Institutional Realism and Bargaining Models

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The Two Stages of Political Decision Making

Close studies of governmental decisions in democracies commonly divide the process into two stages. First, the actors bargain. As Arthur Bentley (1967 [1908]: 371) put it nearly a century ago in describing the legislative process, “It is compromise....It is trading. It is the adjustment of interests.” This stage may include information gathering and exchange, as well as threats and promises. Few rules constrain the actors. The free–form interplay puts a premium on creative interpretations and skillful compromise.

Then when deals have been struck (or the parties to the conflict are exhausted), the second stage takes place. Here the organisational regulations and legal rules shape the process, and a test of strength is carried out according to constitutional or legal procedures. Explicit voting procedures settle differences of opinion.

The two stages of political decision making interpenetrate and influence each other. Groups with more votes in the constitutional procedures have more power in the preliminary bargaining. Conversely, skillful bargainers at the initial stage may persuade other actors and build coalitions that control a disproportionate number of votes at the final stage. Maneuvering at each stage takes account of the contending groups’ power at the other stage. A sophisticated recent discussion that emphasises this two–step view of European Union decision making is Van den Bos (1991, chap. 5). Students of domestic politics have repeatedly discovered the same process at work, particularly in studies of interest groups, “iron triangles,” policy networks, and issue coalitions. A recent colourful American example was the battle
over President William Clinton’s national health plan (Broder and Johnson, 1996).

Contemporary formal theorists often wish to model political decisions as an extensive form game. However, coping with the two stages of decision making, each with its own logic, presents a conundrum. Modelling the formal procedures at the second stage is difficult enough, for the law can be quite complex. To make matters worse, modelling the first stage bargaining as an extensive form game is even more difficult. The strategy spaces are staggeringly large and not known to the analyst, the information sets are poorly specified and may be determined by gossip and back channels, and the order of play is haphazard and contested. Thus expressing either stage of political decision making in the extensive form presents troublesome challenges aplenty. At this stage of our knowledge, detailed modelling of their interconnection seems hopeless.

Sometimes (necessarily highly simplified) models of the two stages are posited without attempting a full-blown conventional game-theoretic analysis. Approaches of that kind are represented by Coleman (1966b; 1971; 1990), Bueno de Mesquita et al. (1985), Stokman and Van den Bos (1992), Bueno de Mesquita (1994), and Stokman and Van Oosten (1994). In updated versions, all these models are represented in this book. For the assumptions of their two-stage models, see chapters 6 and 8. In addition, Mika Widgren and Antti Pajala present a new two-stage model of this kind in Chapter 9.

More commonly, though, theorists are daunted by the modelling complexities, and they give up on modelling both stages. If the initial bargaining
is set aside, for example, analysis can focus on the second stage. Thus as Chapter 3 made clear, many analysts have modeled the formal legal sequencing of the various EU decision making processes (Crombez, 1996; Laruelle, 1998; Laruelle and Widgrén, 2001; Steunenberg, 1994; Tsebelis, 1994). Typically, the Commission, the member countries represented in the Council of Ministers, and the European Parliament are each treated as unitary actors within a simplified version of the EU decision making rules. The actors’ preferences are taken to be common knowledge, so that the game is conducted under complete information. Conclusions are then derived from standard game-theoretic solution concepts for extensive form games, such as sub-game perfection. Models of this kind, where the legal rules are embodied in extensive form games, are called procedural.

Formal mathematical analyses of decision making rules have led to important insights and debates over the consequences for EU decision making of particular legal provisions. The great strength of taking the rules at face value is that they are relatively clear and explicit in a well developed decision making system like the EU. Disputes over procedures occur, of course, and not every legal rule is unambiguous. But compared to the fuzzy informality of pre-decision bargaining, the legal provisions are a model of clarity. Emphasizing legalities brings the great logical power of non-cooperative game theory to bear on EU decision making, with gains in understanding that are evident in the literature. For example, such models have demonstrated that features of decision making often neglected in conventional analyses, such as the reversion point (what happens if agreement fails) may play a fundamental role in determining a political outcome (even if agreement does
Rational–actor models are conventionally criticised for their over-estimation of human cognitive capacity and their under-estimation of the true complexity of human choice. EU decision making models are no exception, and critics have not been slow to complain. Experienced analysts know, however, that all good science simplifies. The only issue is the relative power of alternate simplifications.

The principal serious concern about most procedural versions of EU decision making is not that they are simplified, but rather that they may become politically naive. For example, decisions are often modeled as unrelated even when they are closely linked. Thus the EU’s 1987 decisions about emission controls on small, medium, and large cars would often be treated in extensive form models as if they occurred in complete independence from each other. Indeed, many such procedural models logically imply that no equilibrium exists if the actors consider all three kinds of cars simultaneously. In such cases, no prediction of outcomes is possible. Other models escape this limitation only by assuming that a particular designated actor picks the final proposal to be considered, an assumption with doubtful support in either the formal decision making rules or the case study literature.

A great many case studies have shown that preliminary deal-making is critical to outcomes in the EU, just as they are in virtually every democratic decision making body around the world (for example, Hayes–Renshaw and Wallace 1997: chap. 10; Wallace 2000: 526). Yet in the extensive form models of the formal rules of EU decision making, the compromises and cross-issue deals that dominate in the initial bargaining stage are rarely
discussed. Implicitly, all such activities are assumed to be unimportant compared to the legal rules.

In some procedural models, the EU constitution is treated with a reverence that would please only the legalistic political scientists of the nineteenth century. For example, the power of a dissatisfied state to impose private costs and sanctions on other states and organizations when its will is flouted is nearly always ignored in contemporary extensive form models. Similarly, intensity of preference is usually neglected because it plays no role in the legal rules. Thus when Germany feels that its fundamental national purposes are being sabotaged by some EU decision, it is assumed to behave with prissy decorum on all other EU issues, and to act in other international forums as if it did not mind having its will thwarted by the EU. It was just those sorts of legalisms that pioneering political scientists like Woodrow Wilson (1885) and James Bryce (1893) attacked so long ago.

At least since Thucydides, political analysts have understood that “the strong do what they can, and the weak suffer what they must.” In politics, power is fundamental. To understand political decision making is to understand the balance of political forces that were brought to bear on the decision. For centuries, students of political decision making have taken that conclusion for granted.

Political power is different from formal voting power or the legal power of initiating proposals, and it matters more than either. The bargaining that precedes the invocation of a legal decision process is more consequential than the narrow legalities. This feature of political life holds even more strongly in international forums like the EU. Duncan Black (1958: 141), a founder of
rational choice models of formal constitutional procedures, recognized the limitations of purely legal analysis in the supra-national realm:

We also know that international discussion is the stage for power politics; that behind the scenes there are promises and threats; and that “horses are traded,” or bargains struck, which do not call for mention in the conference room.

Of course, procedures and votes matter: The deal is shaped by the need to have it ratified at the legal decision making stage. But the legal rules should not be the sole focus of analytic effort. To predict EU decisions, it is important not to characterize the process analytically as if it were a textbook collective choice problem, in which atomistic individuals, who need not speak to one another, meet in a room and try out various proposals for approval, until one alternative wends its way antiseptically through a set of legally-sanctioned procedures and emerges as a law. Instead, bargaining and power dominate.

**Institutional Realism and Political Power**

The power–based bargaining that defines the first stage of policymaking belongs in analysts’ models. Unfortunately, few models of the critical first–stage process exist, and none commands universal assent. Conceptually, how might such a process best be understood?

The first source of guidance is the extensive literature in political science on the policymaking process. There is no one name for so disparate a
literature, but “institutional realism” conveys its two central features—an aversion to legalism, and an emphasis on the bargaining interplay of powerful societal and governmental organizations in the formation of policy.\(^3\) The political actors may be individuals, social groups, pressure groups, government agencies, courts, legislatures, or any other private or public organizations. The literature on policy networks and issue coalitions is part of this tradition, as are writings on how conceptions of “the national interest” enter policymaking. Institutional realism is simply the view that politics should be seen realistically rather than legalistically, and that the key actors in politics are usually institutions of one kind or another.\(^4\)

The institutional realist tradition has tended to treat political outcomes as determined by institutional power without paying much attention to the details of the legal process. This is not to say that laws are irrelevant, but rather that they are shaped by power, too. The strong get their way, not only because they can exert pressure within the rules, but also and more importantly, because in the long run, they make the rules. Thus as Riker (1980: 445) said, “Institutions are probably best seen as congealed tastes.” Moreover, for institutional realists, laws and organizations are not just anybody’s frozen preferences. Instead, they represent the solidified desires of the powerful.

This approach does not so much ignore procedural rules as endogenize them: Political forms will reflect political power, and thus the formal rules in the second stage of policymaking will support the will of powerful actors. Hence the outcomes will also reflect the desires of powerful actors, in proportion to the power they bring to bear. That is, institutional realists tend
to see political outcomes at the first stage of policymaking as an agreement to be ratified nearly unanimously at the second stage. And since both the constitutional and extra–constitutional structures reflect the power relationships, the agreement struck will amount to an approximate weighted average of actor preferences, the weights being a function of the actor’s power. As Banfield (1961: 349, footnote 9) puts it, the outcome of the policymaking process is “a ‘quasi–Utilitarian’ conception, the utility of the individual being weighted according to his influence.” Similar statements abound in the policymaking literature. Specialized assumptions of that kind are also made frequently in applied political and economic modelling (Alesina and Rosenthal 1995: 47-48; Chong 1991: 144; Franzese 1999).

A special version of Banfield’s verbal sketch has been formalized by Van den Bos (1991: 175) and by Stokman and Van den Bos (1992: 235). They call it the Base Model. Issues are taken to be one–dimensional. On each issue coming before them, political actors are assumed to agree to a compromise position which is a weighted average of their most–preferred (or ideal) positions, with the weights being their “power.” Formally, if there are \( n \) actors, let the most–preferred position of actor \( i \) be \( x_i \). Denote the power of \( i \) by \( v_i \). Then the expected outcome predicted by the Base Model, \( y_B \), is:

\[
y_B = \frac{\sum_{i=1}^{n} v_i x_i}{\sum_{i=1}^{n} v_i}
\]

(1)

Stokman and Van den Bos were concerned with voting in the EU Council of Ministers, and so they defined “power” as the actor’s number of votes. However, an index of vote power or some other measure of political “clout”
might be substituted. In this book, as noted in Chapter 2, “power” in the EU is measured by the actor’s Shapley–Shubik value. Because of the way that value is defined, this definition of power takes account of actors’ positions in the legal structure. Thus it captures in a simple way the interpenetration of the bargaining and voting stages of EU decision making: Your bargaining strength is greater when the rules favor you.

The Base Model is not a full–fledged formal model, nor is it derived from such a model. It is simply a summary of other literature, such as the less subtle versions of pluralist or Marxian theory, in which only power and interests matter. It was set out by Stokman and Van den Bos, not as a serious theoretical proposal, but rather as a crude but useful comparison measure, whose predictions may be matched against those of better models.

The Compromise Model

An institutional realism model for forecasting political decisions necessarily must take power into account, as the Base Model does. However, power relationships alone are not enough. Long ago, Bentley (1967 [1908]: 215-222) stressed the importance of intensity in creating influence. Much later, Lindblom (1965: 334) wrote, “Other things being equal, the more intensely held a value, interest, or preference the heavier its weight in partisan mutual adjustment.” Similar statements about how intensity adds weight to influence have been made by Banfield (1961: 331-332) and others throughout the political science writings of the last hundred years.

Thus to the extent that one can summarize a somewhat imprecise liter-
ature extending over many decades, one might say that Banfield’s “quasi–Utilitarian” conception characterizes this school of thought deriving from Bentley, but with the understanding that an actor’s influence depends on both the actor’s potential power and on the salience or intensity of the issue for that actor. Predicted outcomes are compromises among the actors, with more powerful actors and more intense actors having more say than the weak and the apathetic. As Harsanyi (1963; 1977: 174-176, 192-195) showed, game theoretic solution concepts for bargaining games lead naturally to the same “quasi–utilitarian” outcome, where the weight on each actor’s utility is determined, not by justice, but by the actor’s strength in the bargaining situation. 5

In a parallel development, Coleman (1966a; 1966b; 1971; summarized in 1990: 769-873) developed “exchange models” in which political actors could trade votes or positions on issues in order to achieve an “ideal system” of social action. In one version of his framework, the ideal collective decision in a dichotomous (yes or no) choice is given by choosing the alternative that has the greatest sum of weighted preferences, where the weights are the product of power and intensity (for example, Coleman, 1990: 850-851). This is again a formalization of Banfield’s version of institutional realism.

Several researchers have developed policymaking analysis in the sociological tradition stemming from Coleman. (See the review in Knoke et al. 1996: chap. 7; a recent application to the EU is Mokken et al., 2000.) In particular, Van den Bos (1991: 175-176) took an important step forward in that tradition by extending Coleman’s decision formula to the case of continuous outcomes. He called it the Compromise Model. 6 In that formula, political
outcomes are predicted to occur at the weighted mean of actor preferences, with the weights being the product of power and intensity. Formally, if actor $i$ has salience $s_i$, and if ideal points and power are denoted as in the Base Model, then the expected outcome predicted by institutional realism (the Compromise Model) is $y_C$, defined as:

$$y_C = \frac{\sum_{i=1}^{n} s_i v_i x_i}{\sum_{i=1}^{n} s_i v_i}$$  \hspace{1cm} (2)$$

Note that if an actor does not care about a particular issue ($s_i = 0$), then that actor is dropped from both the numerator and denominator of the previous equation. In effect, the issue is resolved among the remaining actors.

The link between Banfield’s and Harsanyi’s quasi–utilitarian formulation, Coleman’s model, and Van den Bos’s formula is easily spelled out. Suppose that the policy process works to optimize a weighted sum of utilities, where the weights are power times intensity, as Banfield and Lindblom suggest.\footnote{7} Suppose further that utility losses are quadratic in the distance from the actor’s most–preferred alternative. Then in the same notation as before, the policy chosen will be\footnote{8}:

$$y_C = \arg\max_z \sum_{i=1}^{n} w_i (z - x_i)^2$$  \hspace{1cm} (3)$$

This is a simple quadratic minimization problem in one variable, and in the case of continuous outcomes, the solution is well known from elementary calculus: It is Van den Bos’s $y_C$ as defined in Equation (2). Thus the Banfield formulation with quadratic loss leads to Van den Bos’s Compromise
Alternately, if the possible outcomes of the decision process are discrete (for example, dichotomous), then under the Banfield view, $y_C$ is the alternative that maximizes Equation (3). But it is easily shown that $y_C$ in that case is equivalent to choosing the outcome with the largest product of power times utility, as in Coleman’s model. Thus Banfield’s framework leads to Coleman’s solution in the case that Coleman treated, and Van den Bos’s Compromise Model also generates Coleman’s prediction in that case.

In short, the Compromise Model is a specialized implementation of the century-old tradition of institutional realism in political science. It also incorporates the prediction models from social action theory in sociology. It is a concise and practical formula, suitable for empirical applications. No elaborate software programs are needed to compute it, and no disputable subtleties are disguised in its formula. This sophisticatedly simple equation neatly summarizes much of the previous century’s thought about political policymaking. For all these reasons, it appears as part of the theoretical apparatus in other models, including those in Chapters 5, 7, and 9 of this book.

As it stands, however, the Compromise Model lacks a certain theoretical dignity. In a fundamental sense, there is no model here: Van den Bos (1991: 175-176) explicitly set aside his initial formal model and imposed this equation as a better fit to EU reality. The formula was proposed as an empirical summary of what is known from prior work in sociology and political science. As Equation (3) showed, the formula also follows from Banfield’s macro-level summary conclusion about how policymaking
comes to a decision. But none of these descriptive summaries is theory in the modern sense, that is, a derivation from fundamental axioms about the political behaviour of the actors. Even Harsanyi’s (1963; 1977: 174-176) derivation of the quasi-utilitarian interpretation, while fully rigorous, is abstract, working solely with utilities and not with policy positions. Thus his framework does not connect to political outcomes and policymaking data as the Compromise Model does. And Coleman (1990: 868) himself expressed doubts about the theoretical legitimacy of his own formulation of the Compromise Model applied to the dichotomous case.11 In short, we have no adequate micro-foundations that imply the formula. No such set of axioms currently exists.

Nevertheless, the Compromise Model formula gives a clear and simple, though politically sophisticated, goal for modelling. It summarizes the fundamental orientation of institutional realism. Thus it is a finding or a conclusion, not the story itself. What the realist political science literature and the sociological modelling tradition have agreed on is this: If a good institutional realism model were developed, it should logically imply something like the Compromise Model. And if the viewpoint of institutional realism is correct, then the corresponding model should yield predictions superior to those of extensive form games that adopt a legalistic view of policymaking.

Indeed, the Compromise Model has enjoyed some empirical success. Bueno de Mesquita and Stokman (1994) set out seven different predictive models of EU decision making. They focused on the Council of Ministers, by far the most powerful organ of EU decision making at that time. Examining sixteen policy issues, they read the news agency Agence Europe and inter-
viewed experts to assess the preferred policy positions and issue saliences of each of the national actors, as was done for this book (see chapter 2). The data were then fed into each of the models, and predictive accuracy was assessed.

In Bueno de Mesquita and Stokman’s evaluations (1994, chap. 9), the Compromise Model finished third, just behind the two models favored by the authors. However, the statistical criteria used to evaluate the models differed slightly from the usual statistical measures. If more standard statistical criteria are used, the Compromise Model moves into second place among the models. And if an arguably more plausible scaling of saliences is employed, the Compromise Model is a comfortable winner, easily defeating each of the other six models (Achen, 1999).

Thus in the one small dataset that has been available, the Compromise Model was arrayed against prominent models with good track records. It proved itself to be, at minimum, a strong competitor against the best models, and by some criteria, it did even better than that, defeating all comers. Thus as a pure statistical forecaster, the Compromise Model has been a serious contender.

In summary, many recent policymaking models have been animated by ideas derived from the older legalist tradition, with a potentially serious loss in political verisimilitude. A different understanding of the policymaking process, which we have called institutional realism, has dominated the political science and sociological literature of the last century. A rough weighted-utilitarian outline of its workings is visible, and it has proved itself empirically. However, the institutional realist tradition is overwhelmingly
qualitative and humanist in methodology. Power– and– intensity– weighted bargaining has attracted less analytic attention than might be expected, and no formal model has been proposed which implies this standard political science view of policymaking. Without it, the case study support and statistical victories of institutional realism remain on shaky footing.

As it turns out, however, a theoretical foundation can be supplied for the Compromise Model. This foundation will be called the Institutional Realism Model. The remainder of this chapter is devoted to its derivation. The Compromise Model then appears as a close approximation to the solution implied by the Institutional Realism Model.

Cooperative and Non–Cooperative Game Models

Non–cooperative games specify the moves available to each of the players. In contemporary social science, most such games employ the extensive form, in which the sequence of moves is spelled out explicitly. Other aspects of the players’ situations, such as their information sets, are included as well. Games of this kind were used in Chapter 3.

Models of the initial stage of policymaking typically do not attempt to explicitly model the full bargaining process in the manner of extensive form games. That process, with its many formal and informal channels of power and influence, cannot be encompassed in a manageable extensive form model in any case. Instead, bargaining models from co–operative game theory become the only sensible procedure for studying complex, informal bargaining processes, a point that bargaining theorists have often made (for
Cooperative game models make no attempt to track the full sequence of decisions in a game. Instead, they treat the decision making process as a black box, in the manner of systems theory (Granger and Newbold, 1986: 33). In the framework of this book, cooperative games take preferences, salience, and power as the inputs, and then produce collective decisions as the output. Analytic power is obtained by specifying certain conditions or axioms that the outcome of the game must satisfy, for example that the solution must not depend on strategically meaningless aspects of the game or that the players must not harm themselves for no reason. In the case of bargaining models in particular, cooperative games attempt to specify the nature of the outcome of a class of extensive form bargaining games without attempting the hopeless task of spelling out the full details of how the bargaining might be conducted in each of them.

Twenty years ago, cooperative game models were thought to be of only modest usefulness. Analysts thought of cooperative games as models in which conditions were placed on the nature of outcomes without specifying why those conditions necessary held. After all, well known games often have counter-intuitive outcomes: How can we know what outcomes are like without solving for them explicitly? By contrast, non-cooperative game theorists insisted on spelling out the detailed choices that players face. Explicit modelling of players’ choices was seen as an unmixed improvement on cooperative game models.

Most analysts no longer think about cooperative game theory in this way. Now cooperative game solution concepts are often seen as summaries...
of what many different non–cooperative models would produce (Mas–Colell, Whinston, and Green, 1995: 674). Of course, cooperative games require support from their non–cooperative counterparts. On their own, the cooperative forms do not always represent every strategic possibility well. Thus for analysts to have confidence in a cooperative game solution, it must be shown to be consistent with at least one extensive form. But that one extensive form by no means exhausts its meaning.

As Binmore (1987a: 9) puts it, the purpose of constructing extensive form bargaining games “is not because it is thought that such models will replace the use of cooperative solution concepts. The purpose is to test cooperative solution concepts.” If successfully tested, the broad applicability of the cooperative solution may well outpace that of a corresponding extensive form game. This is especially likely to be true for free–form bargaining situations, in which any extensive form will necessarily be a rather special case substantively, leading to grave doubts about its generality as social scientific explanation. On this view, the relationship between cooperative and non–cooperative models is not competitive, but “complementary; each helps to justify and clarify the other," as Nash himself remarked (1953: 129) long ago.

The next section, then, sets out a cooperative game foundation for institutional realism.
Nash Bargaining and Quadratic Losses

Institutional realism is the view that bargaining among institutional actors determines policymaking. Predicting outcomes from this perspective thus requires a bargaining model. The Nash Bargaining Solution (Nash, 1950) suits this purpose because it has already been suggested in one of the very best set of EU case studies as the appropriate mathematical model for thinking about EU decisions (Moravcsik, 1998: 498). Moreover, as it did in the earliest days of bargaining theory, Nash theory has again come to dominate treatments of solution concepts for cooperative bargaining games (see for example Muthoo 1999: chap. 2).

In a bargaining game, the actors have the opportunity to agree on a particular set of payoffs to each of them. The payoffs must belong to a feasible set $S$ of such payoffs. If they cannot agree, then they must accept the disagreement outcome (or reversion point), which is assumed worse for all of them than any of the other feasible alternatives.

Nash’s bargaining solution for this game is implied by four axioms (set out more formally in Appendix 1 of this chapter). The first of these is the Rescaling Axiom, which simply recognizes that cardinal utilities are measured only at the interval level. Hence, just as expressing a temperature in Celsius rather than Fahrenheit does not make anyone cooler on a hot day, so also re–expressing cardinal utilities on an equivalent scale should not change bargaining outcomes.

Second, the Pareto postulate says that when actors can all agree that one alternative is better than another, the bargaining solution will not pick
the inferior one. Next, the Anonymity Axiom says that it does not matter for social choices who is called “the first actor” or “the nth actor.”

The final axiom is the only one that is seriously controversial, but even it has strong appeal. The Independence of Irrelevant Alternatives (IIA) Axiom states that if an alternative is chosen as the bargaining outcome in a set of alternatives, then it will again be chosen in a subset of those alternatives if it is still available.

The remarkable consequence of these simple axioms is the well–known Nash Bargaining Theorem. If we scale the utility of the disagreement outcome to zero for all actors, then we get a particularly simple form for the Nash Bargaining Solution: The bargainers will agree on the alternative $f(S)$ that maximizes the product of their utilities (see Appendix 1 of this chapter):

$$f(S) = \arg\max_{y \in S} \prod_{i=1}^{n} u_i(y)$$ (4)

The strength of this bargaining solution is its foundation in non–cooperative games. The path–breaking Rubinstein (1982) extensive form game provided a micro–foundation for two–person bargaining. That game has a limiting form (for small time intervals between offers), and that limit turns out to be the (generalized) Nash solution (Binmore, 1987). Thus the Nash Solution has the validation in non–cooperative game theory that makes a cooperative solution credible.

The Nash solution, originally developed for two–person games, also extends smoothly to the n–person case, as Equation (4) shows. Myerson’s (1991: 417-481) text notes that the n–person Nash solution has particular
appeal when the grand coalition of all players is possible, and firm coalitions among proper subsets of the players are difficult to construct. In the EU, shifting interests across issues mean that states have “permanent interests but no permanent friends.” Moreover, the interpenetration of EU institutions by nationals of all member states makes separate, private deals among subsets of the EU actors difficult to arrange and virtually impossible to enforce. Such mini–coalitions play very little role in case studies of EU policymaking. On the other hand, the search for arrangements acceptable to all is a striking feature of those studies. Taken together, these are just the conditions in which the n–person Nash Solution is theoretically attractive.\textsuperscript{12}

Other initially attractive axiomatic two–person solutions turn out not to extend well to the n–person case. For example, the much discussed model of Kalai and Smorodinsky (1975) no longer guarantees Pareto optimal outcomes when there are more than two actors (Roth, 1979: 98-107). In the remainder of this chapter, then, we consider the Nash bargaining model.

The Nash Solution predicts a particular choice among utilities for the players, which may include lotteries. For the purposes of this book, however, actual policymaking outcomes must be predicted. Hence the Nash Solution must be specialized further to get a form tractable for policymaking applications. We do so by assigning to each actor a quadratic loss function \( u_i(z) = a_i - s_i(z - x_i)^2 \) over the sure–thing alternatives, where \( z \) is a sure–thing alternative on a single dimension, \( x_i \) is the actor’s ideal point on the same dimension, and \( a_i \) and \( s_i \) are constants. This postulate turns out to exclude lotteries as solutions (see Appendix 2 of this chapter).\textsuperscript{13} Quadratic losses are, of course, the standard assumption in applied model-
ing on grounds of both theoretical plausibility and analytic tractability, and no alternative has acquired the same widespread acceptance.

The Nash Bargaining Solution, applied in the case of quadratic utilities, gives this solution over the set of sure-thing alternatives $A$:

$$f(S) = \arg \max_{z \in A} \prod_{i=1}^{n}(a_i - s_i(z - x_i)^2)$$  \hspace{1cm} (5)

Under the conditions of the Nash Bargaining Model and quadratic losses, then, Equation (5) is the predictive equation for the Institutional Realism Model for proposals with a single issue dimension. The extension to proposals with more than one issue is obvious and is considered in Appendix 2 of this chapter.

Even in the relatively simple case of a single dimension with quadratic losses, however, the Nash Bargaining solution is analytically somewhat inconvenient. First, nonlinear optimization is needed to find the predicted outcome. Second, the model requires as inputs the value $a_i$ to each player of the disagreement outcome. Now the disagreement outcome is a hypothetical event whose utility is difficult for anyone to estimate, including the actors themselves. (The experts consulted for this book were not asked to evaluate it.) Moreover, these computational and data-collection challenges are compounded when decisions involve more than one issue, which occurs frequently in EU policymaking. Hence in the next section, we set out a convenient approximation to the Institutional Realist Bargaining Model which avoids both these difficulties.
The Importance of Consensus

As it stands, the Institutional Realism Model requires a knowledge of the positions, saliences, and powers of the actors, along with their utilities for the disagreement outcome. Only the last of these is difficult to obtain from expert interviews. In consequence, it is tempting to solve the problem by treating the disagreement point as simply a “reversion point”—the status quo or, more generally, the policy position that occurs if bargaining fails. Then the utility loss for each actor can be computed as the weighted quadratic distance to the reversion point, just as one would compute the loss for any other policy position on the same issue.

This approach to valuing the reversion point is undeniably convenient. Unfortunately, though, it emphasises the legality of the situation rather than the reality, thereby missing the point of institutional realism. It treats a woman who has just been jilted the day before her wedding as no worse off than she was before: “After all, you aren’t married today, and tomorrow you still won’t be married. You haven’t lost a thing. What’s the problem?” That is exactly the logic of treating the reversion point as just the status–quo position on the issue scale.

In an ongoing relationship, a failure in negotiations is far more expensive than just a return to the reversion point. Hence EU negotiators strive intensely and indefatigably to reach an agreement that is acceptable to all parties. Lindberg (1963: 285) noted in the earliest years of the EU that:

Each member tries to influence the content of the final decision as much as it can, but all are agreed on the necessity of mutual
concession, since the normal practice is to exclude the possibility of not reaching an agreement at all.

In the same way, Hayes-Renshaw and Wallace (1997: 251) remark about the EU Council of Ministers that “everything depends on making a proposition ‘yesable’ to as many participants as possible.”

Once a deal has been struck, the subsequent legal stages are often no more than a formality, with all stages proceeding with the approval of very large majorities. Proposing and voting simply ratify the bargain. Hence the strikingly large number of unanimous votes in the EU Council of Ministers even under qualified majority decision rules, quite the opposite of what most extensive form games based solely on the legal rules would predict (Mattila and Lane, 2001). Similar findings about the EU policymaking process appear in the case studies of other chapters of this book. Even when the rules permit a qualified majority to have its way, unanimous agreements are still sought and often attained.

Astute observers have noticed this pattern of striving for unanimity in legislative bodies for more than a century. Wilson (1885: 100-101) described the American Congressional process in this fashion:

Indeed, only a very slight examination of the measures which originate with the [Congressional] Committees is necessary to show that most of them are framed with a view to securing their easy passage... . The manifest object is to dress them to the liking of all factions.

The same emphasis on consensus-building also appears in modern case stud-
ies of skillful committee chairs in the U.S. Congress (Manley, 1970: 111-121).

Thus in bargaining circumstances like those the EU faces, the disagreement outcome is highly undesirable. When a final agreement is at hand, a breakdown in the negotiations does not leave the parties no worse off than they were before. To the contrary, they are likely to feel deeply disappointed, even angry. Relationships with other parties are damaged, and the hard feelings carry over into other, unrelated issues. The cost to each party of the disagreement point is not the simple policy value of the status quo, as some models assume. Instead, the damages are the very large losses that come with broken institutional relationships.\textsuperscript{14}

\section*{Institutional Realism is Approximated by the Compromise Model}

This line of reasoning has important consequences for the Institutional Realism Model. When disagreement is highly undesirable, then a simple corollary to the Nash Bargaining Theorem follows (Appendix 2 of this chapter). That corollary essentially states that under the Institutional Realism Model assumptions (the axioms of the Nash Bargaining Theorem hold, losses are quadratic, and the disagreement point is far in utility terms from all the possible bargaining agreements), then to a first-order approximation, the Institutional Realism Model implies the Compromise Model as its solution. That is, as disagreement becomes ever more undesirable, the policy predictions of the Institutional Realism Model converge closer and closer to the forecasts of the Compromise Model, and in the limit, they are identical.
Moreover, when there are several issues considered simultaneously, then under an additive version of quadratic losses, the Institutional Realism Model is approximated by the Compromise Model applied to each issue separately (Appendix 2 of this chapter).\(^{15}\)

Thus under institutional realist assumptions, the Compromise Model may be interpreted as an approximation to a familiar cooperative game theory solution concept. The Compromise Model applied to each dimension separately gives, to a good approximation, the same answer as the n–person Nash Bargaining Solution applied to all the dimensions simultaneously. Thus unlike some other models of policymaking, the Institutional Realism Model does not shatter when faced with multiple dimensions of the same decision. The saliences incorporate the information about how utility is to be traded off across issues. In addition, the difficult problem of knowing the precise utility of the disagreement point is finessed by simply treating it as “large” and then approximating the resulting solution.

It should be noted in this derivation that “power” \(v_i\) is defined as the inverse of how badly off one would be in the absence of agreement: Implicitly, those who have most to lose from the failure of the negotiations are the weakest.\(^{16}\) On the other hand, large, rich countries that can sanction smaller and poorer countries without suffering much in return will be powerful in the negotiations. For additional details about the measurement of power and salience, see Appendix 2 of this chapter.

In summary, Nash bargaining theory has been used here to impose conditions on any solution to the collective choice problem faced by the EU. These conditions, in turn, are shown to have a solution, the Institutional Realism
Model, to which the Compromise Model is a good approximation. Thus the Compromise Model is shown theoretically to be a plausible approximation for any standard collective decision problem in which bargaining plays a central role. The prominent role of that Model in case studies and empirical tests is thereby explained and justified.

An Application

The Compromise Model is an approximation. There are at least four ways in which it may depart to some degree from reality, in increasing order of importance. First, quadratic losses might be a poor description of actor preferences. Second, the Nash Bargaining Solution might fail to describe agreements reached. Third, disagreement might be only slightly undesirable in some negotiations, so that the quality of the numerical approximation used in the derivation might be poor. And fourth, the legal rules might allow a qualified majority to impose their will on the others and they might do so, meaning that the usual unanimity norm would not be honored.

The EU’s two 1999 decisions on reform of structural assistance in the fisheries sector (CNS/1998/347), discussed in greater detail in Chapter 5, illustrate both a predictive success and a relative failure for the Compromise Model. On the first issue, the number of tons of old fishing fleet that needed to be scrapped to qualify for new funding, the Compromise Model predicts that a bargaining agreement would be reached at a scaled position of 36 on a 100–point scale, meaning that approximately 110 tons would have to be scrapped for every 100 new tons. In fact, however, no agreement was
reached, and the status quo (position 0) of 100–tons–for–100–tons scrapping was maintained. There simply was no working qualified majority for a change from the status quo. Although the size of the prediction error is not large in substantive terms here, nevertheless this issue illustrates the class of situation in which the Compromise Model may not work well. Failing to agree on this issue represented no drastic change from the status quo, and the blocking coalition could prevent action without great cost. Disagreement was not the divisive option that institutional realism presumes and that most case studies of the EU have found.

The second issue concerning fisheries was a measure tying EU funding to compliance with the difficult EU fisheries program objectives. The status quo had no such restrictions, so that failure to agree would have had genuine consequences. On this issue, the Compromise Model predicts a position of 68 on a 100–point scale, while the actual bargaining outcome as scored by experts was 70. Thus the Compromise Model performs extremely well in this case, for which it is well suited. (For details about forecasting with the Compromise Model, see Appendix 3 of this chapter.)

The State-Centric Alternative

In applying the Compromise Model or any other model based on the same inputs, thorny issues of application arise immediately. The first is that any theoretical model of politics begins by defining the relevant actors. Often this step is obvious: The actors are just who they seem to be. But in international organizations like the EU, complexities arise.
In contrast to the institutional realism of this chapter, some other perspectives see international institutions as only marginally important. Moreover, they relegate economic considerations to a minor role in decision making compared to issues of national security. For example, in interpretations of international organizations based on “state–centric realism” (a recent example is Mearsheimer, 1994-95), the central actors in the EU are the nation–states, not the executive and legislative components of the Brussels legal structure. State–centric realism argues that national security interests pervade all the organs of international organizations, in proportion to state power. To a good approximation, only the preferences of the member countries (weighted by their power and intensity) matter in policymaking. As Mearsheimer’s (1994–95: 13) discussion of “the false promise of international institutions” puts it:

Realists also recognize that states sometimes operate through institutions. However, they believe that those rules reflect state calculations of self–interest based primarily on the international distribution of power. The most powerful states in the system create and shape institutions so that they can maintain their share of world power, or even increase it.\textsuperscript{17}

On this version of realism, the state preferences measured for this book should reflect states’ evaluation of their interests in each decision, and those interests should reflect security preferences. Moreover, bargaining power in the Council—the locus of state power in the EU—should proxy for states’ influence throughout the EU. Hence the best version of the Compromise
Model would be approximated by applying it to the members of the Council only, weighting them by their power within the Council. “Power” might be determined by the gross domestic product of each state, or even better, if the logic of state-centric realism is correct, by the Shapley–Shubik value in the Council, since the latter are determined by the institutional rules and thus should be shaped by state power. In this chapter, the latter Shapley–Shubik values are used to operationalize state-centric realism. This portrayal, based on extending Mearsheimer’s arguments to our dataset, is included among the models assessed empirically at the end of this chapter and in Chapter 10.

Another prominent state-centric interpretation of the EU is given by Moravcsik (1998: chap. 7), who argues that the most crucial EU decisions are made by the member states, with supra-national institutions such as the Commission playing only an intermittent role. However, he describes his viewpoint as “liberal intergovernmentalist,” not realist, since his detailed case studies indicate that the security concerns emphasized by Mearsheimer (1994-95) have distinctly secondary weight, and that economic issues dominate. The implication of his work appears to be that the more important the issue, the greater the power of national governments relative to international institutions. This is an important hypothesis.

Unfortunately, the crux of Moravcsik’s arguments cannot be tested here, since the EU issues studied in this book, while consequential, are nonetheless routine, day-to-day matters, not the critical choices he studied. There are not enough major decisions in EU history to permit quantitative study, particularly since the membership and formal rules have changed every decade
or two, making over–time comparison difficult. Thus at this stage, Moravcsik’s case study method seems best for his purpose. With regret, we lay aside his important findings and their implications as topics deserving further elaboration and study, which we cannot undertake here.

**Forecasting Comparisons**

For the dataset used in this book, Table 4.1 gives the mean absolute error of the Institutional Realism Model (under three different measures of power), the state–centric realist model deriving from Mearsheimer, and the simple mean and median. As the table shows, the Compromise Model under the second, more plausible version of the Shapley–Shubik values forecasts better than under the less plausible Shapley–Shubik values, and better also than under human judges’ assessments of power. In fact, the best version of the Compromise Model finishes first overall in the comparisons. The mean is almost equally good. The median is worst. State–centric realism falls in between: It is better than the median, but not as good as the other two models. Thus the Compromise Model narrowly wins this first round of competition.

The second important aspect of Table 4.1 is that state–centric realism is not as successful in predicting day–to–day policy outcomes in the EU as those models that take the full structure of EU institutions into account, including the Commission and the Parliament. Knowing national policy preferences alone is simply insufficient. International institutions matter. For explaining most behaviour of an international organization like the EU,

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state-centric realism is itself the “false promise.”

State-centric realists may object that they aim to explain only major issues of war and peace, not agricultural subsidies and auto emission controls. Fair enough: An organization like the EU has little to do with decisions for war. But then state-centric realism is sidelined into irrelevancy for explaining nearly all the actual work of international organizations. Over time, an international organization like the EU may remake the social and economic face of an entire continent. Explaining its behaviour is deeply consequential. What the statistical evidence of this chapter shows empirically is that for that task, state-centric realism cannot help us as much as models that take seriously the internal institutions of an international organization. By counting all institutions as separate actors, that is just what the Compromise Model does.

Now how impressive is the victory of the Compromise Model? Granted, it is superior to the median and to state-centric realism. However, the mean essentially does just as well in Table 4.1, and so does the Base Model with the second version of the Shapley-Shubik values (results not shown). Their performances are substantively and statistically equivalent. Why focus on the Compromise Model?

The reason for emphasizing the Compromise Model has to do with the imprecision in the measures of power and salience. As Table 4.1 demonstrates, even well informed human assessments of actors’ power do not perform as well as the Shapley–Shubik values in predicting outcomes, and the Shapley–Shubik values themselves are imperfect as measures of actual power. Thus the power measures contain measurement error. Moreover, the inter-
viewers on this project often found that assessments of salience were even more difficult for respondents, meaning that their measurement errors are probably even larger than those for power. The inevitable consequence is that noise enters any model that uses power and salience for forecasting.

Now the mean uses neither power nor salience for its predictions, while the Base Model uses only power. If the power measures were useless and noisy, the Base Model would perform less well than the mean. However, the Base Model performs just as well as the mean, implying that it is overcoming the additional measurement error with greater theoretical accuracy. In the same way, the Compromise Model uses both the Shapley–Shubik values and the particularly noisy salience measures, meaning that if the mean or the Base Model were theoretically better, the Compromise Model should finish well behind them in predictive power. But in fact, the Compromise Model is just as good, indicating again that it has theoretical power that they lack. (For additional discussion, see Appendix 3 of this chapter.)

Additional confirmation of the institutional realism foundation for the Compromise Model appears when EU issues are separated by bargaining context and outcome. This chapter used the perspective of institutional realism to put a theoretical foundation under the Compromise Model. In particular, the Compromise Model was interpreted as a bargaining solution. From this viewpoint, actual EU issues fall into three classes: (1) classic bargaining situations in which the reference point is either non–existent or else falls outside the range of actor positions (that is, outside the Pareto set) and a bargain was struck, (2) those issues in which the reference point was within the Pareto set and a bargain was struck, and (3) those issues for which
bargaining failed. Category (1) matches the traditional interpretation of the theoretical assumptions of the Nash Bargaining Solution. Category (2) may be seen as a situation in which an old bargain is being challenged by a new one, and in which the Nash Solution would apply if disagreement is very undesirable. Category (3) comprises issues which cooperative bargaining models fit poorly, since they assume that some deal is always struck.

The importance of this classification is that, regarded just as a predictive formula, the Compromise Model should not have any more forecasting success in one of these categories than in another. The same is true for the mean and the Base Model. In their case, there is no obvious reason to think of them as bargaining outcomes, and indeed, the usual justification of the mean as a solution concept depends on a procedural model, not bargaining (see Chapter 10). Only if the bargaining interpretation of the Compromise Model developed in this chapter is correct should we see a pattern of decreasing predictive success across the three categories.

Figure 4.1 shows that the theoretical underpinnings of the Compromise Model are confirmed across bargaining contexts. The Compromise Model performed best in classic bargaining situations, next best in other bargaining situations, and poorly in the 18% of issues for which bargaining broke down, just as the argument of this chapter implies. Moreover, as the Figure shows, both the mean and the Base Model have precisely the same pattern of success, working well in bargaining situations and not otherwise. This suggests once again that they are successful because they are approximating the Compromise Model and not because they capture aspects of decision making that it neglects.
Additional discussion of these findings and comparisons with other models appears in Chapter 10.

Conclusion

Institutional realism is the view that institutions, including governmental organs and private organizations, are the key actors in politics, and that the relationships among them are determined by power and bargaining, structured in part by the legal framework. This chapter has argued that institutional realism provides a substantively sensible framework for thinking about government policymaking. Its intellectual ancestry traces to Thucydides, and it has been put forward independently by many authors during the twentieth century as the best description of the case studies of policymaking that they had conducted.

This chapter derived an explicit form of this framework—the Institutional Realism Model—from a well known and widely used solution for bargaining models, namely the Nash Bargaining Solution. When (1) Nash’s axioms hold, (2) the failure to agree is costly, and (3) actors have quadratic loss functions on the issue scales, then Nash’s solution is closely approximated by another formula, namely the Compromise Model, which in various guises has appeared often in both case studies and formal models in political science and sociology. It has also performed relatively well in previous empirical tests. Thus the Institutional Realism Model has both intellectual history and contemporary theoretical and empirical support to complement its other desirable properties. The initial testing of this chapter indicated
that this perspective outperforms the median and state-centric realism, and that it is as good as the mean and the Base Model, while having better theoretical properties than any of them.

The procedural models of Chapter 3 emphasize the legal framework of the second stage of policymaking, de-emphasizing the initial bargaining stage. The Institutional Realism Model of this chapter does the reverse. Both approaches remain only a downpayment on a more comprehensive approach that would incorporate both bargaining and the structure of institutional rules. Nonetheless, at this stage of our knowledge, it is helpful to know which class of model is the more powerful predictor.

In other chapters of this book, alternate models of the EU decision making process are put forward and their predictions computed. The final part of the book compares the forecasts of the Compromise Model with the predictions of many other models. In effect, these comparisons match the logic of institutional realism, which embodies a simple summary of much traditional social science wisdom about the bargaining process in policymaking, against other models, often more sophisticated mathematically, which are based on different understandings of politics and which derive their predictions from legal interpretations, log-rolling procedures, coalition theory, or ideas borrowed from adjacent disciplines such as economics. At the end of this book, we will ask this question: Have our understandings of politics, our latest game-theoretic knowledge, and our grasp of EU legal procedures advanced far enough that our newest models can outperform a simple classic forecast like the Compromise Model? Chapter 10 answers that question.
Appendix 1 to Chapter 4: The Nash Bargaining Theorem

The definition of a bargaining game begins with a set of players $i$ ($i = 1, \ldots, n$). The players must agree unanimously on an alternative taken from a set $X$; otherwise they receive the disagreement outcome (or threat point or reversion point) $d$. For the purposes of this chapter, we shall assume that $X$ is the set of all possible lotteries over a finite subset $A$ of $\mathbb{R}^K$, where $A$ is a set of $K$–dimensional sure–thing alternatives, including the disagreement outcome. For example, $A$ may be interpreted as the set of all possible outcomes on a particular EU Commission proposal consisting of $K$ distinct issues. In the dataset used in this book, the possible sure–thing choices on each issue are finite in number, so that these assumptions correspond to the empirical applications in this volume.

Each player is assumed to have a von Neumann–Morgenstern cardinal utility function $u_i$ defined on the set of lotteries $X$. Since these utility functions are unique only up to an interval–level transformation, for convenience we set $u_i(d) = 0$ for all $i$. It is assumed that, for all $x^* \in X$ and for all $i$, $u_i(x^*) \geq 0$. That is, for every player, the possible agreements are all at least as good as the disagreement outcome.

Now let $S_i$ be the image of $u_i(X)$: $S_i = \{u_i(x^*), x^* \in X\}$. These are the possible utility outcomes that player $i$ could receive from points of $X$, including the utility of the disagreement outcome. Since $X$ consists of all possible lotteries over a finite set of alternatives, it is straightforward to prove that any $S_i$ defined on $X$ is a compact (closed and bounded) and
convex set. In particular, here $S_i$ is a closed interval $[0, m_i]$ of the real line, where $m_i = \max_{x^*} [u_i(x^*)]$.

Now define the utility profile $u(.) = [u_1(.), \ldots, u_n(.)]$, the $n$-dimensional vector of the actors' utility functions over the lotteries in $X$. Set $S = \{u(x^*) | x^* \in X\}$. Thus $S$ is the set of feasible utility vectors that the players might obtain from a bargaining agreement. Since each $S_i$ is compact and convex, so is $S$.

With this structure (which is assumed without further mention in what follows), we may define a bargaining game as a pair $(N, S)$, where $N$ is a finite set $\{1, 2, \ldots, n\}$ of players, where $S$ is a compact and convex subset of the non-negative orthant of $\mathbb{R}^n$ containing the set of feasible utility vectors for the players, and where the utility of the disagreement outcome, the vector $0$, is a member of $S$. A solution $f$ to a bargaining game is then a map that selects a point of $S$ for every bargaining game. Since $N$ is unvarying, we will write $f(S)$ to denote a bargaining solution applied to a particular $S$, and we will refer to $f(S)$ as an outcome.

We now list the well known Nash axioms for bargaining games. Rigorous definitions of all four axioms are widely available, for example in Roth, 1979: 6-8, or Mas-Colell et al. 1995: chap. 22E.) Here we avoid full mathematical detail and state the axioms somewhat informally.

Rescaling Axiom. Suppose that for a given profile $u$ and solution $f$, the bargaining outcome is $f(S) = y$. Then if actor $i$'s utility function $u_i$ is linearly rescaled to $u_i^* = a + bu_i$ ($b > 0$), while all other actors retain the same utility scale, then the bargaining solution chooses the same alternative $y$ when presented with the new feasible payoff set $S^*$: $f(S^*) = y$. 157
Pareto Axiom. If a lottery $y_1$ in $S$ has strictly lower utility for all actors than another alternative $y_2$ in $S$, then the bargaining solution never chooses $y_1$.

Anonymity Axiom. Suppose that for a given $S$, $f(S) = y$. Then suppose that the actors are renumbered, so that each utility function $u_i$ is renumbered $u_i'$, creating a new profile $u'$ and thus a corresponding new set of feasible payoffs $S'$. Then the bargaining solution makes the same choice with the new profile: $f(S') = y$.

Independence of Irrelevant Alternative (IIA) Axiom. Suppose that for a given $S$, $f(S) = y$. Let $R \subseteq S$ and suppose $y \in R$. Then $f(R) = y$.

Theorem. Suppose that a solution $f$ to a bargaining game $(N, S)$ satisfies the Rescaling, Pareto, Anonymity, and IIA axioms. Then for all sets of feasible utility outcomes $S$:

$$f(S) = \arg\max_{y \in S} \prod_{i=1}^{n} u_i(y)$$

A proof for the two–actor case is available in virtually any game theory text covering cooperative game theory; the n–player proof appears in Roth, 1979: 8-12, and in Moulin, 1988: 68.

Appendix 2 to Chapter 4: Lemmas and Corollary

This appendix shows how quadratic loss assumptions may be used to find the approximate Nash Bargaining Solution when only a discrete set of sure–thing alternatives are available (Lemma 1). It also shows that under the
same assumption, lotteries will essentially never occur as solutions, so that
attention can be focused on the sure–thing outcomes (Lemma 2). Finally,
the appendix shows that, as the disagreement outcome becomes arbitrarily
less attractive to all actors, the solution of the Nash Bargaining Model under
quadratic loss assumptions tends to the solution given by the Compromise
Model (a Corollary to the Nash Bargaining Theorem).

Consider first the case when the finite set of sure–thing alternatives \( A \)
lie on a single dimension (that is, \( A \) is a set of points on the real line). This
corresponds to the case of an EU proposal containing a single issue to be
voted on. As before, denote the most–preferred point of \( \mathcal{R} \) for actor \( i \) by
\( x_i \), let \( s_i \) be a non–negative real number interpreted as \( i \)'s “salience” for the
issue, and let \( a_i \) be a strictly positive real number.\(^{25}\) Then the assumption
of quadratic loss is defined as follows:

**One–Dimensional Quadratic Loss Axiom.** For all \( i \) and all sure–thing alter-
natives \( z \in A \), where \( A \subset \mathcal{R} \): \( u_i(z) = a_i - s_i(z - x_i)^2 \).

Here \( a_i \) is chosen so that at the disagreement outcome, each actor has
utility 0, as in the statement of the Theorem. Thus utilities are always non–
negative for each actor. Note that at each actor’s ideal point, where \( z = x_i \),
the corresponding utility is \( a_i \). Thus \( a_i \) measures how much each actor would
lose in moving from the most–preferred point to the disagreement outcome.
Note also that the parameter \( s_i \) measures how quickly the actor’s utility
drops off on each side of the most–preferred point. It therefore expresses
the actor’s relative intensity or salience on the issue.\(^{26}\)

Now in policymaking studies, we often find issues whose outcomes can
take on only a few discrete values. Hence not all forecast values are mean-
ingful. To cope with such cases, we formalize the notion of “picking the nearest meaningful value.” Thus suppose that we have a continuous function $f$ strictly unimodal over a closed and bounded real interval $I$. Let the point of the interval at which $f$ attains its maximum be denoted by $y^*$, and let $A$ be a finite subset of $I$, interpreted as the set of meaningful values. Set $h(x^*) = |y^* - x^*|$. Then define a set $Q_A(y^*)$ as follows: $Q_A(y^*) = \{\text{argmin} \ h(x^*) | x^* \in A\}$. That is, $Q_A$ picks out the point or points that are members of $A$ and closest to $y^*$.

We now establish two lemmas before proceeding to the main result. Let $P$ be the Pareto set of $S$, that is, the elements of $S$ that are not excluded from the outcome by the Pareto Axiom. In the first lemma, we consider the case in which Nash’s bargaining axioms hold, there is a single dimension of choice with a finite number of alternatives, losses are quadratic, and the disagreement outcome is very undesirable for each player compared to any sure-thing element in the Pareto set. Then the lemma shows that if only sure-thing alternatives are available, the Compromise Model (adjusted to the nearest meaningful point) is the approximate solution to the bargaining game.

**Lemma 1.** Suppose that a solution to a bargaining game $(N, S)$ obeys the Nash axioms, and that in addition, the utility function of each actor $i$ is described by the One Dimensional Quadratic Loss Axiom for sure-thing alternatives $z \in A$. Assume that $a_i \gg s_i(z - x_i)^2$ for all $z \in P$. Let $T \subset S$ be the set of utility profiles in $S$ when choice is restricted to the sure-thing alternatives $A$. Then to a first-order approximation, for all $T$ and for strictly
positive constants \( v_i = 1/a_i \):

\[
f(T) = Q_A \left[ \frac{\sum_{i=1}^{n} s_i v_i x_i}{\sum_{i=1}^{n} s_i v_i} \right]
\]

Equation (7) is, of course, the Compromise Model from Equation (2), adjusted to the nearest meaningful point. Naturally, if the sure-thing alternatives form a continuous interval in \( \mathbb{R} \), then all points are substantively meaningful, and we get just the Compromise Model itself.

Proof of Lemma 1. When confined to the sure-thing alternatives on a single dimension, the maximization problem of the Nash Bargaining Solution becomes:

\[
f(S) = \operatorname*{argmax}_{z \in A} \prod_{i=1}^{n} (a_i - s_i (z - x_i)^2)
\]

Factoring out the constants \( a_i \), taking logs, and dropping irrelevant constants from the sum yields:

\[
f(T) = \operatorname*{argmax}_{z \in A} \sum_{i=1}^{n} \log \left[ 1 - s_i (z - x_i)^2 / a_i \right]
\]

Now, by the assumptions of the Lemma and in accordance with the institutional realist logic, \( a_i \) is large relative to \( s_i (y - x_i)^2 \) for every actor \( i \) and each sure thing \( z \) in the Pareto set. This means that the normalized zero point (collapse of the bargaining) is far in each actor’s mind from the Pareto points and thus very unattractive compared to the possible agreements.

In this case, since \( s_i (z - x_i)^2 / a_i \) now becomes small for all \( i \) and all \( z \) that might be agreed to, and because \( \log(1 - r) \approx -r \) when \( r \) is small, to a first-order approximation in the neighborhood of the actors’ ideal points,
we have:

\[
f(T) \approx \arg\max_{z \in A} \sum_{i=1}^{n} \left[ -s_i(z - x_i)^2/a_i \right]
\]  

(10)

If we now set \( v_i = 1/a_i \) and temporarily maximized over a real interval containing \( A \) rather than \( A \) itself, then routine calculus applied to the previous equation would give the solution, denoted by \( y_C \):

\[
y_C = \frac{\sum_{i=1}^{n} s_i v_i x_i}{\sum_{i=1}^{n} s_i v_i}
\]  

(11)

Finally, to restrict the solution to points of \( A \), note that Equation (10) is quadratic in \( z \), so that the solution of the Nash Model must be the point of \( A \) nearest \( y_C \), namely \( Q_A(y_C) \). But this is just the Compromise Model’s forecast adjusted to the nearest meaningful point, and so the proof of the Lemma is complete.

The Nash Bargaining Solution is cast in terms of lotteries, not sure things. This seems to imply that the search for forecasts must include lotteries as well. However, the next lemma shows that under the One Dimensional Quadratic Loss assumption and the approximation of the previous lemma, no proper lottery will be chosen as the Nash bargaining solution. Sure–thing alternatives are always preferred.

Lemma 2. Under the conditions of Lemma 1, then to a first–order approximation, for all feasible utility sets \( S \) over lotteries and all feasible utility subsets \( T \) over sure things, we have:

\[
f(S) = f(T)
\]  

(12)
Hence under these conditions, a considerable simplification of the Nash Bargaining Solution is achieved when there is only one dimension: We need maximize only over the sure–thing alternatives.

Proof of Lemma 2. When lotteries among the $m$ sure–thing alternatives on a single dimension are the objects of choice, denote as before the sure–thing alternatives in $A$ by $z_j$ ($j = 1, \ldots, m$) and the corresponding probabilities that $z_j$ will be selected in a given lottery by $\lambda = (\lambda_1, \ldots, \lambda_m)$, where $\sum \lambda_j = 1$. Let $x_i$ again be actor $i$’s most–preferred point. Then in this case, the Nash Bargaining Solution is:

$$f(S) = \arg\max_{\lambda} \prod_{i=1}^{n} \left[ \sum_{j=1}^{m} \lambda_j (a_i - s_i (z_j - x_i)^2) \right]$$

or equivalently:

$$f(S) = \arg\max_{\lambda} \sum_{i=1}^{n} \log \left[ \sum_{j=1}^{m} \lambda_j (a_i - s_i (z_j - x_i)^2) \right]$$

(13)  
(14)

But factoring out the irrelevant $a_i$, then to the same approximation as in the previous lemma and again setting $v_i = 1/a_i$, we get:

$$f(S) = \arg\max_{\lambda} \sum_{i=1}^{n} \left[ \sum_{j=1}^{m} -\lambda_j s_i v_i (z_j - x_i)^2 \right]$$

(15)

Reversing the order of summation and setting $g_j = \sum_{i=1}^{n} -s_i v_i (z_j - x_i)^2$, it follows that the approximate Nash Bargaining Solution is:

$$f(S) \approx \arg\max_{\lambda} (\lambda_1 g_1 + \ldots + \lambda_m g_m)$$

(16)
But obviously this finite sum is maximized by assigning \( \lambda_{\text{max}} = 1 \) to the quantity \( g_{\text{max}} \) with the largest value, and assigning \( \lambda_j = 0 \) to all the others.\(^{31}\)

Thus the Nash Bargaining outcome here is a degenerate lottery, that is, some sure thing. Hence we must simply search over the sure things to determine which \( g_j \) is the largest. But \( g_j \) is the same maximand treated in Lemma 1, and we are done.

We now move to the main result. First, we extend the quadratic loss assumption to multiple issues considered simultaneously. Here an alternative \( z_j = (z_{j1}, \ldots, z_{jk}) \) is a \( k \)-dimensional sure-thing vector, \( x_i = (x_{i1}, \ldots, x_{ik}) \) is the vector of actor \( i \)'s most-preferred points on each of the \( K \) dimensions of choice, and \( s_{ik} \) is actor \( i \)'s salience on dimension \( k \):

**Separable Quadratic Loss Axiom.** For all \( i \), \( u_i(z_j) = a_i - \sum_{k=1}^{K} s_{ik} (z_{jk} - x_{ik})^2 \).

Intuitively, the main assertions underlying this assumption are three. The first is that losses on each dimension are quadratic, which is a reasonable approximation. The second is that losses on each dimension are separable from those on other dimensions, that is, that doing well or poorly on one dimension does not change one's mind about what would be the best outcome on another dimension.\(^{32}\) It is, of course, possible to think of circumstances in which the separability assumption would be misleading, but these seem to be rare in practice.\(^{33}\)

The third assertion embodied in the axiom is more controversial. It states that if we compare actors who won on the first dimension with actors who lost, then nevertheless, each group will be equally marginally affected by losses on other dimensions. This latter assertion is highly implausible,
of course: Losers are compensated with concessions on other issues because losers care more about the additional losses.\textsuperscript{34} However, the separability assumption was maintained in this chapter because it leads to the Compromise Model, and that model has simplicity on its side and thus deserves to be set out prominently and tested. It should be noted, however, that the separability assumption was made purely for analytic convenience. Institutional Realism does not require it, and Institutional Realism is not identical with the Compromise Model.

The next result then shows that under separable quadratic loss functions and a highly undesirable disagreement point, then to a first-order approximation, the Nash Bargaining Solution in the case of multi-dimensional alternatives (such as EU proposals) can be obtained by applying the Nash Solution to the sure-thing alternatives dimension by dimension. That, in turn, means that under these assumptions, the multi-dimensional Nash Bargaining Solution is just the Compromise Model applied to each dimension separately and then adjusted to the nearest meaningful point. In short, this version of the Nash Bargaining Solution is approximated by the Compromise Model.

\textit{Corollary to the Nash Bargaining Theorem.} Let $f(S) = (f_1(S), \ldots, f_K(S)$ be a bargaining solution when sure-thing alternatives consist of $K$ dimensions. Then under the Separable Quadratic Loss Axiom plus the same assumptions and the same approximation as in the previous lemmas, for all $k$:

\begin{equation}
    f_k(S) = Q_A(y_{C_k})
\end{equation}
Again, when the sure things form a continuous set, we get on each dimension 

\( f_k(S) = y_{ck} \), that is, the unadjusted Compromise Model itself.

**Proof of the Corollary.** With separable losses on each dimension, then by the same logic as before, the approximate Nash maximand for sure–thing alternatives is:

\[
 f(T) \approx \arg\max_{z \in A} \sum_{i=1}^{n} \left[ \sum_{k=1}^{K} (-s_{ik}(z_k - x_{ik})^2 / a_i) \right] \tag{18}
\]

But reversing the order of summation breaks up the maximand into \( K \) independent maximands, each with the form of Equation (10), the single–dimension case, which have \( Q_A(y_{ck}) \) as their respective solutions by Lemma 1. Lemma 2 then applies to eliminate non–degenerate lotteries, and the proof is done.
Appendix 3 to Chapter 4: Applying the Compromise Model to Data

As discussed in Chapter 2, two versions of Shapley–Shubik values were computed for this book, along with expert judgments of institutional power. For the latter, informants were simply asked to assess each actor’s power directly, in the same way that saliences were assessed. These measurement procedures have the appeal of straightforwardness, but they raise a concern. What is “power”? What is “salience”? And how can they be accurately assessed? These challenging issues of measurement arrive immediately when theoretical models are taken to data.

A pleasing feature of the quadratic loss/Nash bargaining framework is that power and salience have clear meanings. Both describe features of the actors’ loss functions. “Power” describes the relative distance of the disagreement outcome from the actor’s bliss point, and “salience” describes the sharpness in the curvature of the actor’s loss function. Thus in principle, standard methods for interviewing actors to learn their loss functions (for example, Keeney and Raiffa, 1993) might be used to make the necessary measurements.

In practice, of course, the top political actors in major international institutions like the EU are rarely available for interviews of any kind, much less for the kind of detailed, somewhat technical interviews necessary to construct utility functions. Their preferences, power, and saliences over issues must be assessed by other participants or by outside experts and observers familiar with them, as was done in constructing the dataset used
Sometimes external assessment is straightforward. An actor’s “most-preferred point” is a clear idea and relatively easy to measure. Even for more difficult concepts such as power and salience, external assessment, done with care, can often be very effective. For this book, elaborate precautions were taken to ensure the accuracy of the judgments. However, as in any interviewing technique, some error is inevitably introduced. Moreover, there is no guarantee that experts used the measurement scales in precisely the same way that any one interpretation of the theory might require. As mentioned in Chapter 2, LaPalombara (1960: 30) put the point clearly in a pioneering early study:

The concept “power” (or “influence”) is not easy to define, and, even after the interviewer suggests a definition, he cannot be certain that the respondents adhere to a specific denotation in their evaluations.

Similar remarks might be made, perhaps with even more force, about the concept of “salience.” Indeed, since there is no canonical question to ask informants in either case, and no standard scale on which their answers are to fall, different studies would inevitably arrive at different measures of power and salience even when interviewing exactly the same informants about exactly the same political events.

Good science requires taking measurement issues seriously. Thus in testing the models in this book, we were alert to the possibility that measured power or measured salience were not identical with actual power or actual
salience. Either measure might need to be transformed to meet the theoretical demands that models place upon it. In particular, since both power and salience are presumably ratio–level variables, the natural class of transformations to consider is exponential.\textsuperscript{35} Thus if $s_i$ is true salience and $\hat{s}_i$ is measured salience, it makes sense to consider transformations of the form $s_i = \hat{s}_i^k$, where $k$ is a parameter to be determined (Achen, 1999).

Several such checks were carried out with the current data. However, there was no systematic evidence in favor of any transformation, and the untransformed versions of power and salience appeared to work best. Hence all reported results were done with untransformed values. Moreover, the Shapley–Shubik values performed better than the expert judgments in forecasting policymaking decisions, and so the Shapley–Shubik values were used in constructing forecasts. Additional discussion of this point appears in Chapter 10 and in Achen (1999).

No matter how much care is taken in collecting measures of power and salience, however, they remain unavoidably somewhat noisy. It is important to understand why the noise can disguise the relative performance of different models. Consider the simple case of two actors of equal power, positioned at 0 and 100 on the issue scale. Suppose that we select a sample of such cases, assigning each actor a true salience of either 40 or 60, drawn with probability .5 each, independent of the salience of the other actor. Assume that the true model is the Compromise Model with the correct saliences, so that we may compute the true outcomes in each case.

Now suppose that the true saliences are unknown to the researcher, as usual, so that respondents are used to estimate them. Imagine that the
respondents always report the saliences with 20 point errors (on a 100 point scale), either too high or too low, each error drawn with probability .5, independent of the error in the salience estimate for the other actor. Now we may compare the forecasts from the Compromise Model using the respondents' estimates of the saliences with the forecast errors using the mean (which always predicts 50 in this example).

It is easy to show that the average errors from the Compromise Model will more than twice those of the mean in this case, even though the Compromise Model is the correct model and the mean is not. Thus noisy saliences degrade model performance considerably, and the errors are approximately proportional to the amount of noise. For example, if the respondents' salience errors are cut in half in this example, the Compromise Model and the mean perform similarly, and if the respondents salience errors are eliminated, of course, the Compromise Model is much better than the mean. Thus there is a tradeoff in predictive success when theoretically more accurate models require data we do not measure well. Most importantly, models that overcome noisy inputs are usually theoretically superior to simpler models using more reliable inputs, even if the two models predict equally well. This argument was set out informally in the text of this chapter to explain why the Compromise Model is likely closer to the theoretical truth than the mean or the Base Model, even though all three predict equally well.

The other issue that arises in applications of the Compromise Model is that the Corollary of this chapter requires its predictions to be adjusted to the nearest meaningful point on each issue scale. When the issue scales
are virtually interval–level measures (for example, when the values 0, 1, 2, . . . , 100 on a one–hundred point scale are all meaningful), the adjustment is essentially irrelevant and can be ignored. At the other extreme, when the issues are dichotomies (yes/no), then only the positions 0 and 100 are meaningful, and forecasts of 45 or 51 will be adjusted very far indeed—to 0 and 100, respectively.

The mathematical results in the appendices to this chapter assume that all positions, saliences, and power values are measured perfectly. In practice, measurement error inevitably enters to blur the predictions. What appears to be a prediction of 45 on a dichotomous scale (and is therefore rounded to zero) may be a measurement error for a prediction of 55 or 65, which should be rounded to 100. Simply using 45 and rounding it to zero takes no account of the statistical character of the data. The best unbiased forecast should average the rounding decisions over the possible measurement errors, perhaps yielding a result such as 40 (meaning a 40% chance of 100 and a 60% chance of 0). The value 40 is not a meaningful position on the issue scale, but it is the unbiased model forecast nonetheless. Unfortunately, the distribution of measurement errors is unknown, and so this calculation cannot be done.

To avoid these insoluble complexities and to approximate the unknown unbiased forecast, therefore, the Compromise Model was simply applied to each issue in the dataset, whether dichotomous, rank–ordered, or continuous, without rounding. If the model forecast 45, for example, that forecast stood as the prediction, even if 45 was not itself a possible outcome on the issue.
Notes

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2 An important model of this kind, directed toward legislative behaviour generally, is Baron and Ferejohn (1989).

3 Of course, this kind of realism is not to be identified with the state-centric analysis of international affairs, also called “realism.” Similarly, Grafstein’s (1992) “institutional realism” is a perspective in political philosophy, quite different from its usage here.

4 Thus both the various Marxisms and the various pluralisms are special cases of the institutional–realist view, but the category itself is much broader. On pluralism, see especially Almond, 1988.

5 Note that this version of utilitarianism is quite different from its counterpart in ethics, and thus the many axiom systems for normative utilitarianism are irrelevant here. As Harsanyi (1977) stresses, it is important not to confuse the derivations and uses of utilitarian models in the two realms. For review and discussion, see Riley (1988) and Elster and Roemer (1991), for example.

6 Van den Bos’s original wording was “Compromise Specification.” In Bueno de Mesquita and Stokman (1994: 114-115), the Base and Compromise specifications were promoted to Base and Compromise “models,” and I have retained that language here.
“To the extent that the process was one of bargaining, it registered a compound of influence and intensity of interest. If it is considered appropriate to maximize ‘total satisfaction’ of those whose views are taken into account, then it is essential to have some indication of how intensely each value is held” (Banfield, 1961: 332).

The expression, \( \text{argmax} \), means “the value of \( z \) that maximizes the following expression.” Here \( z \) is taken to be an element of the real line; in other cases, the set of possible \( z \)'s is specified explicitly.

Note that the Base Model would follow from this argument if saliences were irrelevant (or equal).

Van den Bos interpreted the equation as representing an exchange of information about the actors. For further explanation and extension to other models, see Chapter 5 of this volume.

In general, the sociological modeling tradition stemming from Coleman is full of political wisdom about the policymaking process, often strikingly so in comparison with its economics and political science game-theoretic counterparts, but the sociological models have struggled to attain the theoretical rigor and coherence of the game theory models. See the review in Knoke et al. (1996, chap. 7).

Unfortunately, no generally persuasive micro-foundations for any n-person bargaining solutions yet exist, though several attempts have been made (Muthoo 1999: 336-338).

Appendix 2 of this chapter also shows how to use the quadratic loss assumption to cope with cases, frequent in the dataset used in this book, in which only a finite number of points are meaningful outcomes. For example, suppose that 0, 30, 80, and 100 are the only substantively meaningful outcomes. How is this meaningless 60 to be interpreted? Appendix II shows formally that under the assumptions of this paper and to a close approximation, the forecast of 60 should be adjusted to nearest meaningful point, which is 80. Hence 80 is the approximate true Nash Solution prediction.

There is the additional difficulty with equating disagreement outcomes to reversion points, which is that disagreement outcomes have to be worse for all actors than any feasible bargain if the logic of the Nash Bargaining Solution is to make sense. Only 66 of
the 162 issues in the dataset meet this criterion. See Appendix 1.

15 When issues are multi-dimensional, applying the Compromise Model on each dimension separately is a rather special case of Institutional Realism, based on a somewhat implausible behavioural assumption (see Appendix 2 of this chapter). However, to give the Compromise Model the prominent treatment and thorough test that its simplicity merits, that version of Institutional Realism was adopted for this book.

16 Under the approximation used to derive the Compromise Model, all actors have much to lose from the failure of the negotiations, and thus their power is more equal than the Shapley–Shubik values imply. This argument would seem to apply most strongly to the countries voting in the Council under qualified majority rules. However, from the outset, the authors of this book agreed to use the Shapley-Shubik values as the best objective measure of power, and that convention was adhered to in this chapter. For a related argument about the relative power of states, namely that “preference outliers” are weak in EU negotiations, all else equal, see Mokken et al. (2000).

17 Mearsheimer uses the word “rules” to include both agreements and organizations. Thus he (1994-95: 8-9) defines “institutions as a set of rules that stipulate the ways in which states should cooperate and compete with each other. These rules are typically formalized in international agreements, and are usually embodied in organizations with their own personnel and budgets.”

18 Even the very conservative sign test rejects at the 0.05 level the hypothesis that state-centric realism model is as good as the Compromise Model. See Chapter 10.

19 In fact, the Base Model finished a hair’s breadth ahead of the Compromise Model. On the 100 point issue scale, the Base Model’s forecasts are one tenth of a point (0.1) better on average. In turn, the Compromise Model is 0.3 points better than the mean. Obviously no sensible person should rank-order models based solely on differences of this size.

20 Both the first two groups are statistically significantly different from the third at the .05 level, but they are not statistically distinguishable from each other.

21 Thus $X$ is the mixture set defined on $A$ (Herstein and Milnor, 1953).

22 Even those issues in the dataset treated as intervals are actually recorded only at...
a discrete set of points. No respondent would or could report that, on a scale of 0 to 100, an actor’s preference was 18.732, for example. Thus restricting $A$ to be a finite set involves no substantive loss of meaning here, and it simplifies the presentation and proofs. Generalizing to legitimate interval–level bounded scales of finite length (making $A$ compact if the endpoints are included) is not difficult, however, as Nash (1950) noted.

23 Axiom systems defining preferences over lotteries and then deriving cardinal utilities to represent those preferences are well known and are omitted here. See, for example, Mas–Colell et al. (chaps. 1-3, 6).

24 Note that this standard assumption in bargaining theory is violated when modelers assume that the reversion point falls in the middle of the ideal points of the actors on a single–dimension issue. Then the usual mathematics supporting the Nash Bargaining Solution fails.

25 Note that $x_i$ need not be feasible, i.e., it need not be an element of $A$.

26 In the dataset used in this book, experts were asked to assess salience on each issue relative to other issues faced by the same actor. The assessed salience $s_i$ plus the zero utility for disagreement establish a von Neumann–Morgenstern cardinal utility scale for each actor. Of course, nothing depends on the particular scaling chosen.

27 The dependence of $Q_A$ on $f$ is suppressed in the notation: $f$ is always the Nash Bargaining Solution in what follows.

28 A concave quadratic function $f(z)$ is symmetric around the point $z^*$ at which it attains its maximum. Hence among a set of other points on either side, the nearest point to $z^*$ produces the largest value of $f$.

29 Note, too, that a generalized version of the Nash model (for example, Muthoo 1999: 35-36), in which the social choice maximizes \( \arg\max_{y \in A} \prod_{i=1}^{n} u_i^{\beta_i}(y), \) with \( \sum \beta_i = 1 \), would also lead to the Compromise Model by the same approximation, though with \( u_i = \beta_i / a_i \).

30 More precisely stated, there is always at least one sure–thing alternative among the solutions, and non–degenerate lotteries occur among the solutions only on a set of actor utilities that has (Lebesgue) measure zero.

31 If two or more $g_j$ are tied for the largest value, then any one of them can be chosen.
More precisely, the losses on each dimension are additive, a strong form of separability. An actor with non-separable utilities has to feel, for example, that if emission controls on small cars are imposed, then diesel exhaust on buses not only is less aggravating now that the air is cleaner, but that it actually begins to smell better (or worse) as well.

The Exchange Model of Chapter 5 uses precisely that logic, and its explanatory advantage over the Compromise Model on dichotomous issues in multi-issue proposals may stem from the use of the separability assumption here (see Chapter 10).

Also called “power transformations,” an inconvenient expression when applied to measures of political power.

The point here is exactly parallel to the advice in econometrics texts that estimating a correct first-order serial correlation or heteroskedasticity model may be worse than using ordinary regression if the additional parameters are estimated with considerable noise.

References


