffs that the players will receive?
5. What are the likely payoffs for each of the players in each possible outcome in the game?

The structure that these questions provide is extremely helpful for clarifying the general dynamics of a situation and getting clients to begin to think more strategically. However, game-theoretic analysis contributes much more. It helps clients understand their bargaining power, how much they might demand, settle on, or concede in negotiations, how effective bluffs or signals will be in influencing others, how they should interpret

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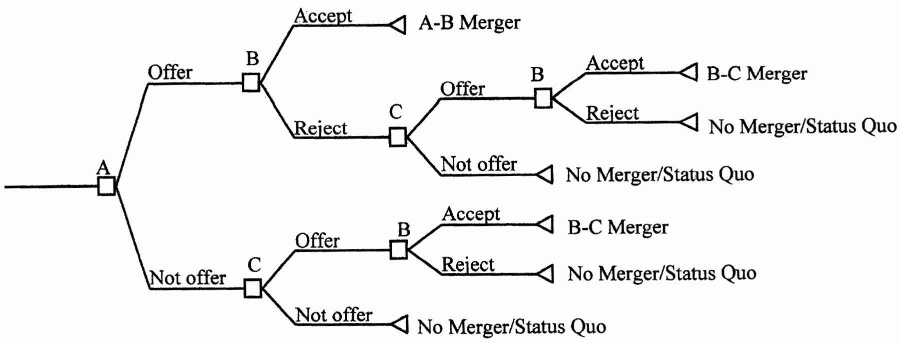


Figure 1: Basic Merger Game

signals from others, and what sorts of evidence or psychological tactics might be useful in persuading adversaries, competitors, or prospective partners. Making assessments about these crucially important matters requires modeling expertise and the power of a computer program.

III. A Merger Game

To illustrate the value of such a game-theoretic approach, let us consider a simple hypothetical merger game and consulting engagement. Because every situation is unique, modeling should take account of a client's particular circumstances, and so it would be inappropriate to draw conclusions about other cases from this example. Nonetheless, the example is illustrative of the approach and its value because it is analogous to the merger games going on throughout the electric utility industry.

There are three players in the game shown in **Figure 1**: companies *A*, *B*, and *C*. Consider *A* to be the client in this hypothetical game and consulting engagement. *A* and *C* are the two largest companies, and thus most capable of acquiring *B*, a prospective target. What we are concerned with in this game is what sort of offer, if any, the client should make to acquire *B*.

As shown in Figure 1, the client first has a choice between making an offer to acquire company *B* or not. If *A* chooses to make an acquisition offer, *B* then decides whether to accept or reject it. If *B* accepts, the game ends and the competitive structure in the industry is the merger of *A* and *B* versus *C*. If *B* rejects *A*'s offer, *C* chooses between making *B* an offer to acquire it or not. If *C* chooses to make an acquisition offer, *B* then decides whether to accept or reject it. If *B* accepts, the game ends and the competitive structure in the industry is the merger of *C* and *B* versus *A*. If *B* rejects offers from *A* and *C*, or offers are not forthcoming, there is no merger and the status quo is maintained; the three companies continue to go their own way.

Figure 2 shows, where the branches of the game tree end, hypothetical payoffs for players *A*, *B*, and *C*, respectively, with commas separating the payoffs. Note that there is an unknown in these payoffs, for the decision player *A* has to make is not just whether to merge, but at what price. Thus, for example, if player *A* makes an offer to *B*, and *B* accepts, *A* and *B* get 8-P and P respectively, where P represents the price *A* pays to *B*. For some realism, and to make the hypothetical concrete, we can reasonably assume the payoffs to be in the billions of dollars.[1]

This game is quite simple as it stands. We can see that *B* would rather accept than reject an offer from *C* because *B* will get 3 rather than 2. That means, for *A* to acquire *B*, *A* must offer at least 3 (P = 3). And because *A* would get only 3 if *B* went with *C*, *A* will be willing to pay up to 5 (P = 5, because 8 − 5 = 3). The client should stand firm in

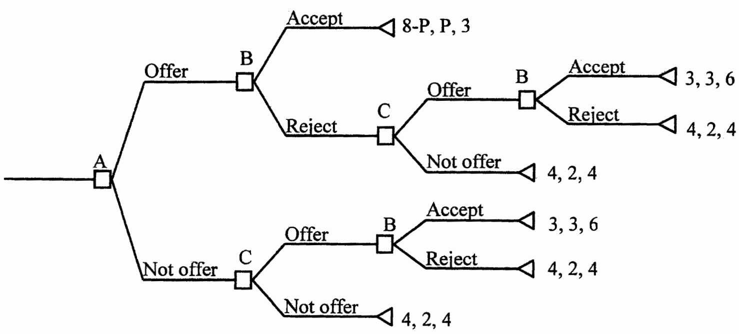


Figure 2: Hypothetical Merger Game I

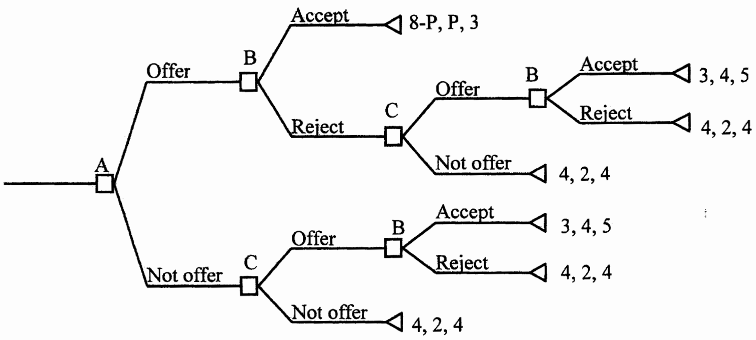


Figure 3: Hypothetical Merger Game II

offering no more than a little over 3, however, as *B* cannot do better by going with *C*.

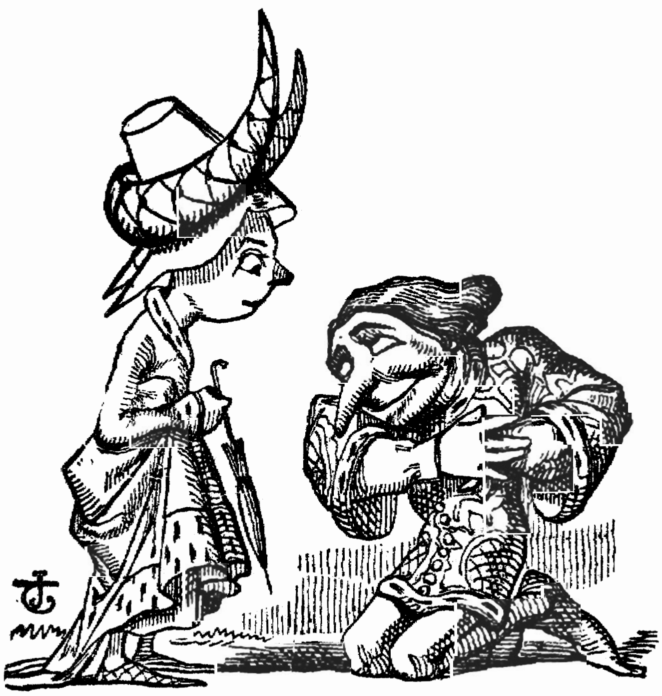
Now what if *C* is more aggressive in what it is going to offer *B*? Consider **Figure 3**. It is the same as Figure 2, except that *B* would get 4 from *C* instead of 3. That means *A* must offer at least 4 to get *B* to agree to a merger.

Now what if there is uncertainty about whether *C* will be aggressive or not in its offer? Companies *A* and *B* do not know whether *C* will be aggressive, but have some probabilistic estimate of *C*'s aggressiveness. Solving such a model, with the help of a computer program, yields interesting results. *A* should be able to get *B* to accept an offer of 3.1 if *C* is seen to be aggressive with 0.1 probability, 3.2 if *C* is seen to be aggressive with 0.2 probability, and so on up to 3.9 if *C* is seen to be aggressive with 0.9 probability. Thus, *A*'s offer to *B* will need to increase with the likelihood of *C* making an aggressive offer.

Company *A* may be tempted to play it safe by paying 4 or more. That would be throwing money out the window though, for *B*'s uncertainty will lead *B* to accept an offer from *A* that is less than 4. The greater *B*'s doubts about *C*'s aggressiveness, the less it will be willing to accept from *A*. Hence, if *A* were to simply play it safe and offer 4, the client would be overspending by as little as 0.1 and as much as 0.9. If each unit is worth $1 billion, as we assumed, that is a savings of $100 million to $900 million.

What, then, should the client do? Obviously, the client should offer only as much as the model suggests; that is, the amount corresponding with the probability estimate for *C*'s likelihood of aggressive spending. The temptation will be to play it safe and pay 4, but *A* should avoid this temptation because *B* should accept less. The issue then becomes how to make sure that *B* accepts *A*'s offer, as the model suggests it should. *A* should, in negotiating with *B*, try to persuade *B* that *C* is not likely to pay a lot—that is, that *C* is not likely to be aggressive—and that *B* should therefore go with *A*'s offer, which is greater than 3 but less than 4. Should that approach fail, *A* should go up to 4, but there is no reason to go as high as 5, its reservation price. *B*, after all, will not get more than 4 even from an aggressive *C*.

In this hypothetical exercise, then, the client would have gained a clear sense of its bargaining power, a precise figure for how much to concede and settle on in



The issue then becomes how to make sure that B accepts A's offer.

negotiating with *B*, and some guidance on negotiation tactics (i.e., how to persuade *B* that it should accept *A*'s offer). Following this strategic advice, *A* should be able to acquire *B* at or close to its optimal price rather than "play it safe" offer, and certainly for less than its reservation price. The savings could be in the hundreds of millions of dollars.

IV. Extensions and Other Directions

This hypothetical leaves out a lot of the richness and complexity we would typically care to model and that would be modeled in a real-world consulting engagement. The hypothetical is simply meant to be illustrative of the nature of a game-theoretic approach and the type of value-added of which it is capable. In practice, more uncertainty would be incorporated. We might, for example, have uncertainty about both *A* and *C*, or about all three players. The game tree might have more interactions and players, and the players might have the possibility of signaling and bluffing. Or, there might be simultaneity in moves that we would want to model. Game theory, and well-trained game theory consultants armed with an adequate computer program, can handle much more complexity than this simple example provides, and the typical consulting engagement will go much further.

In addition, tests would be run on a series of models in a consulting engagement. By analyzing a set of models with different specifications we can see whether and how differences in assumptions should affect a client's strategy. This is most useful because few models can incorporate all the considerations that might represent a given situation. It is thus useful to take different cuts at an issue to understand what is going on. Running a series of tests is also important because there may be disagreement about what the appropriate assumptions should be. Because computerization allows consultants to quickly run tests of models under different assumptions, we can see whether and how assumptions should influence a client's strategy. In some cases, different assumptions do not produce different results. Such findings would bolster confidence in a particular strategic plan, for it is robust in a variety of possible environments. In other cases, the different assumptions do matter. But because a game-theoretic approach highlights how particular assumptions should influence strategies, the exercise leads us to examine certain issues more carefully than we might have. In other words, game theory focuses our attention on what is important, and leads us to ask the most pertinent questions as we seek to develop optimal strategies.

Making decisions about crucially important matters should not be left to guesswork.

V. Conclusion

The electric utility industry is undergoing a fundamental transformation. Restructuring of the industry's markets is, and will continue to be for some time, an issue with billions of dollars at stake. Making decisions about complex and crucially important matters should not be left to chance or guesswork. The stakes are too high. Knowledge combined with the structure imposed by game theory, skilled game-theoretic modelers, and computerization can provide decision makers with clear guidance for making informed, rational strategic decisions about mergers, acquisitions, and partnerships. Such an approach is clearly more valuable than simply jumping on the consolidation bandwagon. ■

Endnotes:

1. Assuming each unit to be worth $1 billion is quite reasonable, for 10 recent mergers have been for more than $10 billion in combined assets. Some were for about $4 billion, and some for $24 billion. See Energy Information Administration, THE CHANGING STRUCTURE OF THE ELECTRIC POWER INDUSTRY 1999: MERGERS AND OTHER CORPORATE COMBINATIONS (Washington, DC: U.S. Department of Energy, 1999), at 11, 20.

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