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Coalitions, Power, and the FOMC?

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We apply a notion of power defined for coalitions derived from the Shapley value. We calculate the power of coalitions within a twelve-person committee, meant to correspond to the FOMC.

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"For power is no mysterious and elusive phantom: it is, forthrightly speaking, *the capacity to effect results*"–T.V. Smith.

1. Introduction

Because the Federal Open Market Committee has the key role in setting monetary policy, its actions are scrutinized by the general public and academic economists alike. But while observers at times remark that the FOMC is not a monolithic bloc, the group dynamics within the committee is less appreciated, and less frequently studied. Some important work has traced voting and appointment patterns, but even that has avoided the committee nature of the decision. As Alan Blinder (1998), former Vice-Chairman of the Board of Governors put it:

> My experience as a member of the FOMC left me with a strong feeling that the theoretical fiction that monetary policy is made by a single individual maximizing a well-defined preference function misses something important. In my view, monetary theorists should start paying some attention to the nature of decision making by committee, which is rarely mentioned in the academic literature.(p.22)

In a committee, coalitions can form, and the final decision often depends on how much the power those coalitions have. We apply techniques from cooperative game theory to look at the power of various coalitions in the context of a 12-person committee.

We use a measure known as the Shapley-Shubik power index, which has a simple interpretation as the probability that an individual will cast the deciding vote. It has a broader interpretation as well, as the degree power an individual has in the sense of clout or influence. Whether this ultimately shows up as the ability to set the agenda, call the tune, or get the corner office is another question. As macroeconomists, we are interested in interpretations that link power to policy outcomes, in the sense that more powerful individuals get a monetary policy more to their liking. Either interpretation, though, provides insights into the pressures and strategic possibilities that the 12 committee members face.

Some work on monetary policy reaction functions has explicitly considered differences between FOMC members, addressing such questions as whether district bank presidents vote differently than do members of the Board of Governors (Tootell, 1997) or whether governors appointed by Republican or Democratic presidents dissent in one direction or another (Chappell, Havrilesky and McGregor, 1993, Falaschetti 1999). The work done so far, though very important, misses some of the subtle and nonlinear ways that coalitions interact. As our calculations will show, the coalition structure makes a great deal of difference. Adding one monetarist to a board of 11 committed Keynesians has a different effect than adding two supply-siders to an even split of hawks and doves.

The Federal Open Market Committee

The Federal Open Market Committee, the main policy making body within the Federal Reserve System, meets formally eight times per year to determine open-market operations, the Systems principal monetary-policy tool. The committee consists of the seven members of the Board of Governors, the president of the Federal Reserve Bank of New York, and four of the remaining regional bank presidents. Members of this latter group serve on a rotating one-year basis. Because of delays in the appointment of new members, meetings may take place with fewer than the 12 voting participants. Currently, for example, the FOMC consists of ten members because of two vacancies among the governors. The non-voting regional bank presidents attend FOMC meetings and may contribute fully in the discussions at the meeting. Moreover, they actually cast a vote on issues, but their vote is not counted in the official tally, nor is an explanation of their dissent recorded in the proceedings.

In an initial go-round at the FOMC meeting, each participant expresses his or her judgment of the overall state of the economy. In a second go-round, they each offer recommendations as to the appropriate thrust of monetary policy. Discussion, intended to sway individual opinions, accompanies this part of the meeting. Voting usually centers on choosing among three options that express the tightness and/or ease of monetary policy. The Board of Governors *Monetary Policy Alternatives* (Blue Book) provides these options. Current economic conditions, however, sometimes render one of the options irrelevant. Policy choices are framed in terms of adjustments in the federal funds rate target. A majority vote determines the outcome.

The committee structure of the FOMC, and the possibility that factions and coalitions can arise within it, has received a fair amount of informal attention over the years. In their monumental *A Monetary History of the United States,* Friedman and Schwartz (1963) attribute the inept monetary policy at the beginning of the Great Depression to a power shift within the committee (away from the New York bank), and remark that "There is more than a little element of truth in the jocular description of a committee as a group of people, no one of whom knows what should be done, who jointly decide that nothing can be done."(pp. 415-416). They report incidents such as the "bills only" decision of 1953, where the five voting presidents won a vote when several governors were absent, only to have the vote reversed several months later when the governors returned. Newspapers and financial magazines can be counted on to count up the "hawks" and "doves" whenever a new member is appointed or the next batch of reserve bank presidents rotate onto the committee.

The diversity of political, professional, and ideological backgrounds among the FOMC members suggests that coalition alignments may be rather fluid. Voting blocs can coalesce around many different and overlapping influences. Individuals policy preferences may reflect various interpretations of economic data, disparate beliefs about the nature and timing of the monetary policy transmission, and alternative views about short-run trade-offs among policy objectives. District bank presidents may view themselves as representatives of the economic conditions in their districts and vote with Presidents of districts experiencing similar economic conditions. In addition to economic factors, differences in individual voting preferences may reflect differences in the selection processes for governors and regional bank presidents. Because the former are appointed by the President of the United States and confirmed by the U.S. Senate, some economists and political scientists assert that Governors are more susceptible to political pressures than the district bank presidents (see Tootell 1997). This may be especially so if the President that appointed a particular governor is still in office. Others believe that political party affiliation, rather than selection criteria, forms the basis for coalition building.

Concerns about the power and influence of coalitions lie behind a series of reform proposals over the years. Reagan (1961) was concerned that in the "event of a split within the FRB segment of the committee, however, a solid front by the five president-members would enable them to determine public policy" (p.67). Others, such as Timberlake (1984) worried that the timing of appointments would make it difficult for an American president to fully implement the economic program for which he was elected.

Most narrative histories of monetary policy provide many examples of how coalitions form in the FOMC.[1] An example from Greider (1987) nicely illustrates the process. At the May 24, 1983 meeting, for example, the FOMC was evenly split about a decision to tighten monetary policy. Eventually, however, Preston Martin and Henry Wallich sided with Chairman Volckers coalition, enabling the vote to pass. Presidents Guffy, Morris and Solomon and governors Rice and Teeters cast dissenting votes.

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[1] For a treatment of the Arthur Burns years, see Wooley (1984), for the Volcker years, see Greider (1987), and for the Greenspan years, see Woodward (2000).

2. Calculating Power

"Power," "influence," "clout," or whatever you wish to call it, is an important and intuitively meaningful concept, but rather difficult to define precisely. We focus on a particular, admittedly imperfect, definition adopted from cooperative game theory, where power is the probability of casting the deciding vote. The approach has provided useful insights in related areas, such as the supreme court (Krislov 1964, Schubert 1964), presidential veto power (Friedman 1986), and the electoral college (Mann and Shapley, 1962). More general approaches, where influence is interpreted as the ability of a person to change the outcome of a game, in many cases reduce to the definition of power we use (Al-Najjar and Smorodinsky, 2000).

This section describes how we compute the power index of a coalition. We begin with the standard approach introduced by Shapley and Shubik, whereby the Shapley value is applied to a voting procedure. This index is a bit restrictive, however, because it provides a power index only for individuals, not for coalitions. It enables us to compare the power of a senator, a representative, and a president, but tells little about the power of a cohesive group such as Senate Republicans. To address this, Krislov (1964) and Schubert (1964) showed how to handle coalitions in a very natural way. We base our computations on the exposition provided in Goldberg (1983).

We begin with a few necessary definitions. Our game has 12 players (the number of voting members on the FOMC). A *coalition*, K, is a subset of the players. The game has a *characteristic function*, $v(K)$, that associates a payoff to each coalition. This function assumes transferable utility, perhaps best thought of as the coalition getting a lump of cash, which they can distribute among themselves as they please. Voting games, such as we consider, are often called *simple* because a coalition either wins, in which case $v(K) = 1$, or loses, in which case $v(K) = 0$. If a person, i, is not part of the coalition K we define the *incremental value* of i to K as $v(K \cup \{i\}) - v(K)$.

To illustrate the logic behind the Shapley value it helps to consider a simple three-person voting game. In this case, $v(\emptyset) = 0$, $v(\{1\}) = v(\{2\}) = v(\{3\}) = 0$, $v(\{1,2\}) = v(\{1,3\}) = v(\{2,3\}) = 1$ and $v(\{1,2,3\}) = 1$. The characteristic function v does not tell us what part of the payoff each member of a coalition K finally gets. To determine what each individual gets requires defining what game theorists call a "value." The Shapley value determines each person's payoff by assigning a "worth" or fair value to each individual's contribution to the coalition, and then summing this up over the possible coalitions. The incremental value is credited to the player. So in our simple voting game, if the initial coalition is $\{1,2\}$ the incremental value of adding person 3 is zero, since 1 and 2 already have a majority, and $v(\{1,2,3\}) - v(\{1,2\}) = 1 - 1 = 0$. Riker and Ordeshook (1973) provide the classic description of this convention:

> The last member, sequentially and chronologically, gets the increment, as might happen if each person were able to insist on receiving his marginal contribution to the value of the coalition. Where players are able to withhold membership–and hence contributions–this is a common rule.

In the example so far, person 3 was rather unlucky, in that a winning coalition had already formed without him. A different ordering would treat him differently, giving him a higher incremental value. In fact we have $3! = 6$ possible orderings, $\{1,2,3\}$, $\{1,3,2\}$, $\{2,1,3\}$, $\{2,3,1\}$, $\{3,1,2\}$, and $\{3,2,1\}$. Of these, person 3 will be the *pivot* or the *swing* twice, when he is able to create a majority where none existed without him. Using this we can calculate his average, or expected incremental value v_3. For the example,

$$v_3 = \frac{0+1+0+1+0+0}{6} = 1/3.$$

One interpretation of this approach is that before walking into the room, a player guesses his chances of being the pivot and being able to demand a payoff, and the Shapley value then gives an expected value for his payoff. At any given play of the game he may not get such a payoff. That is not the only possibility: Harsanyi (1977, section 11.4) shows how to interpret the Shapley value as the outcome of bargaining between the agents.

Generalizing to more players requires a brief foray into combinatorics.[1] For n players, there are $n!$ different orders of n. If person i joins a coalition K which already has k members, sometime i will be in the $(k+1)$st position. How often? Well, there are $k!$ ways of ordering the k players. Now put i in the $k+1$ spot, so there are $(n-k-1)!$ ways of ordering the remaining $n-k-1$ players. So of the $n!$ ways of ordering the n players, player i is the pivot in $k!(n-k-1)!$ of the orderings. The expected incremental value for player i given a coalition of size k is then just $\frac{k!(n-k-1)!}{n!}[v(K \cup \{i\}) - v(K)]$. Many different sized coalitions may form, however, so the Shapley value sums up over all possible coalition sizes, for

$$v_i = \sum_{K \subset N} \frac{k!(n-k-1)!}{n!}[v(K \cup \{i\}) - v(K)].$$

The particular application we have in mind reduces the complexity of the problem. In our voting game, the incremental value is either zero or one. We get the simplification described by Goldberg (1983) as:

> the Shapley-Shubik power index of a member of a voting body is the number of voting orders (permutations of all members) in which that member is the pivot, divided by the total number of possible voting orders.

The extension to voters forming coalitions is then straightforward: a bloc of voters is treated as a single player having multiple votes. Then the power index is computed in the usual manner. For example, with six voters, three of whom form a voting block, we have the following possible orders:

[1] For an excellent treatment of basic combinatorics, see Niven (1965). For a discussion of the applications to cooperative game theory, see Friedman (1986), or Vorob'ev (1977).

Bxxx
xBxx
xxBx
xxxB

In a majority voting game, bloc B will be in the pivot 3/4 of the time, and thus have a power index of 3/4.

3. Results and Interpretation

For the FOMC, of course, there are twelve voters, and coalition may range in size from two to twelve individuals. Calculating the power of various voting blocs is trivial when a coalition of seven or more–an automatic majority–exists. Hence, any coalition of district bank presidents would remain powerless if governors voted en masse, but governors do not routinely vote in a bloc. Between 1962 and 1998, governors dissented about 6 percent of the time, whereas district bank presidents dissented approximately 9 percent of the time.

When an automatic majority is not present, the power of any bloc varies with the size of opposing blocs. Because of the many possible dimensions for coalition building, most power calculations involve determining the power of a bloc faced with several smaller blocs. We call the largest bloc the protagonist coalition and investigate how alternative possibilities for defensive coalitions change the power of the protagonist bloc. We also consider how coalitions affect the power of a lone, unaffiliated individual.

Table 1 presents our calculations of the power indexes. It first lists possible sizes of the protagonist bloc and other blocs. It then presents the power index for each bloc. We discuss several of the many possible comparisons that we find particularly interesting.

P Bloc	Others	P power	Other's power		
7	1,1,1,1,1	1	0		
6	1,1,1,1,1,1	0.857	0.0238 each		
	2,1,1,1,1	0.8333	0.0333	0.0333 each	
	2,2,1,1	0.8	0.05	0.05	0.05 each
	2,2,2	0.75	0.0833	0.0833	0.08333
	3,1,1,1	0.8	0.05	0.05 each	
	3,2,1	0.75	0.0833	0.0833	0.0833
	3,3	0.6667	0.1667	0.1667	
	4,1,1	0.75	0.0833	0.0833 each	
	4,2	0.6667	0.1667	0.1667	
	5,1	0.6667	0.1667	0.1667	
	6	0.5	0.5		

P Bloc	Others	P power	Other's power			
5	1 (7)	0.625	0.0536 each			
	2,1 (5)	0.5952	0.0952	0.0619 each		
	2,2,1,1,1	0.5667	0.1167	0.1167	0.0667 each	
	2,2,2,1	0.55	0.2	0.2	0.2	0.05
	3,1 (4)	0.5333	0.1333	0.0833 each		
	3,2,1,1	0.5	0.1333	0.1333	0.1167	0.1167
	3,2,2	0.5	0.1667	0.1667	0.1667	
	4,1,1,1	0.45	0.2	0.1167 each		
	4,2,1	0.4167	0.25	0.2083	0.125	
	4,3	0.3333	0.3333	0.3333		
	5,1,1	0.3333	0.3333	0.1667 each		
	5,2	0.3333	0.3333	0.3333		

P Bloc	Others	P power	Other's power			
4	1 (8)	0.4444	0.0694 each			
	2,1(6)	0.4286	0.1071	0.0774 each		
	2,2,1,1,1,1	0.3905	0.0952	0.0952	0.1048 each	
	2,2,2,1,1	0.4167	0.15	0.15	0.15	0.0667 each
	2,2,2,2	0.4	0.15	0.15	0.15	0.15
	3,1(5)	0.3809	0.14	0.0952 each		
	3,2,1,1,1	0.4167	0.1667	0.15	0.0888 each	
	3,2,2,1	0.4	0.2333	0.15	0.15	0.0667
	3,3,1,1	0.3667	0.2833	0.2833	0.0333 each	
	3,3,2	0.4167	0.25	0.25	0.0833	
	4,1,1,1,1	0.3	0.3	0.1 each		
	4,2,1,1	0.25	0.25	0.2167	0.1417 each	
	4,2,2	0.3333	0.3333	0.1667	0.1667	
	4,3,1	0.3333	0.3333	0.3333	0	
	4,4	0.3333	0.3333	0.3333		
3	1 (9)	0.3	0.0778 each			
	2,1 (7)	0.2917	0.1667	0.0774 each		
	2,2,1 (5)	0.25	0.125	0.125	0.1 each	
	2,2,2,1(3)	0.5714	0.1048	0.1048	0.1048	0.0381 each
	2,2,2,2,1	0.2667	0.1667 each	0.0667		
	3,1 (6)	0.25	0.25	0.0833 each		
	3,2,1 (4)	0.2714	0.2714	0.1714	0.0714 each	
	3,2,2,1,1	0.2667	0.2667	0.1333	0.1333	0.1 each
	3,2,2,2	0.25	0.25	0.1667	0.1667	0.1667
	3,3,1,1,1	0.2833	0.2833	0.2833	0.05 each	
	3,3,2,1	0.2667	0.2667	0.2667	0.1	0.1
	3,3,3	0.25	0.25	0.25	0.25	

P Bloc	Others	P power	Other's power			
2	1 (10)	0.1818	0.0818 each			
	2,1 (9)	0.1778	0.1778	0.0806 each		
	2,2,1 (6)	0.1825	0.1825	0.1825	0.0639 each	
	2,2,2,1 (4)	0.1857	0.1857	0.1857	0.1857	0.1071 each
	2,2,2,2,1(2)	0.1714 each	0.0714 each			
	2,2,2,2,2	0.1667 each				
1	1 (11)	0.0833 each				

Coalition Power Calculations

The opposing bloc structure really matters for the power index of the protagonist bloc. A bloc of six opposed by single voters clearly dominates the committee, since it can expect to be the pivot nearly 86 percent of the time. A bloc of six opposed by another bloc of six has its power index reduced to 50 percent. Similar, though less extreme numbers hold for blocs of other sizes.

The quantitative results of the model generally accord with intuition and common sense, but the model offers some notable exceptions. It is not quite so obvious that a protagonist bloc of five should lose substantially more power than a protagonist bloc of six when differently sized blocs face the maximum possible counter-bloc, the amount of power they lose can differ greatly depending on the size of the original bloc. For example, if a six-person bloc arise to oppose an existing six-person bloc, the existing bloc loses more power than a five-person bloc confronted by two blocs, one with five members and one with two. This happens because the five-person bloc started out with less power than the six-person bloc.

Opposing blocs do not always hurt the protagonist bloc. Krislov (1964) and Schubert (1964) first found this in their studies of groups with nin members (meant to represent the Supreme Court). Our results twelve-member groups confirm their finding. A protagonist bloc of three facing nine individuals has a power index of 0.3, but when the opposition organizes into blocs of two, two, and two with three remaining individuals, the three-member protagonist blocs power increases to over 0.57. This power index exceeds any value that a protagonist bloc of four might obtain and is even quite high relative to those possible for a protagonist bloc of five. A similar, though less dramatic result takes place when a two-member bloc faces three blocs of two and four unattached individuals.

As one might imagine, coalition structure also affects the power of unaffiliated voters. In a twelve-member committee each individual has a power index of 0.083. When facing a single protagonist bloc of six voters, an individuals power index falls to only 0.02. When simultaneously facing blocs of six and five, however, the power of the odd man, who now can cast the deciding vote, rises to a relatively high 0.167. A single voter also does especially well when facing blocs of four, four, and two; of five, four, and two; and of five, three, and two.

Coalition structure can completely eliminate the power of an individual voter. A single voter facing blocs of four, four, and three has a power index of zero: no power. With that combination of blocs, a single voter can never be the pivot and grant a majority to any of the blocs. Moreover, if any of the blocs combine, they already have a majority and do not need the individual.

No simple rule of thumb emerges from the different coalition structures presented in table 1. As voting blocs form, they may take power from the protagonist bloc, from single voters, or from each other. The quantitative approach, however, reveals subtleties. It is not intuitively obvious that the power of a single voter varies tremendously even when facing a similar coalition structures–say one of four, four, and two and one of four, four, and three. Nevertheless, in the first case, the voter has a great deal of power, but in the second case the individual has none.

It is tempting to assume that being part of the largest coalition gives the members more power as individuals, but that is not always true. The voters in a protagonist bloc of five, for example, have a collective power of 0.333 when facing blocs of four and three. This is less than their total of $5/12 = 0.416$ when each votes as an individual. A similar loss of power occurs in several other combinations, notably when a bloc of four faces blocs of four and two. Then the two remaining individual voters each have a power index of 0.14. The blocs of four have a collective power of 0.25, which amounts to 0.06125 when split between the 4 individuals in the coalition. An unaffiliated voter has more than twice the individual power of an individual coalition member.

4. Conclusions

Our discussion of the Shapely-Shubik power index illustrates that small changes in FOMC membership can have potentially large effects on the power of coalitions with the committee and on monetary policy decisions. Explicitly considering the power index can lead to a clearer view of the strategy underlying FOMC votes, in much the same way that knowing the odds provides a clearer understanding of the intricacies of poker. Poker, however, is a lot more than probability theory and monetary policy–even FOMC voting–is a lot more than cooperative game theory. By presenting FOMC voting within the precise framework of the Shapely-Shubik power index, we have attempted to provide a deeper understanding about the decision making process of monetary-policy.

Further investigation of the influence of coalitions on voting behavior could extend our understanding of how policy reacts to economic developments. A great deal of empirical work looks at Federal Reserve reaction functions, trying to correlate monetary-policy decisions with important macroeconomic variables, like inflation and unemployment, or with broad political factors, like party affiliation or composition of the Senate Banking Committee. Another branch of research tries to determine the factors that influence votes of individual FOMC members, such as whether the member is a governor or a bank president. Understanding the shifting balance of power between possible blocs within the FOMC might offer an insight into the timing of the Committees actions, as new appointments change the size and strength of coalitions.

On the theoretical side, questions about the most effective commitment mechanisms or optimal contracts for central bankers, as in Walsh (1995), should consider what coalitions in a committee might do. For example, in the case of appointing a conservative central banker, which Rogoff (1985) discusses, must all 12 FOMC members be conservative? Likewise, how an incentive system or reputation effects, which Sibert (1999) considers, interact with a committees coalition structure is apt to have major effects. Thus, the tools used to study coalitions hold promise both to help explain observed policy decisions and to scrutinize reform proposals.

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