CENTRAL BANK STRUCTURE AND MONETARY POLICY UNCERTAINTY*

José I. García de Paso
Universidad Complutense de Madrid

ABSTRACT

Recent research has shown that partisanship causes monetary policy uncertainty. Since monetary policy is implemented by central banks, this paper models alternative central banks structure to analyze their effects on policy uncertainty in a two-party political system. the major result of the paper is that the length of governors' terms plays a more important role than the number of governors on the board. moreover, it is shown that both postelectoral appointments and the membership of administration officials on the central bank board raise monetary policy uncertainty. The paper' results are illustrated by analyzing alternative structures of the Federal Reserve Board of Governors.

RESUMEN

Este trabajo desarrolla un modelo de la estructura institucional de un banco central para analizar los efectos que esa estructura tiene sobre la incertidumbre del público respecto a la política monetaria futura. El principal resultado obtenido es que la duración del mandato de los gobernadores juega un papel de mucha mayor importancia que el número de éstos. Asimismo se muestra que la existencia de una estructura postelectoral de nombramientos y el derecho de la administración a sentar a alguno de sus miembros en el consejo del banco central aumentan la incertidumbre monetaria. Los resultados se ilustran mediante el análisis de estructuras alternativas del Consejo de Gobernadores de la Reserva Federal.

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1. INTRODUCTION

Partisanship in monetary policy has recently been subject to a great deal of attention. At a theoretical level, there are several reasons that could explain partisan differences in monetary policy. Hibbs (1986) suggests that such differences arise because the constituency bases of diverse political parties differ in their relative position in the income distribution as well as in their absolute level of economic well-being. As a consequence, these constituencies are diversely affected by monetary policy. Since parties promote policies broadly consistent with the interests and preferences of their core constituencies, differences in the interests and preferences of party clienteles are reflected on the partisan pattern of monetary policies.

Havrilesky (1987) suggests that monetary policy is often used to offset the incentive adverse effects of distributionally motivated policies. Therefore, if parties differ in the amount of redistribution they are engaged in, such differences will be reflected on partisan monetary policies.

At the same time, the existence of heterogeneity of market structures in an economy may generate partisanship in monetary policy (Waller, 1992b).

Moreover, economic diversity across regions within a monetary union may provoke significant differences in the types of monetary policies advocated by different regions (Alesina and Grilli, 1992).

At an empirical level, recent evidence is consistent with partisanship in monetary policy, at least for the U.S. case (Havrilesky, 1987; Alesina and Sachs, 1988; Chappell and Keech, 1988; García de Paso, 1993a).

While creating a central bank independent of the government may be feasible, it is unlikely that political influence on it will be completely eliminated. Since the central bank is not divorced from the political process and modern societies are heterogeneous (in some or all the senses cited

above), the central bank is subject to diverse political influences because its objectives may not be agreed upon.

In practice, there exist several ways through which partisan influences can be transmitted to the central bank. The main channels that researchers have explored are direct signalling of desired monetary policies (Havrilesky, 1988, 1991), coercion and bashing (Waller, 1991), and central bank appointments (Havrilesky and Schweitzer, 1990; Gildea, 1990; Havrilesky and Gildea, 1992). From an empirical point of view, in the U.S. case the primary mechanism by wich partisan differences in monetary policies arise seems to be the appointment process (Chappell, Havrilesky, and McGregor, 1993).

Both the existence of social, economic, political or geographical groups with different preferences in monetary policy and the possibility that such groups appoint central bank governors cause partisanship in monetary policy to arise.

Alesina (1987) and Ball (1992) have shown, in a framework where government and central bank coincide, that the presence of partisanship contributes to increase the variability in the conduct of monetary policy and to generate uncertainty about its future stance.

Given the facts that societies are heterogeneous and that the appointment of central bank governors is a political process, it seems natural to ask how the design of alternative central bank structures will affect monetary policy uncertainty. Research in this way will lead to further understanding of the role of monetary institutions and how partisanship influences the monetary policy-making framework.

In order to perform this task it is necessary a level of theoretical analysis that, for the moment, has only been carried out by Waller (1989, 1992a).

In his first paper, Waller uses a two-party model to show how overlapping the terms of central bank governors reduces monetary policy uncertainty. However, the central bank structure he models is such that the number of governors and the number of periods in governors' terms are the same. Because of this particular structure, he mistakenly considers that the number of governors plays the key role to characterize monetary policy uncertainty.

In his second paper, Waller formulates a model within the context of a two-party political system, in which the winning party is allowed to nominate candidates to serve as central bank governors and the losing party has the right to confirm the nominees. It is shown that in this institutional framework the appointments to the central bank are more moderate in their views on monetary policy than within a framework in which the losing party cannot veto the nominees. However, since his model does not specify the voting process through which the board of governors determines the monetary policy actually implemented, it does not allow to characterize the monetary policy stance under a particular composition of the board. As a consequence, his paper cannot provide any conclusion about the way the pattern of appointments affects monetary policy uncertainty.

As a further step towards the development of positive theories of monetary institutions, the purpose of this paper is to construct central bank alternative generic structures in order to discuss their effects on monetary policy uncertainty. At the same time, the paper' results are illustrated by analyzing alternative (past, present and potential) structures of the Federal Reserve Board of Governors.

The key results obtained are the following:

-the lengthening of governors' terms in office reduces monetary policy uncertainty.

-the number of governors has no effect on uncertainty.

-governors' terms running concurrently with the administration's term in office raise policy uncertainty.

-the membership of administration officials on the central bank board either raises or leaves unaffected monetary policy uncertainty.

The rest of the paper contains five sections. Section 2 presents the institutional structure. Section 3 derives a general expression to obtain monetary policy uncertainty. Section 4 uses that expression to analyze the effects of the number of governors, the length of governors' terms, the membership of administration officials on the board, and the timing of appointments on monetary uncertainty. Section 5 applies those results to illustrate the likely effects of earlier and current proposals to alter the structure of the Federal Reserve Board of Governors and section 6 concludes.

2. INSTITUTIONAL STRUCTURE

Consider an independent central bank who conducts monetary policy ruled by a r-member board (r is an uneven integer) whose members serve n-period overlapping terms (n is a submultiple of r).

Once a governor is appointed, he cannot be fired or voted out of office before his term expires. Moreover, it is assumed that no resignations from the board occur.

The central bank conducts monetary policy through controlling a monetary instrument (denoted by m) like a money stock rate of growth, an interest rate or another policy instrument.

There are two different political parties in this economy (1,2) interacting through an electoral process being held every period. The parties have different preferences about the monetary policy instrument (m_1, m_2).

These preferences are common knowledge.

The winning party has the right to fill the vacancies that regularly occur on the board. Governors appointed by each party are assumed to adhere to the monetary policy desired by the party who appointed them. The existence of two diverse attitudes determines, in turn, the types of monetary policy action each governor will advocate[1].

Let P be the probability that party 1 wins the election, with 1-P being the probability that party 2 wins. In order to simplify the solution to the model we assume that P is exogenously determined and time-stationary[2].

The monetary policy actually implemented by the central bank board of governors is determined by a majority-rule voting process. Given this rule, the uneven number of members on the board permits us to easily characterize the monetary policy actually implemented. Such a policy course will be the value of the monetary instrument preferred by the median voter on the board. Therefore, the intensity of preference of each governor does not matter for the policy decision and, thus, a governor does not have any strategic incentive to misrepresent his own preferences (see appendix 1).

Each period of time a number of vacancies on the board occurs. These vacancies are filled by appointing new governors. In order to have at least one vacancy occurring every period of time and, in turn, to have a chance of finding uncertainty over the future course of monetary policy, we have assumed that the number of periods in governors' terms is a submultiple of the number of members on the board.

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[1] That is, we do not consider institutional structures where the losing party has the right to reject a nominee if it so desires. Because of this reason, the paper of Waller (1992a) complements our analysis for institutional structures where confirmation hearings exist.

[2] In an Alesina's type partisan policy model, García de Paso (1993b) shows that the existence of endogenous voting affects the monetary policies implemented by each party when in office but does not have any effect on the outcome of future elections.

At the start of each period, the public sets expected monetary policy. Expectations are assumed to be rational. Then an election is held and the winning party fill the board vacancies so that a new central bank structure is determined. Next the central bank chooses the monetary policy preferred by its median member.

3. MONETARY POLICY UNCERTAINTY

3.1. Derivation of policy uncertainty

Now we are interested on measuring monetary policy uncertainty arising from the institutional structure just laid out. To do this we will make use of the conditional variance of the central bank monetary instrument.

Since r is the number of governors on the board and n is the number of periods in governors' terms, the ratio r/n indicates the number of vacancies ocurring every period. At the same time, $((n-1)r/n)$ is the number of governors who have not completed their terms (i.e., the incumbent members on the board).

Given this institutional framework, we can observe a number of incumbency structures on the board. That is, we can observe a number of different board compositions at the time vacancies occur.

In spite of ocurring vacancies every period, there may be incumbency structures such that there is no uncertainty about the future stance of monetary policy. The reason is that we may find incumbency structures such that the number of new appointees is smaller than the difference between the number of party 1 incumbents and the number of party 2 incumbents. In such cases, the future monetary policy is known with certainty, irrespective of the party the new appointees belong to.

The set A includes all the incumbency structures which generate monetary policy uncertainty. Let x be the number of party 1 incumbent governors. Then

the set A can be expressed as

$$A = \left\{ x \in \mathbb{N},\ \left| x - \left[\frac{n-1}{n} r - x \right] \right| < \frac{r}{n} \right\} \tag{1}$$

The set A indicates that the number of party 1 incumbents which provokes monetary policy uncertainty is such that the difference of incumbents between parties is strictly smaller than the number of new appointees (r/n).

Under the assumption that governors appointed by each party adhere to the monetary policy desired by the appointing party, all the r/n governors appointed at the same period of time have identical preferences on monetary policy. To account for this fact, it must be noticed that any incumbency structure existing each period will consist of several blocks of governors appointed by former administrations. Therefore, the number of incumbent governors from each party should be a multiple of the number of governors appointed every period.

As a consequence, any incumbency structure will be composed of several blocks, each consisting of r/n governors. Each block of r/n governors is appointed by the same party. Hence, the number of blocks within any incumbency structure is given by

$$\frac{\frac{n-1}{n} r}{\frac{r}{n}} = n-1 \tag{2}$$

Let z be the number of blocks within the incumbency structure appointed by party 1. Then, we have

$$x = z\frac{r}{n} \tag{3}$$

Then the set A of incumbency structures which provide monetary uncertainty can be expressed as

$$A = \left\{ z \in \mathbb{N},\ z \leq n-1,\ \left| 2z\frac{r}{n} - \left[\frac{n-1}{n}r\right] \right| - \frac{r}{n} < 0 \right\} \tag{4}$$

The set A can be rewritten as

$$A = \left\{ z \in \mathbb{N},\ z \leq n-1,\ \left| 2z - (n-1) \right| - 1 < 0 \right\} \tag{5}$$

Each incumbency structure causing monetary policy uncertainty can be obtained in a number of different ways. The number of times a particular incumbency structure can be observed is given by the number of ways of choosing the incumbent governors that compose such a structure without regard to order and provided that uncertainty arises.

The only value of z one can find into the set A is

$$z = \frac{n-1}{2} \tag{6}$$

Since $(1-z)=(n-1)/2$ is the number of party 2 incumbents which generates electoral uncertainty, it is clear that -in order to observe electoral uncertainty- there must be the same number of incumbents from each party.

That particular incumbency structure may be obtained from the $n-1$ previous electoral results. Hence, the number of ways we can observe such a structure is given by the binomial coefficient

$$\binom{n-1}{\frac{n-1}{2}} \tag{7}$$

Moreover, there exists a particular probability of observing such an incumbency structure with uncertainty. This probability is given by the likelihood of observing an incumbency structure consisting of $(n-1)/2$ blocks of party 1 governors (the remaining ones belonging to party 2). This probability is given by the following expression

$$p^{(n-1)/2}{}_{(1-p)}{}^{(n-1)/2} \tag{8}$$

Once the probability of observing each incumbency structure with uncertainty is calculated, next it is necessary -for each of these incumbency boards- to obtain the probabilities of observing a particular (m_1 or m_2) monetary policy as well as the expectation of the upcoming monetary policy.

Suppose an incumbency structure with uncertainty where x is the number of party 1 incumbents and $\{((n-1)r/n) - x\}$ is the number of party 2 incumbents. Then the probability of observing m_1 is given by the likelihood of the event that the number of party 1 incumbents plus the number of party 1 new appointees generate a majority on the board. Let j be the number of new appointees belonging to party 1. Thus the set B contains the number of party 1 new appointees such that -given the number of party 1 incumbents (x)- the monetary policy actually implemented is m_1 (that is, party 1 has a majority of governors on the board).

$$B = \left\{ j \in \mathbb{N},\ j \leq r/n,\ (j+x) > \frac{r}{2} \right\} \tag{9}$$

The number of new appointees belonging to party 1 may be r/n or zero. Since the only incumbent structure with uncertainty consists of $\frac{n-1}{2}.\frac{r}{n}$ party 1 incumbents and $\frac{n-1}{2}.\frac{r}{n}$ party 2 incumbents, the set B that contains the number of party 1 new appointees such that the monetary policy actually implemented is

m_1 can be expressed as:

(10) $$B = \left\{ j \in \{r/n,\ 0\},\ \left[j + \frac{n-1}{2}.\frac{r}{n} \right] > \frac{r}{2} \right\} \equiv \{r/n\}$$

Let i be the number of new blocks of party 1 appointees. Then, we have

(11) $$j = i\frac{r}{n}$$

Thus, the set B can be expressed as

(12) $$B = \left\{ i \in \{1,\ 0\},\ \left[i + \frac{n-1}{2} \right] > \frac{n}{2} \right\} \equiv \{ 1 \}$$

For this particular i, the number of feasible patterns of new appointments such that the new appointees provoke a party 1 majority on the board is just one, as shown by the binomial coefficient

(13) $$\begin{pmatrix} 1 \\ i \end{pmatrix} = 1$$

Since the probability of party 1 winning the election and therefore of appointing r/n party 1 governors is P, then the probability of a monetary policy m_1 being implemented when there exists a split incumbency structure is P. Accordingly, the probability of observing m_2 is 1-P.

Hence, the conditional mathematical expectation of the monetary policy instrument is

(14) $$m^e = Pm_1 + (1-P)m_2$$

so that the differences between actual and expected monetary policy will be:

(15) $$m_1 - m^e = (1-P)(m_1-m_2)$$

(16) $$m_2 - m^e = P(m_2-m_1)$$

The probability of observing these differences are P and 1-P, respectively.

Hence, the conditional variance of the monetary instrument when governors are appointed just after the election by the new administration is given by

(17) $$\mathrm{Var}(m)\big|_{AE} = \begin{pmatrix} n-1 \\ \frac{n-1}{2} \end{pmatrix} P^{(n-1)/2}(1-P)^{(n-1)/2}\left[P(m_1-m^e)^2 + (1-P)(m_2-m^e)^2 \right]$$

The expression $\left[P(m_1-m^e)^2 + (1-P)(m_2-m^e)^2 \right]$ can be rewritten as

(18) $$P(1-P)(m_1-m_2)^2$$

so that monetary uncertainty is

(19) $$\mathrm{Var}(m)\big|_{AE} = \begin{pmatrix} n-1 \\ \frac{n-1}{2} \end{pmatrix} P^{(n+1)/2}(1-P)^{(n+1)/2}(m_1-m_2)^2$$

4. THE EFFECTS OF CHANGING CENTRAL BANKS' STRUCTURES

Since our model characterizes monetary policy uncertainty depending on the central bank structure, it will enable us to analyze the effects of the number of governors and of the length of governors' terms on monetary policy uncertainty. Moreover, we will see the effects of changing the appointment patterns of governors so that their terms run concurrently with the administration's term in office. If terms are coincident, at the time the new administration takes office, it appoints the new governors. On the contrary,

if terms are not coincident, the administration appoints the governors just before the election is held. In the former case, there exists electoral uncertainty with respect to the new governors' monetary preferences. In the latter case, however, the expectations on the future course of monetary policy are formed by knowing in advance the composition of the central bank board. In addition, our analysis will permit us to evaluate the effects on monetary uncertainty of the membership of administration officials on the central bank board.

4.1. The length of governors' terms

Expression (19) indicates that the lengthening of governors' terms in office reduces monetary policy uncertainty. As the number of periods in a term approaches infinity, the variance of the monetary policy instrument goes to zero.

The reason is that, the greater the number of periods in governors' terms, the greater the number of incumbent blocks and the less likely that the new block of appointees will be pivotal.

4.2. The number of governors on the board

At the same time it can be seen that expression (19) does not depend on the number of governors on the board. That is, if we modify the number of governors on the board, monetary policy uncertainty will remain unaffected. Such a conclusion can also be obtained from expression (5) which shows that there exists a 'sufficient' parameter (the length of governors' terms) in order to characterize monetary policy uncertainty.

Waller (1989) investigates the results obtained under a central bank structure ruled by a three-member board whose members serve three-period

overlapping terms. By extrapolating his results to a n-member, n-period setting, he obtains an expression for the variance of the monetary policy instrument similar to ours although our derivation is more general (since our model is not constrained to $r=n$). Nevertheless, his expression and ours are similar because, as was shown above, the number of governors on the board does not have any influence on monetary policy uncertainty.

Because of the particular central bank structure he models, Waller cannot distinguish between number of governors and length of a term on the central bank board. As a consequence, he mistakenly considers that the 'sufficient' parameter in order to characterize monetary policy uncertainty is the number of governors. Thus, Waller argues that monetary policy uncertainty can be driven very close to zero by a marked increase in the number of board members.

4.3. The membership of administration officials on the central bank board

This subsection analyzes a particular case where there are members on the central bank board differing in the length of their terms in office. An example of this type of circumstances arises for institutional structures under which the administration -in addition to the right to fill the regular vacancies that occur on the board- has the right to appoint to the central bank one or several of its officials to serve one period of time (i.e., the time horizon between two elections).

Such a board structure corresponds, for instance, to the pre-1935 Board of Governors of the Federal Reserve System where the Secretary of the Treasury participated in monetary policy deliberations. Along this line, recently a number of legislative proposals have sought to increase the influence of the President over monetary policy by adding Administration officials (the Treasury Secretary and the Chairman of the Council of Economic Advisors) to

the Federal Open Market Commitee (Akhtar and Howe, 1991).

Let consider an institutional structure such that a new administration places one or several officials on the central bank board when it takes office. The length of these officials' terms on the central bank is one period.

Imagine an initial situation where the central bank is ruled by r governors serving n overlapping periods of time. Next consider an institutional proposal which incorporates s administration officials to the central bank (where s is an even integer).

As a result, the new number of board seats is $r+s$, the number of seats becoming vacant each period is $s + r/n$, and the incumbency structure consists of $(n-1)r/n$ members. The set C including all the incumbency structures which generate monetary policy uncertainty is such that the difference of incumbent governors between parties is strictly smaller than the number of new filled seats $(s + r/n)$.

$$(20) \qquad C = \left\{ z \in \mathbb{N},\ z \leq n-1,\ \left| z\frac{r}{n} - \left[\frac{n-1}{n}r - z\frac{r}{n}\right]\right| - \left[s + \frac{r}{n}\right] < 0 \right\}$$

Rewriting expression (20), one obtains

$$(21) \qquad C = \left\{ z \in \mathbb{N},\ z \leq n-1,\ \left|2z - (n-1)\right| - \left[1 + \frac{s}{r/n}\right] < 0 \right\}$$

Expression (21) shows that, in the new framework, the uncertainty about future monetary policy is not only determined by the length of governors' terms (n), but also by both the number of governors (r) and the number of administration officials on the board (s). It is worth noticing that the

decomposition of the number of seats on the board $(r+s)$ into r and s matters to characterize monetary uncertainty.

Since the set C may contain values of z in addition to $(n-1)/2$, the number of times we can observe incumbency structures provoking monetary uncertainty are given by the binomial coefficient

$$(22) \qquad \binom{n-1}{z}$$

There exists a particular probability of observing each incumbency structure with uncertainty. This probability is given by the likelihood of seeing an incumbency structure consisting of z incumbent blocks of party 1 governors and $n-1-z$ incumbent blocks of party 2 governors. Its expression is the following:

$$(23) \qquad P^{z}(1-P)^{(n-1-z)}$$

For each incumbency structure with uncertainty, we can observe m_1 with probability P and m_2 with probability 1-P.

Since -within the set C- it may be possible to find several values of z which generate the monetary policy m_1, the conditional variance of the monetary policy instrument if s administration officials seat on the central bank board will be:

$$(24) \qquad \mathrm{Var}(m)\big|_{M} = \sum_{z\in C}\binom{n-1}{z} P^{z}(1-P)^{(n-1-z)}P(1-P)(m_1-m_2)^2$$

Rearranging, we obtain

$$(25) \qquad \mathrm{Var}(m)\big|_{M} = \sum_{z\in C}\binom{n-1}{z} P^{(z+1)}(1-P)^{(n-z)}(m_1-m_2)^2$$

where C was already defined in (21).

Let C' be the following set of party 1 blocks of incumbent governors:

$$(26) \quad C' = \left\{ z \in \mathbb{N},\ z \leq n-1,\ z \neq (n-1)/2,\ \left|2z - (n-1)\right| - \left[1 + \frac{s}{r/n}\right] < 0 \right\}$$

From expression (26) it is easy to see that the following holds:

$$(27a) \quad C' \neq \emptyset \quad \text{if} \quad \frac{s}{r/n} > 1$$

$$(27b) \quad C' = \emptyset \quad \text{if} \quad \frac{s}{r/n} < 1$$

Now, let W be the following expression:

$$(28a) \quad W = \sum_{z \in C'} \binom{n-1}{z} p^{(z+1)}(1-p)^{(n-z)}(m_1 - m_2)^2 > 0 \quad \text{if } C' \neq \emptyset$$

$$(28b) \quad W = 0 \quad \text{if } C' = \emptyset$$

Then we can write

$$(29) \quad \text{Var}(m)\big|_M = W + \text{Var}(m)\big|_{AE} \geq \text{Var}(m)\big|_{AE}$$

This result implies that institutional structures where the administration has the right to appoint its officials to the central bank may raise policy uncertainty. However, uncertainty does not necessarily raise with such structures. As shown above, the condition for additional policy uncertainty to emerge is that the number of administration officials on the board are higher than the number of regular vacancies occuring every period.

In this context ($s>0$), the number of new appointees each period ($s + r/n$) is higher than the number of governors within an incumbent block (r/n). As a consequence, the likelihood of finding incumbency structures with monetary

uncertainty may be higher because the new block of appointees (governors plus officials) is more pivotal. The additional uncertainty under the proposed structure is summarized by W. The higher s and n, and the lower r, the higher the value of W. Therefore, the membership of administration officials on the central bank board generates more additional policy uncertainty the higher the number of officials and the number of periods in governors' terms, and the lower the number of governors on the board.

4.4. Preelectoral versus postelectoral appointments

Diverse institutional structures may provide different timings of appointment to the central bank. In particular, we may find central bank term structures such that some or all governors' terms run concurrently with the administration's. On the other hand, there may exist patterns of appointments such that the terms of governors and the terms of administrations are staggered.

In order to consider the different monetary uncertainty consequences arising from these diverse patterns of governors' appointments, let now assume a setting where elections are held every two periods. Suppose that elections are held at the beginning of periods t and $t+2$. Therefore, the time horizon between these two elections consists of periods t and $t+1$. Assume, as before, that expectations over the future monetary stance are formed at the beginning of every period. Hence, at the start of period t there will be electoral uncertainty but such uncertainty has disappeared at the beginning of period $t+1$.

Assuming that vacancies on the board arise every period, the time horizon between elections contains two moments of time for which vacancies occur. Depending on the particular term structures we consider, these moments can be

the following:

-on the one hand, at the beginning of periods t and $t+1$ if governors' terms are coincident with the administration's.

-on the other hand, at the end of periods t and $t+1$, if governors' terms are not concurrent with the administration's.

Since the beginning of period $t+1$ coincides with the end of period t, the difference between our two settings is that in the former one appointments are made at the start of the administration's term and in the latter one such appointments are made at the end of the administration's term.

To consider the differences between our two alternative settings, we calculate the conditional variances of the monetary instrument for periods $t+1$ and $t+2$.

Under both frameworks, monetary uncertainty for period $t+1$ disappears because at the time monetary expectations are formed, the future board composition is known with certainty.

However, monetary policy uncertainty differs for period $t+2$. Under the former setting, monetary expectations are formed before the result for the $t+2$ election is known, so that the future board composition is unknown. As a result,

$$(30) \qquad \mathrm{Var}(m)\big|_{t+2,\ AE} = \begin{pmatrix} n-1 \\ \frac{n-1}{2} \end{pmatrix} P^{(n+1)/2}(1-P)^{(n+1)/2}(m_1-m_2)^2$$

Under the latter setting, monetary expectations are formed after knowing the $t+2$ board composition. Therefore,

$$(31) \qquad \mathrm{Var}(m)\big|_{t+2,\ BE} = 0$$

Expression (31) indicates that if administrations appoint governors just before elections, the expectations about the future stance of monetary policy are not subject to electoral uncertainty. Therefore, the variance of the monetary policy instrument is zero. Thus, we can conclude that governors' terms running concurrently with the administration's term in office raise monetary policy uncertainty for periods after elections.

5. AN EXAMPLE: PAST AND PRESENT PROPOSALS TO REFORM THE FED

To illustrate the results obtained in previous sections, this one derives, as an example, the likely effects on monetary policy uncertainty of alternative (past, present, and potential) structures of the Board of Governors of the Federal Reserve System.

The present structure of the Board dates back to the 1935 Banking Act. It consists of seven members, appointed by the President and confirmed by the Senate to 14-year terms. Governors' terms are staggered such that one term expires every even-numbered year.

However, the original structure of the Board, given in the 1913 Federal Reserve Act, was not the same. That primitive structure consisted of the Secretary of the Treasury, the Comptroller of the Currency, and five presidential appointees serving ten-year terms with a two-year overlap. Such a structure emerged from the House and the Senate versions of the bill. The House version proposed that the Board consist of the Secretary of the Treasury, the Secretary of Agriculture, the Comptroller of the Currency, and four presidential appointees serving eight-year terms with a two-year overlap. The Senate version proposed that the Board consist of the Secretary of the Treasury and six presidential appointees serving six-year terms with a one-year overlap.

The 1933 Banking Act increased the terms of Fed governors from ten years to twelve years and the 1935 Banking Act established the current structure by lengthening the terms to fourteen years and removing administration officials from the Board.

From the legislative history of the Board of Governors, it seems there were several institutional issues that legislators were more concerned on. In particular, it is likely that the number of seats on the board was not regarded as an important issue because the number of governors plus the number of administration officials was the same (seven) under different bills. However, it seems that the decomposition of the number of seats into the number of governors and the number of administration officials was an important issue. At the same time, it seems that the lengthening of the Board terms was viewed as very important.

For more recent proposed legislation to restructure the Federal Reserve System, Akhtar and Howe (1991) surveys all bills and resolutions introduced in Congress for the period 1979-1990. For instance, of the proposed legislation, 19 bills have sought to shorten the terms of the governors, 14 bills have proposed the membership of the Secretary of the Treasury and/or the Chairman of the CEA to the FOMC, and 26 bills have been introduced to make the terms of some governors concurrent with the President's.

Our model can be used to illustrate the likely effects of such old and modern proposals on monetary policy uncertainty. In order to do so for the earlier proposals, we will derive monetary policy uncertainty arising from the 1913 and 1935 bills. Assume that a period is composed of two years and elections are held every two periods. By supposing that appointments to the board are postelectoral and by using expression (25), we have the following monetary uncertainty expressions for the period after an election under

different bills and acts:

$$\mathrm{Var}(m)\big|_{1913S} = 2P^2(1-P)^2(m_1-m_2)^2 \text{ since } C = \{1\}$$

$$\mathrm{Var}(m)\big|_{1913H} = P(1-P)(m_1-m_2)^2$$

This is so since in this case all the possible incumbency structures provoke monetary uncertainty (that is, the probability of observing incumbency structures causing monetary uncertainty is 1).

$$\mathrm{Var}(m)\big|_{1913A} = \left[6P^3(1-P)^3 + 4P^2(1-P)^4 + 4P^4(1-P)^2\right](m_1-m_2)^2 \text{ since } C = \{1,2,3\}$$

$$\mathrm{Var}(m)\big|_{1935A} = 20P^4(1-P)^4(m_1-m_2)^2 \text{ since } C = \{3\}$$

As a result we have the following sequence of inequalities:

$$\mathrm{Var}(m)\big|_{1913H} > \mathrm{Var}(m)\big|_{1913A} > \mathrm{Var}(m)\big|_{1913S} > \mathrm{Var}(m)\big|_{1935A}$$

Figure 1 shows these relations between monetary uncertainties for all the possible values of P under the assumption that $(m_1-m_2)^2 = 1$.

[INSERT FIGURE 1]

These results seem to show that the 1913 Federal Reserve Act was a compromise between the House and the Senate bills in terms of monetary uncertainty. At the same time, the lengthening of Fed governors' terms in office and the removal of administration officials from the Board established

by the 1935 Banking Act may have tended to cause less monetary uncertainty[3].

Similarly, the model can be used to account for the likely effects of modern proposals on monetary uncertainty. In particular, from the results obtained in previous sections, all the sorthening of terms, the membership of administration officials on the FOMC, and the coterminous terms of some governors (Chairman and Vicechairman) with President's would be likely to provoke more monetary policy uncertainty.

6. CONCLUSIONS

This paper discusses the effects of alternative central bank structures on monetary policy uncertainty.

If the central bank implements the monetary policy for an electoral bipartisan society, the number of governors does not have any influence on monetary policy uncertainty but lengthening the terms on the board will lead to less policy uncertainty. Moreover, concurrent terms for governors and administration raise monetary uncertainty. Finally, the membership of administration officials on the central bank board may increase uncertainty over the future monetary stance.

[3] The conclusions obtained from our examples, however, rest on the *ceteris paribus* clause. As it is well-known, at its inception the Federal Reserve System was committed by the gold standard and in the 1920s the political system still accepted the gold standard as a norm. This type of commitment was lost in the 1930s with the end of the international gold standard (Hetzel, 1990). At the same time, the New Deal banking reforms of 1933-35 centralized System authority and power in the Board of Governors and reduced the authority of the regional Reserve Banks (Sylla, 1988). As a result, there were elements other than the pure Board of Governors structure that affected monetary policy and, accordingly, monetary uncertainty.

APPENDIX

This appendix shows that central bank governors do not have any strategic incentive to misrepresent their own preferences.

Suppose, for instance, a central bank board consisting of r_1 party 1 governors and r_2 party 2 governors. Assume the following inequalities hold:

(A.1) $$r_1 > r_2$$

(A.2) $$m_1 < m_2$$

Given the majority-rule voting process assumed, the monetary policy actually implemented will be m_1. This policy course is "optimal" for party 1 governors but it is not so for party 2 governors.

Assume that some or all party 2 governors misrepresent their true preferences by declaring a new preference $m_2^* = \lambda m_2$, where $\lambda > 1$. Accordingly, the monetary stance chosen by the majority rule will also be m_1 because such a policy is the preferred one by the median governor on the board.

Moreover, since -under the assumed board composition- the monetary policy actually implemented will be the preferred one by party 1 governors, these governors have no incentive to misrepresent their true preferences.

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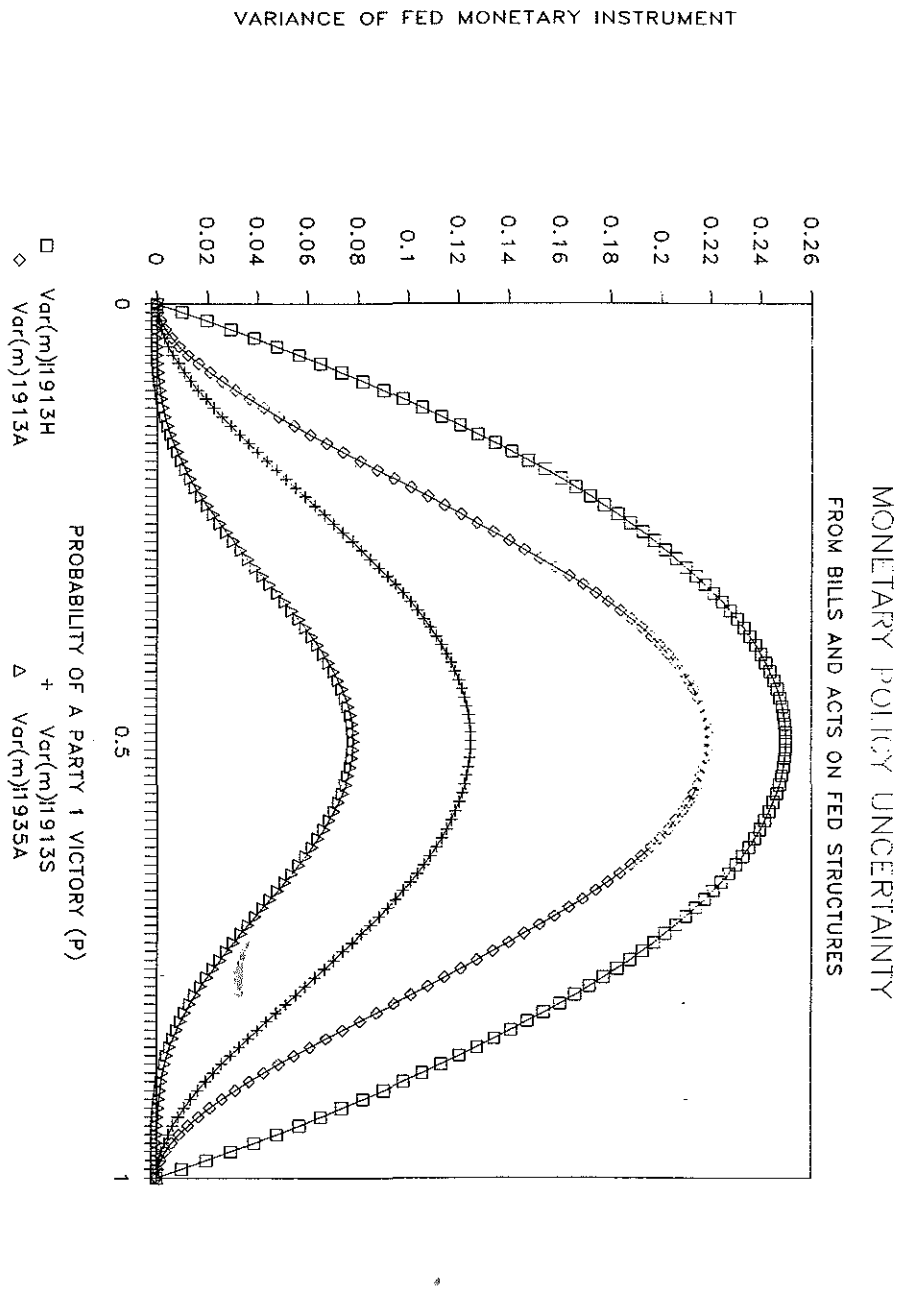

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