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A Selective Survey

Hiroshi FUJIKI

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INSTITUTE FOR MONETARY AND ECONOMIC STUDIES

BANK OF JAPAN

C.P.O BOX 203 TOKYO

100-8630 JAPAN

The Monetary Policy Committee and the Incentive Problem: A Selective Survey

Hiroshi FUJIKI*

Abstract

This paper strives to answer five questions. First, why do legislators choose to create an independent central bank? Second, why do legislators delegate the conduct of monetary policy to a committee, rather than to a central bank governor? Third, what kinds of factors are crucial in limiting the size of the committee? Fourth, should the committee disclose individual members' voting records in addition to their policy decisions? Fifth, to what extent do current committee members constrain the decisions of future committee members? A selective review of the relevant economic literature suggests the conclusion that there is reasonable consensus on the first and second questions. The remaining three questions are still unresolved.

Key words: central bank independence, monetary policy committee, voting, transparency, commitment

JEL classification: E58

* Director and Senior Economist, Institute for Monetary and Economic Studies, Bank of Japan (E-Mail: hiroshi.fujiki@boj.or.jp)

"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 attention to the nature of decision making by committee, which is rarely mentioned in the academic literature. (Blinder 1998, p.22)"

I. Introduction

The nature of decision making by a monetary policy committee is a relatively new subject for academic economists. The literature on such decision making covers a wide range of topics. Among them, I pay attention to two broad issues in this paper. First, I analyze the rationale for an independent monetary policy committee. Second, where there is such a committee, I assess the extent of the information that the committee discloses.

Regarding the first topic, episodes of worldwide inflation in the late 1970s convinced monetary economists that inflation was a monetary phenomenon. These episodes also convinced monetary economists that legislators preferred to delegate monetary policy to unelected technocrats.

This consensus among monetary economists promoted many institutional changes. The Roll report (Roll [1993]) summarizes the argument for these changes, and the U.K. Government gave the Bank of England (BOE) responsibility for setting interest rates to meet the Government's stated inflation target in 1997. In the later 1980s and the 1990s, many central banks, such as the Bank of Japan (BOJ), the Reserve Banks of New Zealand and Australia, and the European Central Bank (ECB), also obtained independence.

But the delegation to unelected technocrats now may not be enough to conclude that the

current institutional structure of central banks should be taken for granted. I offer three examples below.

First, legislators can, in principle, change their minds. What prevents legislators from changing a central bank's institutional framework?

Second, in the United Kingdom, on May 6, 1997, the BOE's Monetary Policy Committee replaced the previous system in which a single individual—the Chancellor of the Exchequer—decided on the appropriate level of U.K. base rates. However, does it really make sense to delegate to a committee, rather than an individual? Why not let an expert central banker make decisions on monetary policy?

Third, what if legislators in many economies within the monetary union are responsible for choosing the committee members of a single monetary policy, as in the enlarged European Union? How many committee members should the new enlarged committee have? Even within some selected economies surveyed by Fracasso, Genberg, and Wyplosz (2003), as Table 1 shows, the number of committee members varies from central bank to central bank.[1] What explains these cross-sectional variations in the size of committee members?[2]

Regarding the second topic, the extent of the information that the committee discloses, a variety of literature emerges from the debate over more practical issues of disclosure at some central banks. I consider points that emerged from the following historical episodes.

In the 1980s, some literature on the publication of short-term interest rate targets emerged from the discussion originating from a U.S. court trial from 1975 to 1981, which forced the Federal Open Market Committee (FOMC) to justify the delay of 90 days for the publication of

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[1] According to Mahadeva and Sterne (2000), the decision makers at central banks vary from monetary union to monetary union: either individual (nine central banks) or committee (79 central banks).

[2] Table 5 of Lybek and Morris (2004) shows the cross-country variation in number of members in different types of boards at central banks based on their survey of 101 central bank laws.

its Directive, which included short-term objectives for Federal Funds rate tolerance ranges and money stock growth. The FOMC refused to publicize the Directive immediately and ultimately won the case. The classic on this subject, Goodfriend (1986), summarizes five reasons offered by the FOMC against the disclosure of the Directive in terms of economic theory: (i) unfair speculation, (ii) inappropriate market reaction, (iii) harm to the government's commercial interest, (iv) undesirable commitment, and (v) more difficult interest rate smoothing. Goodfriend (1986) then describes the benefits and costs of central bank's secrecy.

Many points made in the debate on the disclosure of the current Directive reappear in the debate over the disclosure on the course of future interest rate policy in the era of low inflation in some economies, notably Japan and the United States. New literature on the zero bound of nominal interest rate policy suggests that expectation management through a credible commitment to the future course of interest rates is important. Consistent with this idea, the U.S. Federal Reserve made so-called "conditional commitments," and so has the BOJ.

A new and important practical point in this debate is that central bank committee members change over time. There is no reason for the new members to follow the commitment made by the former members (King [2004]). To what extent do committee members credibly commit to the future course of interest rates?

In the late 1990s, a debate over transparency developed. For example, Briault, Haldane, and King (1997) discuss the democratic legitimacy of an independent bank, which needs to be accountable and transparent to governments' policy decisions. Economists agree that transparency is, in principle, important for a central bank.[3] However, in practice, the variety of

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[3] Faust and Svensson (2002) consider endogenous choice of monetary control and transparency, in the sense that a public knows about monetary shock more precisely. Walsh (2003) proposes a model to implement inflation targeting in a New Keynesian monetary economics model under imperfect information in which the central bank has became a source of discretion. See Carpenter (2004) for a review of academic literature on transparency in the

information released by various central banks differs widely. For example, even within selected economies, as Table 1 shows, the decision on whether to publish minutes or transcripts varies from central bank to central bank. One notable example is a debate over the disclosure of monetary policy decision making between Buiter (1999) and Issing (1999).

Buiter (1999) requests that the ECB publish the minutes of policy meetings of the Governing Council and an individual voting record. Buiter considers that whatever the formal confidentiality of the ECB Council meetings and votes, the national heads of government will know exactly who voted in favor of what, thus political pressures from the national governments are unavoidable. Buiter considers that the exercise of undue influence is not deterred by secrecy and confidentiality, but only by openness. He goes on to argue that "confidentiality of the votes also destroys any vestige of individual accountability of ECB board members. It encourages excessive consensus-seeking and compromise."

Issing (1999) responds that the publication of voting records is in itself good for individual accountability. However, in practice, the publication of voting records without the real-time publication of detailed minutes will force market participants to predict individual members' voting patterns, and legislators and interest groups will try to put pressure on some individuals to see if their pressure results in their preferred outcome.[4]

The serious question for an economist is as follows: Under specific conditions, what kind of information should the central bank disclose? This debate produces a large academic literature on the pros and cons for the disclosure of individual voting records.

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instruments, goals, and implementation of monetary policy. Lybek and Morris (2004) review central bank laws and show that legally independent central banks are accountable to the legislature for monetary policy, while legally less independent central banks are accountable to the ministry of finance (see especially Table 3, p.18).

[4] Regarding this point, Meyers (2004, P77) says: "To be sure, the media delighted in separating us into hawks and doves, to see the feathers fly (which happened occasionally around the table, in vigorous debate). But when it came to the vote, the tendency was to join the majority view. In this way, we remained birds of a feather."

These episodes show us that central banking economists should pay serious attention to the nature of decision making by monetary policy committees. I therefore strive, in this paper, to answer the five questions below.

First, why do legislators choose to create an independent central bank? Second, why do legislators delegate the conduct of monetary policy to a committee, rather than to a central bank governor? Third, what kinds of factors are crucial in limiting the size of the committee? Fourth, should the committee disclose individual members' voting records in addition to their policy decisions? Fifth, to what extent do current committee members constrain the decisions of future committee members?

To answer those questions, I pay special attention to the economic literature on incentive problems. The incentive problem may be relevant to legislators or committee members, depending on the nature of questions. The incentive problem may arise from dynamic inconsistency in economic policy making, from the free rider problem for the cost of obtaining relevant information for monetary policy, or from the preference for longer terms of office, depending on the nature of questions.

The literature on operational transparency, following the definition by Hahn (2002), helps me answer my second, third, and fourth questions. Operational transparency in Hahn's definition includes the announcement of decisions regarding the short-term interest rate.[5] Operational transparency also includes the disclosure of information on how decisions are made: the voting, and publication of the minutes of the meeting.

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[5] Hahn (2002) defines "transparency" as the alleviation of information asymmetries by the publication of the central bank's private information that is relevant for the policymaking process. He distinguishes three types of transparency; goal transparency, knowledge transparency, and operational transparency. Goal transparency means transparency regarding the central bank objectives, such as the announcement of numerical inflation targets, or loss functions. Knowledge transparency means the publication of models used inside the central bank, and economic data such as inflation forecast. Operational transparency includes the disclosure of information on how decisions

In papers on operational transparency in Hahn's (2002) definition, economists model a wide variety of private information and institutions to solve the asymmetric information problem. The policy suggestions in these papers should be taken with care, especially their assumptions.[6]

Note that I focus on the literature on the behavior of central bank monetary policy committees. I do not review the literature on other important issues, for example, the monetary transmission mechanism.[7] Note also that I answer those five questions through surveying various economic models. Those economic models include the monetary economics models of central bank independence, the models of collective decision making in juries, or the models of game theory.

After reviewing economic literature on those five questions, I offer some examples based on Japan's experience. The examples invite readers to apply the theoretical models surveyed in this paper to the Japanese experience and should help readers to assess the applicability of that literature to other central banks.

Before moving on to details of the literature review, I summarize my tentative answers to the questions in this paper below based on the survey.

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are made.

[6] Geraats (2002) surveys central bank transparency with special emphasis on the distinction between the uncertainty and incentive effects of transparency. The uncertainty effect of asymmetric information means that asymmetric information generates uncertainty for the agents who experience the information disadvantage, and provides an opportunity for others to directly exploit the availability of private information. The incentive effect of asymmetric information means that those with access to private information may try to manipulate the beliefs of others through signaling, and the response to the signal could influence the sender's incentives and thereby indirectly alter economic behavior. Geraats (2002) shows that it is generally possible to distinguish between the uncertainty and incentive effects of transparency, but their consequences depend crucially on the precise circumstances.

[7] See Piga (2000) for a review of the literature of central bank independence and the list of unanswered topics, such as political accountability and the optimal term length of board members.

First, giving a long-term contract to an independent central bank governor gives the central banker an incentive to put more effort into the policymaking process than an elected politician would. This extra effort translates, in expectations, into better forecasts and fewer policy mistakes. The effort increases benefits to society, and the legislator's own utility increases compared with those legislators who run monetary policy by themselves. Delegation to an independent central banker should be an incentive-compatible proposition to legislators.

Second, some theoretical models show that decisions made by committees are better than those of an individual, in cases where there is an incentive for individual members of a monetary policy committee to gain reputations as inflation fighters, or where an opportunistic central banker desires to mimic a nonopportunistic central banker, or where there is electoral uncertainty that influences the degree of stabilization policy determined by politically appointed central bank committee members.

Third, the classic Condorcet jury theorem suggests that a larger committee will make a better decision. In practice, the committee members may vote based not only on their private signals but also on their inferences about other members' private signals, may not obtain signals relevant to their decisions at zero cost, may exchange views before voting. Under those situations, the classic Condorcet results may fail. The optimal committee size weighs the benefit of a diversity of views in a larger committee against the risk of free riding due to the cost of obtaining relevant information.

Fourth, in theory, voting transparency may be beneficial or problematic. In practice, for a committee that respects diversity of individual opinion and does not strive for group ownership of its decision, the disclosure of voting might make sense to provide a useful indicator of balancing the competing consideration. For a committee that prizes solidarity and strives for group ownership of any decision it makes, while potentially many interest groups may put pressure on their actions, it makes sense to suppress the voting record in the interest of

maintaining group harmony.

Fifth, in theory, collective decisions made by current committee members today may fail to bind future collective decisions made by future committee members. However, the Japanese experience of commitment to a procedure for money market operations until the consumer price index (CPI, excluding perishables, on a nationwide basis) stably registers a zero percent or an increase on a year on year shows a counterexample to the argument. Economists need to make greater effort to interpret this experience and present a reasonably acceptable model based on it.

The organization of the rest of this paper is as follows. Section 2 reviews the literature on the needs of an independent central bank. Section 3 surveys the literature on the needs of the monetary policy committee. Section 4 touches on the optimal number of committee members. Section 5 discusses the pros and cons of the disclosing the vote. Section 6 reports some literature on the difficulty of forcing future committee members to honor current members' commitments. Section 7 presents issues for discussions based on the Japanese experience. Section 8 concludes the paper.

II. Why Do Legislators Delegate Monetary Policy to An Independent Central Bank?

This section first selectively reviews papers on the question: Why should we have an independent central bank, maybe run by a committee or an independent central banker? I think monetary economists agree on this issue. This section then reviews classic papers based on an idea of dynamic inconsistency, and a paper by Eggertsson and Borgne (2004), which does not rely on dynamic inconsistency. The rationale for delegating monetary policy to an independent central banker is that he or she is given a long-term job contract; this, in turn, gives the central

banker an incentive to put more effort into the policymaking process than an elected legislator would.

A. Insights from Literature on Monetary Economics

Why should we have an independent central bank, maybe run by a committee or an independent central banker? A common and well-established answer is that a central bank should be better insulated from the short-term political pressures of the electoral cycle. For example, Blinder (1998, P56) suggests that the nature of monetary policy requires a long time horizon: "many governments wisely try to depoliticize monetary policy by, and e.g., putting it in the hands of unelected technocrats with long terms of office and insulation from the hurly-burly of politics."[8]

Do economic models justify such an argument?   The classic paper on dynamic inconsistency by Kydland and Prescott (1977) considers a monetary policymaker who faces a trade-off between employment and inflation. Suppose higher-than-expected inflation lowers real wages and increases labor demand and employment in this economy. Suppose further that, following Barro and Gordon (1983), this monetary policymaker wants to minimize the objective function that consists of the sums of the squares of two gaps. The first gap is the gap between the desired unemployment rate (which is lower than the market clearing equilibrium unemployment rate) and the actual unemployment rate. The second gap is the gap between the desired inflation rate (zero in this case) and the actual inflation rate. This monetary policy maker controls for the inflation rate to minimize the objective function. *Ex ante,* the monetary policymaker finds it optimal to choose zero inflation. However, once private agents expect

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[8] The members of the U.S. Board of Governors in the Federal Reserve System have unusually long terms: 14 years. Table 9 of Lybek and Morris (2004) shows that if the term is fixed, it is often around five years based on their survey of 101 central bank laws.

zero inflation, *ex post*, the monetary policymaker finds it optimal to choose positive inflation to reduce unemployment by taking advantage of private agents' expectations (namely, the *ex ante* optimal plan is time inconsistent). Since private agents correctly anticipate the monetary policymaker's behavior described above, in equilibrium, the inflation rate is positive and there is no additional employment. The additional inflation rate is called "inflation bias."

The idea of dynamic inconsistency led to a lot of papers on institutional reforms that would have improved the performance of discretionary policymaking, including the establishment of an independent central bank.

Rogoff (1985) demonstrated that a proper balance between credibility (of low-inflation policy) and flexibility (stabilization) could be achieved through delegation of monetary policy to an independent central bank managed by a "conservative" central banker—i.e., an agent who is more inflation averse than citizens in general. Better welfare outcomes would then be achieved.

Rogoff's idea has been used in analyses of monetary regimes with explicit inflation targets and incentive contracts for central bankers. For example, Walsh (1995) proposes a state-dependent wage contract between a central banker and elected leaders under the private information of the central bank on supply shock, assuming that society and the central bankers have the same preference. The state-dependent wage contract resolves inflation bias and achieves the second-best outcome in equilibrium (see also Svensson [1997a] for an extension of this idea).

Criticisms apply to the state-dependent wage contract between a central banker and elected leaders to solving the inflation bias stemming from a dynamic inconsistency problem. First, one may complain that no central banker has a state-dependent wage contract as Walsh (1995) proposes. Second, McCallum (1995) criticizes this approach as merely relocating the problem, not solving it. Third, Waller (1995) points out that the real problem is that the central

bank would like to do the right thing, but the elected leaders have objectives that differ from those of the general public. If the elected leaders are the ones who write the contract, they are unlikely to solve the problem. Finally, the model does not necessarily explain the causal relationship between inflation and central bank independence. For example, Posen (1993) argues that the observed relationship between inflation and central bank independence does not reflect a causal relationship, but simply reflects citizens' preferences toward inflation.

Rogoff's idea has been also extended in analyses of the term lengths of central bankers based on a partisan model. For example, Waller and Walsh (1996) assume that the economy consists of numerous sectors that differ in terms of their preferred rates of inflation and that the government represents the preference of median voters. They assume that after each election, the government in office appoints a new central bank head. They show that short-run variability of voter preference in elections creates excessive volatility of policy if the central banker has a short term in office. They show that the optimal term length balances the value of the marginal reduction in output fluctuation achieved by lengthening the terms of office against the greater expected cost of deviations from the median voter's preferred inflation rate. For example, if the median voter's preference for inflation is constant over time and inflation bias is sufficiently large, society benefits from appointing a conservative central banker with a long term in office.

B. Benefits of Delegation Based on Long Terms of Office
Maskin and Tirole (2004) compare decision-making powers by accountable officials subject to election (elected leaders, hereafter) and nonaccountable technocrats (judges, hereafter). They show that policy decision making by nonaccountable judges is desirable when (i) the elected leader is poorly informed about the optimal plan, (ii) acquiring decision-relevant information is costly, and (iii) it takes a long time to know whether the decisions made in the past are correct

or not. Maskin and Tirole (2004) argue that the technical decisions may be best allocated to judges or appointed bureaucrats. In particular, they argue that monetary policy is a special case that satisfies the three conditions of delegation above. Behind their reasoning, long and variable lags in the transmission of monetary policy are important. Eggertsson and Borgne (2004) propose a theory of delegation based on optimal contract theory similar to the idea of Maskin and Tirole (2004).

Eggertsson and Borgne (2004) model two trade-offs of delegation in a representative democracy. The cost of delegation is that the electorate is unable to get rid of incompetent office holders. If the ability of job candidates cannot be ascertained perfectly prior to hiring, society may be stuck with a low-ability bureaucrat for a long period of time. The benefit of delegation is that the officeholder is provided with a long-term employment contract, enabling him or her to have a long-term horizon that may improve performance. In their model, if there is uncertainty about the ability of the officeholder, a longer employment contract gives the long-term appointee an incentive to invest more effort into his or her decision making, thereby increasing the quality of decisions.

Eggertsson and Borgne (2004) apply this idea to a stochastic general equilibrium to provide a theory of central bank independence (CBI). The rationale for delegating monetary policy to an independent central banker is that he or she is given a long-term job contract; this, in turn, gives the central banker an incentive to put more effort into the policymaking process than an elected politician would. This extra effort translates, in expectations, into better forecasts and fewer policy mistakes, which increases social welfare, and the elected leader's own utility, thereby making delegation incentive-compatible. Delegation becomes more likely to be incentive-compatible to elected leaders if the private rent for elected leaders to run monetary policy by themselves is low and the elected leader's ability to run monetary policy is low, because they would thus make bad monetary policy decisions and lose office at the next

election. The model does not rely on the presence of an inflation bias in monetary policy as the reason for delegation, and thus is free from the critique of McCallum (1995).

C. Reservations

There are at least two reasons why we should not take the discussion in the previous two sub sections literally.

First, I assume that a central bank in the previous two sub sections has instrument independence, but does not have target independence. If a central bank selects goals to target, such as output, the foreign exchange rate, or asset prices, the incentive effects of delegation to a central bank might be quite different from the one I analyzed in the previous two sub sections. Moreover, if the multiple goals include one that is hard to enforce by setting a numerical target, such as stability of the financial sector, the incentive effects of delegation to a central bank might differ, because the achievement of that target could in theory have both positive and negative effects on price stability. One may argue that the strongest supporter of stable financial markets, such as pension funds, will exert more pressure for price stability on a central bank. One may also argue that excessive emphasis on financial stability might delay changes in the interest rate that would achieve price stability.

Second, the literature reviewed in Section A includes the classic papers of inflation bias. In an era of low inflation, the discussion on deflation bias might be also useful. For example, Eggertsson (2004) shows that if the government has only one instrument, namely, open market operations in government bonds, and the natural rate of interest is temporally negative, there will be excessive deflation if the government cannot commit to future policy. Deflation bias arises from the central bank's lack of commitment to optimal future policy when faced with negative demand shock and the lack of a policy instrument.

III. Why Do Legislators Delegate the Conduct of Monetary Policy to a Committee?

On May 6 1997, the BOE's Monetary Policy Committee replaced the previous system in which a single individual—the Chancellor of the Exchequer—decided the appropriate level of U.K. base rates. Can economists provide any rationale for this replacement?

Blinder (1998) argues that decision making by committee, especially with a strong tradition of consensus, makes it very difficult for idiosyncratic views to prevail. Decisions tend to regress toward the mean, and reinforce other factors, such as gradualism against model parameter uncertainty, to make central bank decision making inertial. However, Blinder (1998) conjectured that the additional monetary policy inertia imparted by group decision-making provided a net benefit to society. Under what circumstances is his conjecture correct?

This section selectively reviews theoretical studies to answer Blinder's (1998) conjecture. It reviews three recent theoretical papers on the case for a monetary policy committee rather than an individual. The papers consider three incentive problems and show the conditions for decision making by a committee to be better than decision making by an individual. The first paper considers the relationship between the size of the committee and the incentives for individual members of a monetary policy committee to gain a reputation for being inflation fighters. The second paper considers the relationship between the number of committee members and an opportunistic central banker's incentive to mimic a nonopportunistic central banker. The third paper considers the relationship between the nomination process of committee members and the incentive for legislators to choose a particular type of committee member.

Before moving on to those three papers, I touch upon a few earlier works that suggest that

a monetary policy committee by a group of individuals with staggered and finite terms of office would help to resolve the inflation bias.

Tabellini (1987) considers an example of staggered three-member boards with nonrenewable three-year terms of office.[9] Suppose each member has the same loss function L on actual inflation rate π and expected inflation rate π^e within each year, defined as $L=(1/2)\pi^2-\alpha(\pi-\pi^e)$, $\alpha>0$. Each member individually wants inflation α given expected inflation rate (i.e., inflation bias) under a one-shot game. In this three-member committee, the following trigger strategy equilibrium holds: if the actual inflation is not the same as expected inflation, the two younger members will vote for inflation rate α. Otherwise, the two younger members will vote for small but arbitrarily close to zero inflation. To see why, note that if π^e is zero, the oldest member always votes for inflation rate α, the middle-aged member is indifferent to choose inflation rate α and zero, and the youngest member votes for an inflation rate of zero. Thus, small but arbitrarily close to zero inflation is accepted by the youngest member and the middle-aged member. In this way, staggered three-member boards can reduce inflation bias so that it is close to zero.[10]

Cothren (1988) considers a committee by n individuals with staggered and finite terms of office n (with n as an odd number). He considers a situation in which the committee members have incentives to vote for lower inflation, to gain reputations as inflation fighters for the remainder of their terms of office, even if those terms of office are finite. He shows that under some values for discount rates that make younger committee members prefer the gains from

[9] Cremer (1986) first proposed that overlapping games could provide a natural theory of long-lived institutions. His model showed that participation in an organization of infinite duration changed the incentives of agents with finite lives, and would induce more cooperation than a static model would predict under some assumptions.

[10] Waller (1989) considers the result of a three-member monetary policy committee helping to reduce output variability and inflation bias under the assumption that the committee members are appointed based on the preference of one of the two ruling political parties, considering who likes surprise inflation and who does not.

continuing lower inflation to those from one-time low inflation minus the discounted cost of subsequent future inflation bias, younger members will form a majority and inflation bias will disappear.

A. Strategic Behavior, Reputation, and Inflation Smoothing

Sibert (2003) considers a central bank committee with a two-period overlapping term. The committee consists of one junior and one senior member in each period.

The type of committee member is either nonopportunistic or opportunistic, as defined below. The nonopportunistic member always votes for zero inflation. The opportunistic member wants to use surprise inflation, taking into account a predetermined nominal wage contract.

Sibert (2003) considers a model similar to that of Barro and Gordon (1983). Social welfare is increasing in unanticipated inflation and decreasing in realized inflation.

In the monetary policy committee, two members vote for the desirable rate of inflation. Nonopportunistic members always vote for zero inflation. Opportunistic members vote for either zero inflation or inflation that maximizes social welfare within a period, given the expected inflation rate. Opportunistic members are either a hawk with probability ρ or a dove with probability $(1-\rho)$. If two members disagree, a compromised inflation rate is implemented.

Sibert (2003) supposes that the type of a committee member is private information, and can only be signaled by his or her voting behavior. If a junior member votes against inflation in his or her first period in office, the likelihood the public attaches to the nonopportunistic member rises. The higher this likelihood, the lower the future expected future inflation, and the higher the expected future welfare. Sibert (2003) assumes that the senior member truthfully announces his or her preferred inflation rate. If he or she is a hawk, the vote is for zero inflation. If he or she is a dove, the vote is for inflation.

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Under the assumptions discussed so far, an opportunistic junior member may pretend to be a nonopportunistic central banker in the first period of tenure. The opportunistic junior member compares the current benefit of causing surprise inflation, given current expected inflation, and the future benefit of an enhanced reputation for being an inflation fighter. Sibert (2003) considers whether the junior opportunistic members have more or less incentive to gain a reputation as nonopportunistic members when they are part of a group, rather than a single policymaker.

According to the analyses of Sibert (2003), a committee member is less influential than a single policymaker and has less impact on both current and future inflation. In a committee, the current cost of voting against inflation is smaller for the member and so is the future benefit of an increased belief that the member is a hawk (voting against inflation). The size of the discount rate for the future benefit and the probability of being a hawk, ρ, determines the trade-off for a committee member.

If the discount rate for the future period is very small, then the gain from lower future expected inflation is small. Junior opportunistic dove committee members are at least as likely to vote for inflation when they are the sole policymaker. On the contrary, if the probability of being a hawk, ρ, multiplied by the discount rate is sufficiently large, the future is important, and it is easy to gain a reputation for being a hawk (because a member is likely to be a hawk given a high value of ρ), then doves are at least as likely to vote against inflation when they are the sole policymaker.

The committee with opportunistic members has potentially adverse incentives to create unanticipated inflation. But the committee is still beneficial from a welfare point of view if the compromised inflation rate becomes sufficiently smooth compared with the bumpy path of realized inflation rate under the decision making of a single policymaker who prefers either zero inflation or surprise inflation.

B. Committee Reproduces Rogoff (1985)'s Conservative Central Banker

Mihov and Sibert (2004) add the role of activist monetary policy to offset stochastic shock to the model of Sibert (2003). They consider whether the committee is more beneficial than a single policymaker in their model.

The addition of the role of activist monetary policy changes the behavior of an opportunistic committee member. More specifically, an opportunistic committee member's incentive to mimic a nonopportunistic committee member depends on the size of the current stochastic shock. An opportunistic committee member finds it relatively attractive to pretend to be a nonopportunistic committee member when shocks are small. However, an opportunistic committee member finds that the reputation gain is less likely to be worth not responding to large shocks. Therefore, an opportunistic member produces an *endogenous* nonlinear response to shocks through reputation building.

The committee endogenously produces a strictly positive inflation bias, but produces less inflation on average than a policymaker who maximizes social welfare within a period would select. In this sense, the committee reproduces Rogoff's (1985) conservative central banker. Because of the assumption that the welfare cost of inflation is increasing at an increasing rate, the smoother inflation produced by the committee is also likely to make a committee more attractive than a single policymaker.[11]

C. A committee reduces uncertainty from a partisan business cycle

In the previous two sub sections, I assume that some committee members want higher inflation

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[11] Mihov and Sibert (2004) also show that if central bankers' types are unknown, then for a wide range of parameters an independent committee achieves higher social welfare than either a zero inflation rule or discretionary policy conducted by an opportunistic central banker.

while others do not. Why do committee members disagree about their desired rate of inflation? Waller (1992a) shows that if there are two sectors that differ in their wage rigidity, the socially desirable rate of inflation that minimizes the marginal losses of output variability and reduction in mean inflation, as Rogoff (1985) proposes, may not be supported by both sectors. The rigid wage sector prefers higher inflation, while the flexible wage sector prefers lower inflation. Suppose one of the two sectors chooses a central banker depending on the election outcome. Society will experience either too low or too high inflation depending on the majority of the ruling party.

Suppose both sectors nominate committee members. Can committee members achieve a stable rate of inflation under electoral uncertainty? Waller (2000) shows an example of a committee that consists of a group of politically appointed individuals, staggered three-member boards with nonrenewable three-year terms of office, with explicit consideration of the process of political appointment, which achieves a steady-state rate of inflation despite electoral uncertainty.

Voters elect a president and a legislative body from one of two parties every period. The results of elections are supposed to be random; however, it is assumed that the government is perpetually divided (absence of one-party government).

The two parties differ in their desired monetary policy outcome, and there is complete party discipline. Both parties maximize their lifetime utilities from the monetary policy choice.

Regarding the structure of the monetary policy committee, the president nominates an individual to serve in the committee. The preference of a nominee regarding monetary policy is known to everyone. The legislative body must confirm nominations. Every period, only one individual is nominated for each vacancy. If a nominee is rejected, the seat is vacant until the next period.

In the process of nomination, the confirming party can either accept a candidate now and

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policies associated with this person in the future, or reject the candidate, let the remaining two current committee members set the policy, and wait for an acceptable candidate in the next period.[12] The nominating party will choose a candidate that the confirming party can accept given the current members. Therefore, in equilibrium, the nominee will never be rejected.

Under the four key assumptions of frequent election (or long board terms), constant election probabilities, linear utility of parties, and perpetually divided government, it is possible to have a steady-state rate of inflation in this economy. Despite the fact that there is electoral uncertainty regarding the winner of the election, the structure and appointment process of the committee eliminates all policy uncertainty and achieves a steady-state rate of inflation.

D. Summary

I find three theoretical arguments in favor of decision making by committee, rather than by a single policymaker discussed in recent literature. The first argument focuses on the incentives for an opportunistic member to gain a reputation as an inflation fighter. The second argument focuses on the incentive of an opportunistic committee member to mimic a nonopportunistic central banker.[13] The third argument focuses on the role of a committee that eliminates the effects of electoral uncertainty on monetary policy through its appointment process.

IV. How Many Committee Members Should the Committee Have?

Suppose that having a monetary committee, rather than an individual decision maker, is good for society. The next question is "How many members should we have on the committee?"

Condorcet's jury theorem without cost of communication or strategic consideration gives

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[12] Waller (1992b) considers a similar appointing process. Chang (2003) examines the political influence through appointment on the U.S. Federal Reserve.

an answer. According to this theorem, in terms of efficient information acquisition under uncertainty, the optimal size of the committee is infinity. The first part of this section reviews the insight of Condorcet's jury theorem, a theoretical application to the monetary policy committee, and evidence for this argument based on experimental study.

In practice, most assumptions of Condorcet's jury theorem are violated. A more practical question is "How many committee members should the committee have in order to improve its decision making, if some assumptions of Condorcet's jury theorem are violated?" The second part of this section reviews models that relax some of the assumptions of the theorem. The models suggest that it appears very difficult to give a practical answer to the question above at this stage.

In the future, the literature based on Condorcet's jury theorem may be a good basis for consideration of the optimal size of the monetary policy committee. A jury's binary decision based on available evidence is similar to the decision made by monetary policy committee members in setting interest rates.

A. Insight from Condorcet's Jury Theorem

Gerling, et al. (2003) summarize the classic Condorcet jury theorem and the literature to extend the idea of the theorem to consider the optimal size of a committee.[14]

Suppose that (i) each individual is equally skilled and this skill, expressed as a probability to make a right decision, should be larger than 0.5, (ii) individuals always reveal their signal about the state of the world, (iii) individuals obtain their signal at zero cost, (iv) all individuals have the same objective (namely, to make a correct decision), and (v) individuals do not exchange views before voting.

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[13] My focus in this sub section is on literature that presumes the delegation to a central bank discussed in section 2.

Under those five assumptions, the classic Condorcet jury theorem tells us two things. First, increasing the number of informed committee members raises the probability of reaching an appropriate decision. Second, the probability of making the appropriate decision will converge to one as member numbers increase. In other words, if assumptions (i) to (v) are satisfied, the optimum number of monetary committee members is infinity.

1. Application to a monetary policy committee

Gerlach-Kristen (2003a) extends the idea of Condorcet's jury theorem to the case for a monetary policy committee. She considers a backward-looking model of Svensson (1997b), and derives a linear reaction function that depends on inflation and the output gap. She supposes that the estimates of potential output gaps differ from committee member to committee member, and that the true potential output follows a random-walk process.

She considers the case where the committee members are equally skilled in assessing a potential output gap assuming that their observation errors are serially uncorrelated and normally distributed with a mean of zero and the same variance but are uncorrelated between members. If the committee members know the true value of the current shock to the potential output and the true value of the potential output, the committee member should react to the current shock immediately. The desirable policy response to the shock in her setup is to set the nominal interest rate at the weighted average of current inflation and the current output gap, which is the geometric average of past shocks to the output gap. Thus, under perfect information, the interest rate should be changed immediately after the observation of the current shock to the potential output. Under partial information on the value of the potential output, the committee members only know the shift in the potential output gradually. The committee members change interest rates slowly, as compared with the situation with perfect

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[14] See Piketty (1994) for a review of application of Condorcet's theorem to political institutions.

information on the shocks to the output.

In her setup, since an optimal decision rule for a monetary policy committee attaches less weight than a single policymaker to past observations of potential output, the committee, on average, makes good forecasts on the value of the potential output, and sets the interest rate closer to the interest rate chosen under the perfect information case. More precise estimates of the random-walk shock to the current output gap and more weight to the current output gap contribute to more frequent changes in interest rates, and the interest rates set by a committee are less smooth. In other words, uncertainty is reduced and interest rates move more quickly with a committee.[15] Thus, in her setup, the optimal number of committee members is infinity.

2. Evidence from an Experiment

Lombardelli, Talbot, and Proudman (2002) conducted an experiment with students from the London School of Economics. The experiment showed that committee decisions were superior to those of individuals because the process of majority voting stripped out the effect of bad play, which is consistent with Condorcet's jury theorem.

In their experiments, participants attempt to "control" a simple two-equation model—a Phillips curve and an IS curve. The two-equation model is subject to randomly generated shocks in each period, as well as a structural shock that occurred at some point during the experiment.

Participants control the model by choosing the path for the short-term interest rate after observing the response of the endogenous variables—output and inflation—in the previous period. Participants receive a clear mandate at the beginning of the experiment: their objective is to maximize a score function that penalized deviations of output and inflation from their target values. The participants know that at the end of the game they will be paid in pounds

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[15] The result here is robust to the changes to average voting under the assumption that the ability of all members is

according to the following formula: Payoff $= 10 +$ Average score/10, where the score is averaged over the 16 rounds of the game.

The participants do not know with certainty the exact structure of the economy they are attempting to analyze. The only information given to participants about the model is that it is linear and broadly characterizes the structure of the U.K. economy. They are also told that the economy was subject to random shocks in each period, and that a structural change occurs at some point during each game. The challenge for players is to extract the signal from the noise and change their behavior accordingly to maximize their score.[16]

During the experiments, the participants maximize a "score" in two setups. In the first setup, participants decide on the appropriate level for the interest rate after observing the initial values of inflation and output with a one-period lag individually. In the second setup, the participants do the same thing by committee. Participants observe the median vote of the group (as a proxy for a majority-voting rule) as well as the response to it of output and inflation.

The experiment provided two results in favor of decision making by committee. First, the decisions made by committees were superior to those of a single individual. Second, the committee's performance was, on average, better than the performance of the best individual.

B. General Case

There are many criticisms of the five assumptions of the classic Condorcet jury theorem: (i) each individual is equally skilled, and this skill, expressed as the probability of making a

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equal.

[16] At the beginning of the experiment, participants filled in a questionnaire that attempted to reveal these prior beliefs. Asking participants to fill in the questionnaire again at the end indicated how much they had learned about the underlying model during the experiment. The questionnaire was designed so that answers could be directly compared with the parameters of the model and the coefficients of the optimal rule. Blinder and Morgan (2000) do not uncover prior beliefs by questionnaire.

correct decision, should be larger than 0.5, (ii) individuals always reveal their signal about the state of the world, (iii) individuals obtain their signal at zero cost, (iv) all individuals have the same objective, and (v) individuals do not exchange views before voting. Below, I provide a few examples to demonstrate that some of the five assumptions do not hold.

1. Strategic Interaction

Austin-Smith and Banks (1996) point out that behind assumption (ii) of the classic Condorcet jury theorem, two important assumptions about voting behaviors exist. First, a committee member votes "sincerely," in the sense that each committee member selects the same alternative that he or she would have selected when voting alone. Second, a committee member votes "informatively" in the sense that each member's decision reflects a signal that only he or she received.

Austin-Smith and Banks (1996) show an example in which, if some committee members vote "sincerely" and "informatively," the rest of committee members might not find it optimal to vote "sincerely" and "informatively." In particular, if the rest of the committee members vote "rationally," in the sense that a member's voting rule constitutes a Nash equilibrium,[17] the member might ignore his or her own information (not vote informatively) and might not reveal his or her signal about the true state of the world (not vote sincerely).

The rest of the committee members do not vote "sincerely" or "informatively" because they vote based not only on private signals but also on inferences about other members' private information. Therefore, even if all members share the same preference for the policy decision, the rest of the committee members do not vote in exactly the same manner as they do individually.

Austin-Smith and Banks (1996) show the following example. Consider a committee that

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[17] By a voting rule that constitutes a Nash equilibrium, I mean that given every other member's rule, each member

consists of three individuals: members 1, 2, and 3. They make a decision about two alternatives in two states of nature. They have the same preferences (payoffs) and signals discussed below. Regarding their payoffs: in state A (say, good economic conditions), if they choose alternative A (say, higher interest rates), their payoff is 1, and if they choose alternative B (say, lower interest rates), their payoff is 0. In state B (say, bad economic conditions), if they choose alternative B (say, lower interest rates), their payoff is 1, and their payoff is 0 if they choose alternative A. Regarding individuals' private signals, if the true state is A, they are likely to receive signal 0. If the true state is B, they are likely to receive signal 1. The decision is taken by majority vote without abstentions.

Two assumptions mean that "sincere" voting does not constitute a Nash equilibrium in this committee. First, suppose that "sincere" voting is "informative" in that if on receiving a signal of 0 (or 1), an individual thinks A (B) is the true state. Second, suppose that all members have a sufficiently strong common prior belief that the true state is A, and members believe that the true state is B only if all their available evidence suggests that all three members receive signal 1.

Below, I show that if members 1 and 2 vote sincerely, a rational member 3 will not vote sincerely. To see this point, consider this. Given sincere voting by members 1 and 2, member 3 faces three possibilities: (i) members 1 and 2 receive signal 1 and vote for B, (ii) members 1 and 2 receive signal 0 and vote for A, (iii) members 1 and 2 receive different signals. In cases (i) and (ii), the vote of member 3 does not change the outcome. In case (iii), the vote of member 3 is pivotal in a sense that the vote does change his or her (and the committee's) payoff. However, because of the assumption of common prior belief of the true state A, if the vote of member 3 is pivotal, not every member receives signal 1. Given this prior belief regarding

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votes to maximize his or her own expected payoff.

other members' private signals, irrespective of the value of the signal that member 3 receives, member 3 should vote for A to maximize his or her payoff and should not vote sincerely. In other words, member 3 should use his or her inference about other individuals' private signals to make a decision and should not use private information.

The example of Austin-Smith and Banks (1996) shows that a prediction of the classic Condorcet jury theorem, that the optimum number of monetary committee members is infinity, should not be taken literally because strategic interaction between the members exists. We should use a game-theory model to deal with strategic interaction between members.[18]

2. Free Rider Problem

Regarding assumption (iii) of the classic Condorcet jury theorem, Gerling et al.(2003) point out that when information becomes a public good, committee members will lose the incentive to collect information. Mukhopadhaya (2003) shows an example where the larger jury panel brings about the free rider problem discussed by Gerling et al. (2003). In a larger jury panel, each juror has less incentive to pay attention in court if the jury needs to pay a fixed cost to pay attention, even though they are all pledged to listen and deliver a verdict. Hence, a juror's information does depend on the size of the jury. Because of the free-rider problem, a larger jury panel may actually make poorer decisions.

Mukhopadhaya (2003) motivates his example based on a recent debate in the optimal size

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[18] In this paper, I focus on a simple majority rule. However, strategic interaction among members requires serious study to compare the performance of different voting rules. For example, Feddersen and Pesendorfer (1999) give the following example: members 1 and 2 vote sincerely and a rational member, 3, does not vote sincerely, voting under a unanimous voting rule, whereas sincere voting is consistent with majority rule. This example shows that the failure of policy recommendation based on a version of the classic Condorcet jury theorem, which suggests that, given the size of the jury, requiring a supermajority to convict the defendant will reduce the probability of convicting an innocent individual. The model supports the requirement for unanimous jury verdicts as a rule that minimizes the probability of convicting innocent defendants, although Feddersen and Pesendorfer (1999) show that such a policy recommendation is not robust with the inclusion of strategic voting.

of the U.S. jury. Some argue that six-person juries are inferior to 12-person juries based on the classic Condorcet's jury theorem. This debate might have relevance to the discussion on the composition of the U.S. FOMC. For example, Goodfriend (1999) points out that the great strength of the policy made by representatives from a system of regional banks is the diversity and number of viewpoints brought to the table; however, the size of the FOMC creates the free rider problem discussed above. Recognizing that their influence in the committee may be small, the FOMC members may be inclined to "freeride" on the preparation of others, such as the Chairman or board staff.

3. A General Case

In addition to the points made in the previous two sub sections showing that assumptions (ii) and (iii) do not hold in practice, it is quite natural that the members of a monetary policy committee exchange views before voting. Thus, it is quite likely that assumption (v), in addition to assumptions (ii) and (iii) of the classic Condorcet jury theorem, does not hold in practice.[19] However, in a monetary policy committee, all individuals may share the same objective function, or at least they want to make a correct decision to achieve price stability. Thus, assumption (iv) of the classic Condorcet jury theorem seems to be innocuous.

Gerardi and Yariv (2003) provide a model, in which assumptions (ii), (iii), and (v) do not hold. Hence, their model seems to be a reasonable example of an incentive problem in a monetary policy committee.

They consider the following situation. First, there are two states of the world, G (good) and B (bad), with prior distribution of probability P(G) and P(B). The committee member, chosen from an infinite pool of identical agents, will choose either H (raise the interest rate) or L (reduce the interest rate). An agent's utility depends on the committee's choice and the state

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[19] Regarding the effects of dropping assumption (v), Gerlach-Kristen (2003b) models the benefits of deliberation in

of the world. The agent's utility is zero when the committee chooses H in state G, and when the committee chooses L in state B. Let q be a number between zero and one. Agent utility is $-q$ if the committee chooses L in state G. Agent utility is $-(1-q)$ if the committee chooses H in state B.

Each agent can purchase a signal of the states of the world, either G or B, with an accuracy of $p>0.5$ with a cost of c.

Committee members are chosen from the agents. The committee will vote for the decision. The committee members can communicate before the voting. But the committee members may not truthfully reveal their voting decision during the communication period.

A social planner who has the same preferences as agents will solve the following problem. First, the planner chooses an extended mechanism consisting of the size of the committee, the voting rule, and how the committee members can exchange information before voting. Second, a committee member will decide to purchase information or not. Third, the committee members communicate with each other, without knowing whether the others purchase information or not, and then vote.

In this institutional setup as explained above, agents do not necessarily reveal their preference correctly. Agents want to "freeride" on others' information during the communication stage, because purchasing information is costly. Agents want to obtain information from others through their communication before voting.

Gerardi and Yariv (2003) prove the possibility of a mechanism where all committee members collect information and report their signals truthfully and all committee members are symmetric in a sense that the probability that a member decides L depends only on the number of signals but not on the identity of the members who send signals (i.e., the committee members

the committee.

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are anonymous). Namely, they prove that social planners solve a mechanism that maximizes the expected utility of agents by the choice of a mapping probability of choosing L when they obtain a signal of the economy, subject to the constraint that members will invest to buy information, and members will report their decision truthfully. Such mechanisms depend on the number of committee members. The social planner will choose the number of members that achieves the highest expected utility among such mechanisms.

Their comparative statistics show that: (i) the highest expected utility of the social planner achieved among such mechanisms is decreasing in the information cost c, but the effects of c on the committee size are not clear; (ii) the highest expected utility of the social planner achieved among such mechanism is increasing in the information accuracy p, but the committee size is not a monotone function of p; and (iii) if P(G) is smaller than q, their simple example shows that the committee size is decreasing in q. If P(G) is about 0.5 and if the loss of choosing L in state G (choosing too loose a monetary policy under good economic conditions) is small, as is often the case for "insurance" arguments for low interest rates, it is better to have a small committee.

4. Reservations

There are at least two reasons why we should not take these conclusions literally.

First, I assume that the skills of voting members are equal and that all members meet and exchange their views freely. In practice, monetary policy decisions are sometimes taken by a "hub-and-spokes" committee, and my assumptions may not be correct. The U.S. FOMC consists of the members of the Board of Governors (hub) as well as the presidents of the Federal Reserve Banks (spokes). The Governing Council of the ECB includes members of the Executive Board of the ECB (hub) as well as governors of all Euro area national central banks (spokes). One may wonder if the members from the hub are more informed by the staff members at the hub than the members from the spokes. One may also wonder if the members

from the hubs have more chances for discussions than do the members from the spokes. I do not investigate the issues related to "hub-and-spokes" committees.[20]

Second, I assume that all committee members share the same price stability mandate. In practice, regional considerations, in addition to union-wide consideration might be important in some monetary unions.[21] I do not discuss the optimal member size and weight of regional representation in the monetary policy committee.[22] I do not discuss the effects of political business cycles in monetary union economies on the union monetary policy.[23]

C. Summary

The classic Condorcet jury theorem suggests that a larger committee will make good decisions. This policy recommendation depends on many assumptions, and the prediction may not be robust in practice.

First, the recommendation assumes that a committee member will vote based only on private signals. However, strategic considerations lead to a situation where committee members will also vote based on inferences about other members' private information. Therefore, even if all members share the same preference for a policy decision, the rest of the

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[20] Berk and Bierut (2004) focus on the majority voting rule and the fact that skills of members are heterogeneous. They prove that they can replicate the optimal monetary policy outcome using a suboptimal voting rule, by institutional adjustment of the monetary policy committee.

[21] See Meade and Sheets (2002) for evidence that the U.S. Federal Reserve policymakers do take into account developments in regional unemployment when deciding monetary policy.

[22] Hefeker (2003) theoretically compares the choice of three regimes: monetary policy by regional representatives, monetary policy by a board appointed by the central government only, and a council in which board members and regional representative jointly determine the monetary policy.

[23] Von Hagen and Süppel (1994) show that dominance of regional interest that considers the inflation and unemployment trade-off as a primary target, rather than union-wide interests that stabilize union-wide unemployment and inflation, will lead to inefficient monetary policy stabilization policy in a multicountry Barro and Gordon (1983) model.

committee members do not vote in exactly the same manner as they would individually; thus, the classic Condorcet results may fail.

Second, the recommendation depends on the assumption that the private information is free. However, in practice, the committee members may not obtain signals relevant to their decision at zero cost. In particular, they may manipulate their views before voting to "freeride" on other members' costly information, thus the classic Condorcet results may fail.

Third, the recommendation depends on the assumption that the members do not exchange views before voting. Removing the three assumptions simultaneously, a mechanism that maximizes the expected utility of agents subject to the constraint that all committee members will invest to buy information, report their decisions truthfully, and can communicate before the voting, depends on the number of committee members. Several key parameters, such as, in particular, the cost of acquiring information, or the relative probability of good economic conditions, and the loss accompanying the choice loose monetary policy under good economic conditions, affect the committee size.

The model suggests that the optimal committee size weighs the benefit of diversity of views in a larger committee against the risk of free-riding due to the cost of obtaining relevant information in a larger committee. Although it is very difficult for us to obtain reasonable empirical estimates of these key parameters, the models here suggest that the committee size cannot be infinity, and that the size can differ depending on the relative estimates of these key parameters. Indeed, the revealed preference of many economies regarding the size of the committee is not a large number such as 20 or 30, but usually at most 10, as Table 1 shows.[24]

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[24] Table 5 of Lybek and Morris (2004) also shows that most policy boards have seven to nine members based on their survey of 101 central bank laws.

V. Voting Transparency in the Committee

Suppose that having a monetary committee (without knowing the optimal size), rather than individual decision making, is good for society. Our next question relates to the empirical observation that the way to disclose the decision making in the monetary policy committee varies from central bank to central bank. We focus on a topic that is the subject of many research papers: the pros and cons of the disclosure of voting records in detail. Regarding the pros and cons of the disclosure of voting records and the minutes of policy board meetings, Buiter (1999) and Issing (1999) express strikingly different views.[25]

In this section, I discuss various incentive problems for outside interest groups, legislators, and central bank monetary policy committee members arising from the choice of open voting or secret voting. Note that I discuss the issue of voting transparency in a monetary policy committee. The issues of transparency in a monetary policy committee may not always apply to a monetary policy run by an individual. The results in this section should not be taken as a general policy recommendation for central banks.

A. The Case for Open Voting: Different Preference and Re-election

Gersbach and Hahn (2004) favor open voting when the government must choose committee members from a pool of candidates whose preferences regarding stabilization might differ from those of the government, because the government cannot tell the preferences of candidates before appointment.

Consider a two-period model where the government can reelect or dismiss committee members after the first period. Consider two types of committee member, one which has the

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[25] We do not discuss why majority voting is better than decision making by consensus. We also presume simple majority voting in this section. See,Ben-Yashar and Nitzan (1997) on the optimal group decision rule in a fixed-

same preference as the public (type A), and the other having a different preference (type B). In the first period, n members constitute the committee, and with some probability members are type A, but the true type of member is private information. The committee members will vote and set interest rates. In the second period, the government reelects committee members and replaces some members.[26]

Under open voting, the government will dismiss committee members who do not vote for a socially desirable interest rate. Under secret voting, the government must either accept all committee members if the committee chooses the socially desirable interest rate, or the government must dismiss all committee members if the government observes socially undesirable interest rates.

Regarding the voting strategy of members in the second period, all members will choose their preferred interest rate because the second period is their last term of office. Regarding the voting strategy of members in the first period, type A members will vote for the socially desired rate, but type B members might mimic type A members to get reelected.

The cost of mimicking a type A member for a type B member is that tight monetary policy is chosen in the first period, which type B members do not want. The benefit of mimicking the type A member for the type B member is that he or she will be reelected and will vote for his or her preferred monetary policy in the second period.

Given the government's reelection strategy, Gersbach and Hahn (2004) shows that the cost of mimicking a type A member is higher than the benefit. In equilibrium, both the type A member and the type B member will vote truthfully. Knowing that all members truthfully reveal their type, it makes sense to select open voting, since the government dismisses type B

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sized committee.

[26] To be consistent with the idea of central bank independence, I interpret one period in this model as a long period of time.

committee members only under open voting, while under secret voting, the government must dismiss all members, including type A.

A prediction from Gersbach and Hahn (2004) is that a central bank whose preferences are the same as the public prefers transparency, while a central bank whose preferences differ from the public prefers opacity. Note that Gersbach and Hahn (2004) suppose that the government chooses central bankers whose preferences differ from the public as committee members because there is some uncertainty about the preferences of candidates before appointment. In Rogoff (1985), it is a good thing to delegate monetary policy to a conservative central banker whose preference differ from society's, while in Gersbach and Hahn (2004), it is a good thing to expel such members from the committee.

B. The Case for Open Voting: The Information Value of Voting Records

Buiter (1999) stresses the importance of disclosing voting records. An interesting empirical question is whether the disclosure of voting records conveys any useful information to the market participants in a sense that the disclosure increases the transparency of monetary policy. Gerlach-Kristen (2004) gives an interesting answer, that the voting records of the monetary policy committee of the BOE help in predicting future policy rate changes, and thus improve the transparency of monetary policy.[27] I take her results as support for the disclosure of voting records of the U.K. monetary policy committee throughout the period studied.

In the United Kingdom, the monetary policy committee has nine members and meets

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[27] I take the analysis of Gerlach-Kristen (2004) just as an example. Other methods might work to infer the information contained in the variable "skew" for other central banks. For example, Chappell, McGregor, and Vermilyea (2005) analyze the voting patterns of FOMC members with an econometric model and test a number of hypotheses such as the median voter hypothesis or the influence of the chairperson. See also section 3.5 of Chappell, McGregor, and Vermilyea (2005) for a survey of the economic analysis of the U.S. FOMC voting record.

monthly to decide on the level of the repo rate. Policy decisions are taken by majority vote and are announced the same day. Gerlach-Kristen (2004) defines the variable called "skew," which is a measure of the difference between the average rate proposed by individual members and the policy rate decided upon by majority voting, to measure the degree of disagreement on the level of the U.K. repo rate.[28]

In the U.K. monetary policy committee, disagreement was common between June 1997 and February 2003. There were 70 meetings, and only in 22 of them was the interest rate decision taken unanimously.

Given those disagreements, "skew" must be volatile. I reproduce "skew," the majority interest rate, and average voting rate in Figure 1.

To study the relationship between "skew" and future interest rate changes, Gerlach-Kristen (2004) specifies the date of the interest rate decision as $t-1$, and the date of the vote publication (in practice, two weeks later) as t. Since policy is adopted every four weeks, the next policy rate decision in this framework is announced at time $t+1$. The change of the policy interest rate is measured as the change between $t+1$ and $t-1$, and we denote this monthly change as Δi_{t+1}.

The regression that assesses whether $skew_t$ predicts policy rate changes take the form

$$\Delta i_{t+1} = a1 * skew_t + a2 * \Delta i_{t-1} + e_{t+1},$$

where e_{t+1} is white noise. The lagged policy rate change is included to account for the autocorrelation in interest rate changes. Gerlach-Kristen (2004) uses data from June 1997 to

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[28] Starting with the first Monetary Policy Committee (MPC) meeting, minutes of the discussions preceding the policy decision have been published. These minutes also include the voting record, the publication of which is intended to improve the accountability of the committee members. From June 1997 to October 1998, the voting record indicated whether those committee members who disagreed with the majority favored a tighter or looser policy, but it did not reveal which interest rates they voted for. In this period, the minutes, moreover, were released only after the following MPC meeting. Since November 1998, the voting record has contained the interest rates

January 2003 and November 1998 to January 2003, and runs an ordered probit model regressing future policy changes on "skew" and the past interest rate change.

Gerlach-Kristen (2004) then finds that "skew" is informative for forecasting the future policy change. The probability of no interest rate change in that period is about 80 percent. Nonetheless, a repo rate cut is more likely than an increase if we observe a negative "skew," where some Monetary Policy Committee members favor a lower interest rate than do the majority.

Her finding of statistically significant effects of "skew" on the future policy rate is robust even if she adds the slope of the term structure, which is another indicator of market participants' future inflation expectation. Her finding of statistically significant effects of "skew" is also robust even when she regresses the change of a market interest rate between the day before the announcement of the voting record and the day after on the variable "skew."[29]

C. The Case for Secret Voting: Political Interest Groups

It is true that some committees disclose both decision and voting records, like the BOJ policy board, parliaments, or juries in sports (say, ice skating or synchronized swimming). However, some committees only announce their decision, such as the ECB governing council, juries in courts, or school admission committees. Why do some committees prefer secret voting, while others do not?

Issing (1999) favors secret voting on the ground that legislators and interest groups will put pressure on some committee members to see if their pressure results in their preferred

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proposed by dissenting members, and has been published two weeks after the meeting.

[29] Contrary to the findings of Gerlach-Kristen (2004), Meade (2002) shows that the difference between the mean and median FOMC members' preferred interest rates does not help to predict future interest rates. However, it does help to predict policy bias.

outcome. Felgenhauer and Grüner (2003) elaborate the effects from outside interest groups stressed by Issing (1999) in detail. They argue that if an external interest group attempts to influence committee decisions, it makes sense to have secret voting committees. The logic is that restricting access to information obtained from the decision-making process by interest groups may reduce the bias toward special interest policy.[30]

Felgenhauer and Grüner (2003) suppose that the economic condition is either good or bad, with a probability of 0.5. Committee members have private signals regarding the future economic conditions, and they want to serve the public's interest by truthfully reporting their private signals.

Suppose that some committee members are subject to external influences from an interest group. An interest group offers side payments to the committee members to influence their voting. Suppose the members receive money if they vote in favor of policy biased toward this interest group. Members' utility depends on their view of economic conditions, plus the side payment from the interest group. Members' utility is high when they correctly report their private signal on economic conditions. Members' utility is also high if they get a side payment. The interest group wants members to vote in one particular way irrespective of the economic

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[30] The influences of interest groups have been quite common in the history of central banks other than the ECB. For example, in the United States, a famous example of pressure from an interest group was a demand from President Harry Truman and the U.S. Treasury to peg interest rates. The FOMC met with President Truman late in the afternoon of Wednesday, January 31, 1951. According to Hetzel and Leach (2001), Truman began by stating that "the present emergency is the greatest this country has ever faced, including the two World Wars and all the preceding wars. . . . [W]e must combat Communist influence on many fronts. . . . [I]f the people lose confidence in Government securities all we hope to gain from our military mobilization, and war if need be, might be jeopardized." At the meeting, FOMC members had made no commitment to the President. Nonetheless, the next morning, the White House press secretary issued a statement that "The Federal Reserve Board has pledged its support to President Truman to maintain the stability of Government securities as long as the emergency lasts." The Treasury then issued a statement saying that the White House announcement "means the market for Government securities will be stabilized at present levels and that these levels will be maintained during the present

conditions implied by the committee members' private information. Thus, the interest group is willing to make side payments to the committee members, even though such payments reduce the interest group's utility.

The game is as follows: an interest group commits side payments, the committee gets signals on the state of the economy with some probability of error, and members decide on policy based on majority vote. Society cannot know whether the committee made the right decision, because society cannot verify the true state of the economy from the members' private information. Hence, society cannot punish committee members.

Suppose there are two types of committee, each consisting of three members. The first type of committee announces not only the decision, but also the individual voting record and the results of majority voting. The second type of committee decides and tells only the outcome based on majority secret voting.

In the first committee, the cost of biased voting arises if an individual vote is pivotal (note that without payment, all members will choose socially desirable policy).[31] The biased voting reduces the probability of correct decisions being made. If the probability of a vote becoming pivotal is small, the cost of biased voting is small. However, the benefit of getting money is certain, because a member's voting record is disclosed even though his or her vote is not pivotal. Thus, it is possible that all committee members vote in favor of the biased policy.

In the second committee, members get money only if their vote is pivotal and indeed the committee makes the biased decision. Thus, the price of an insincere vote is higher.

According to this analysis, the secret voting is not worse than the open voting in the relevant range of the correctness of committee members' private information on the economic

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emergency."

[31] See the definition on "pivotal" in the example discussed in section IV B 1.

situation, and in the relevant range of the degree of bias made by the interest group.[32]

D. The Case for Secret Voting: Different Abilities and Reelection

Gersbach and Hahn (2001) favor secret voting if committee members differ with respect to competence concerning future developments in the economy, and if committee members derive large private benefits from holding office.

Gersbach and Hahn (2001) consider a two-period economy where a central bank sets interest rates based on majority voting of committee members. They suppose that committee members want to be reelected, but their abilities are not uniform. Some committee members are good at forecasting the future developments in the economy.

Note that Gersbach and Hahn (2001) focus on the situation where the committee members have common preferences but different forecasting abilities, and thus the members may vote differently. Gersbach and Hahn (2004), discussed in section V.A, focus on the opposite situation, where the committee members have common forecasting abilities but different preferences for stabilization policy, and thus the members vote differently. The two papers employ a similar setup, but differ in the reasons why the committee members have different opinions.

I summarize below government and committee member actions in the first period and in the second period. In the first period, *n* members constitute the committee, and with some probability each member is good at forecasting future developments in the economy, but the type of member is private information. The public forms an expectation of inflation but does not observe the magnitude of the shock. Good committee members observe a shock signal, and

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[32] Note that secret voting is not the only way to prevent side payments by interest groups. Felgenhauer and Grüner (2003) show that communication among committee members before voting may severely limit an interest group's ability to pay money contingent on biased voting.

with probability p ($p>0.5$), good committee members correctly identify the magnitude of the shock, and with probability $1-p$, they identify the magnitude of the shock wrongly. Other committee members correctly identify the magnitude of the shock with probability 0.5. All members will vote for their preferred interest rate, and set the interest rate. All members are allowed to abstain. Shocks are revealed, and inflation and output are determined. In the second period, the government reelects committee members, and replaces some members (from the same pool), inflation expectations emerge, good members observe the signal, members vote (but may abstain), and inflation and output are determined. Gersbach and Hahn (2001) assume that the shock takes only two values, say, "low" or "high," and thus socially desirable interest rates take only two values, either "high" or "low."

Under such a framework, we can show that the following government's reelection strategies, chosen under open voting and under secret voting, constitute equilibrium reelection strategies. Under open voting, the government dismisses committee members who do not vote for socially desirable interest rates, given shocks. Under secret voting, the government must either accept all committee members (if the median voter is socially desirable) or dismiss all committee members if the government observes socially undesirable interest rates.

The government strategy discussed in the previous paragraph is an equilibrium strategy in secret voting because, if the committee performs well, it must be better than the average social pool. Thus, all members should remain even though some of them are not good members. In open voting, again, the government strategy is an equilibrium strategy.

Given this government reelection strategy, under secret voting, good members will vote for either high or low interest rates depending on the information on the shock in both periods. The less able members will not vote, because their voting will only exacerbate the results of monetary policy and reduce their chance of getting reelected. If there is no good member, the committee will randomize the two possible interest rates.

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Under open voting, in the first period, good members will vote for either high or low interest rates depending on information on the shock. The less able members will vote. If a member does not vote, it reveals that he or she is not a good member and thus will be fired at the end of the first period. The best the less able members can do in the first period is to randomize the two possible interest rates, and expect a 50 percent chance of not being fired. In equilibrium, in the first period, the strategic vote by less able members makes open voting worse than secret voting because less able members, on average, make inferior decisions.

Under open voting, in the second period, good members will vote for either high or low interest rates depending on information on the shock, and the less able members will not vote. However, under open voting, the average probability of selecting good committee members is higher in the open voting than in the secret voting, and the expected loss in the second period is lower for open voting.

Given the opposite effects of secret voting in the first period and in the second period, Gersbach and Hahn (2001) conducted simulations to check which effect dominates in equilibrium. According to their simulations, the benefit of secret voting in the first period dominates the loss of secret voting in the second period.

E. Reservations

There are at least two reasons why we should not take these conclusions literally.

First, the publication of voting records is not the only way to release the central bank's intention for the future course of monetary policy.[33] We should be careful about the combination with other information disclosed by a central bank, such as the disclosure of

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[33] For example, Geraats (2005) examines the reputational incentives related to transparency, focusing on the publication of central bank forecasts of economic shocks, which are only observable by a central bank. However, her analysis assumes that a central bank, rather than a central bank committee, controls monetary policy.

minutes, as we will elaborate in the final section.[34]

Second, the models discussed in this section assume that the voting powers of all members are equal. However, in practice, a member on the committee, perhaps the chairperson, might be influential compared with other members (Blinder [1998, p.21]). For example, if the monetary policy committee includes full-time internal members and part-time external members, members' degrees of information and expertise may not be the same.[35] In such a situation, people will have no problem with a good central bank run by a chairperson alone if he or she is good. However, such an institutional set up, heavily relying on a particular person, may be risky. The Reserve Bank of New Zealand Amendment Act 2003, separating the chairperson of the board of directors and the governor, is a response to this idea.[36]

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[34] In inflation-targeting economies, the relationship between the dates of publication of the Inflation Report and the meeting and decisions of the monetary policy committee do not coincide (Fracasso, Genberg and Wyplosz [2003, p8]). In the United States, the FOMC decided to expedite the release of its minutes on December 14, 2004. Before December 14, 2004, the minutes of each meeting were made available on the Thursday after the next regularly scheduled meeting. After December 14, 2004, the minutes of regularly scheduled meetings were released three weeks after the date of the policy decision.

[35] In the United Kingdom, the monetary policy committee includes both external and internal members. Gerlach-Kristen (2004c) shows interesting differences in the voting pattern of insiders and outsiders in the U.K. Monetary Policy Committee. First, external committee members tend to be "doves", while insiders act as "hawks". Second, outsiders are more persistent in their dissent than insiders. Why do we observe such a voting pattern? She points out three reasons. First, internal members might have more similar views about the state of the economy. Working at the bank may provide them with more information and opportunities for discussions about the economy and each others' views, which might lead them to vote as a block more frequently and to dissent from the majority more rarely. Second, outsiders may have incentives to use their stay on the Monetary Policy Committee to raise their "profile". Conceivably, dissenting is a means of attracting media attention. Third, and in a similar vein of strategic behavior, internal Monetary Policy Committee members might perceive dissent as not conducive to promoting their careers at the bank.

[36] In "Independent Review of the Operation of Monetary Policy" (28 February 2001), Lars E.O. Svensson proposed the following changes for Reserve Bank of New Zealand. Svensson recommend that a formal monetary policy committee, comprised of the Governor and four other Reserve Bank staff, be formed. Named votes and nonattributed minutes should be published. Svensson recommended the changes to the membership of the Bank's Board of Directors: (i) The Governor and Deputy Governors should not be members of the Board as they are at present, (ii) The Board should consist of nonexecutive directors only, and (iii) The chair should be selected by the Board members themselves. The Reserve Bank of New Zealand Amendment Act 2003 implemented the Government's response to the recommendations of the Svensson proposal. The amendments to Part III include the following: (i) Removing the Governor as chairperson of the Reserve Bank's Board of Directors, and providing for a nonexecutive director to be Chairperson of the Board; (ii) Retaining the Governor on the Board but removing the Deputy Governor from the board; (iii) Requiring the board to issue an annual report on its assessment of the Reserve Bank's and the Governor's performance; (iv) Increasing the minimum number of nonexecutive directors from 4 to 5; (v) Requiring the nonexecutive directors to appoint one of their number as chairperson; and (vi) Reducing the minimum number of board meetings from 10 per annum to six per annum.

F. Summary

The models discussed in this section show that voting transparency is beneficial if central bankers have preferences different from those of the public and do not conduct socially desirable monetary policy, if for some reasons the society chooses such central bankers as one of the committee members. Voting transparency is beneficial if it gives relevant information on future monetary policy. Voting transparency is beneficial if it induces central bankers to be more competent. Those considerations suggest that, as Blinder (2004) argues, where a committee respects the diversity of individual opinion and does not strive for group ownership of the decision, the disclosure of voting might make sense to provide a useful indicator of the balancing of competing considerations.

The models discussed in this section also show that voting transparency is problematic if an external interest group attempts to influence committee decisions biased toward special interest policy. Voting transparency is problematic if central bankers focus too much on appearing as competent individuals and less on overall problems. Those considerations suggest that, as Blinder (2004) argues, for a committee that prizes solidarity and strives for group ownership of any decision it makes, while potentially many interest groups put pressure on their action, it does make sense to suppress the vote in the interest of maintaining group harmony.

VI. To What Extent Do Committees Credibly Commit to the Future Course of Monetary Policy?

The papers in the previous sections show the case for a monetary policy committee on various grounds, and sometimes that open voting is good. Recently, some central bank committees have been making policy statements that include their commitment to a particular style of

monetary operation or their commitment to a particular level of interest rates until some economic conditions are met. However, some monetary policy committee members are being replaced. There is no reason that a new committee member should accept commitments made by past committee members. This section shows a negative view on this point, and a theoretical proposal that makes it possible for a monetary policy committee to maintain a desirable monetary policy rule across generations. The idea is that by giving veto power to the older generation and thereby prevent younger generations from deviating from a good commitment.

A. King's (2004) Negative View of Future Commitment

King (2004) points out that, in practice, it is difficult to write contracts that commit to future collective behavior. Collectively, it is possible to ignore the previous commitment. A deeper problem is whether we can expect future board members to keep previous commitments.

King (2004) is negative regarding the possibility of constraining future members for two reasons. First, it is impossible to forecast the future completely, thus there is no enforcement technology. Second, it is impossible to write state-contingent contracts that forecast all relevant future courses of the economy. He argues that monetary institutions are solutions offered by society to this problem, but that there is no clear answer.

B. Super-Majority Rule May Implement A Commitment Solution

Bullard and Waller (2004) show an example of a monetary authority governed by a super-majority rule, rather than majority voting in the committee, implementing the commitment of the committee and achieving higher social welfare in a coherent general equilibrium monetary

model.[37]

They consider an overlapping-generation model with physical capital and fiat money, in which all agents live three periods (young, middle, and old). The agents do not consume or work in their first period of life, but they join the political system. In the second period, the agents supply labor, join the political system, collect wage income, and consume and save for retirement. In the third period, agents retire, and consume from their savings. Agents in the last period of life are making no further decisions, so they have no incentive to join the political system.[38]

The young care about their wage in middle age, but the middle-aged care about the returns they will earn between their middle age and old age. In the monetary equilibrium, higher inflation leads to higher physical capital stock due to Tobin effects, and increased marginal productivity of labor and real wages. Higher wages allow workers to consume more now and save more for the future. Thus, the young want a low real interest rate and high inflation. The middle-aged want high interest rates, low inflation, and low capital stock. Therefore, both the young and the middle-aged cannot implement socially desirable steady-state inflation rate. Given population growth, the young are always in the political majority, and prefer higher inflation. Thus, under majority rule, as long as the old do not join the political system, the median young voter generates an inefficiently higher inflation rate, and cannot commit to a

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[37] Prior to Bullard and Waller (2004), Faust (1996) considers a two-period overlapping-generation model with fiat money as the only asset. The young work and save their earnings via money. The old consume using fiat money. The population grows in every period. As in Bullard and Waller (2004), in the model of Faust (1996), the young want inflation and the old want deflation. Based on majority voting economic policy, the majority of members, if young, will create an inflation bias and everyone will be worse off. A committee consisting of one young and one old member can resolve the inflation bias problem.

[38] This only happens to the very last generation; thus, in a large model with 55 lifetimes, generations 1 to 54 will participate and the 55th will not. The conflict in this larger model would not only be between the young and the middle-aged, but also between the young and the old.

stationary inflation path.

Bullard and Waller (2004) suggest that a policy board, which gives some representation to the middle-aged, reduces the inflation bias created by the majority voting dominated by the young. However, this solution seems to be fragile because the young are always in the majority. To overcome this uncertainty, Bullard and Waller (2004) suggest that a super-majority rule, in the sense that current monetary policy can be changed only if a substantial number of the middle-aged agree with the policy proposal made by the young. Super-majority voting implements the social optimum, because the young want to implement today's monetary policy that will not lead to lower future welfare.

One may still criticize the proposal of Bullard and Waller (2004), because even super-majority rule can be changed. Another question is that if we regard the supermajority rule as a constitutional arrangement, it is well known that constitutional changes are rare events, and thus it might be difficult to implement the desired constitutional change (see Persson and Tabellini [2004] on constitutional inertia).[39] Finally, giving veto power to the younger generation rather than the older generation might be beneficial for reducing inflation bias in other situations. For example, the results of Cothren (1988) suggest that giving veto power to the younger generation might be beneficial if the reputation of being an inflation fighter is for the younger board members the key factor in reducing inflation bias.

VII. Discussion Based on the BOJ's Experiences

In this section, I discuss two practical issues based on the Japanese experience: with voting records at the BOJ, and enforcement of commitment for future board members. Before moving

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[39] However, in the model of Bullard and Waller (2004), it is shown that both young and middle-aged have incentives to honor the rule, and it is the design that makes it difficult to change the commitment to desirable

on to the details of the Japanese experience, the next sub section summarizes major points of

the role of the BOJ Policy Board under the current Bank of Japan Law, to help readers

understanding the following sub sections.

A. BOJ Monetary Policy Board: Background

The Japanese Diet passed the new Bank of Japan Law on June 11, 1997 and the law came into

effect on April 1, 1998. The new law states: "The Bank of Japan's autonomy regarding

currency and monetary control shall be respected" (Article 3, Paragraph 1). Article 5,

Paragraph 2, of the Bank of Japan Law states that "due consideration shall be given to the

autonomy of the Bank's business operations."[40]

The new Bank of Japan Law incorporates major revisions on the functions of the Policy

Board, the BOJ's highest decision-making body in two respects.

First, the composition of the Policy Board was altered. Under the old law, the Policy

Board consisted of seven members: the Governor of the BOJ; four appointed members; and

two government representatives without voting rights, representing the Ministry of Finance and

the Economic Planning Agency. Under the new law, the Policy Board consists of nine

members: the governor and the two Deputy Governors of the BOJ, and six deliberative

members.[41]

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monetary policy rules.

[40] Revision of the Bank of Japan Law was initiated by the three-party coalition government in 1996. More
discussions followed at the Central Bank Study Group, an advisory panel to Prime Minister Ryutaro Hashimoto set
up in July 1996, and at the Subcommittee on the Revision of the Bank of Japan Law of the Financial System
Research Council set up in November 1996. For details, see, for example, Matsushita (1997).

[41] Two government representatives without voting rights may attend and express views at Policy Board meetings
for monetary control matters, may submit proposals regarding monetary control matters, or request that the Policy
Board postpone a vote on monetary control matters until the next meeting of this type. If a request is made to
postpone a Policy Board vote, the Policy Board shall decide whether or not to accommodate the request, in
accordance with the same voting procedures that apply to other matters.

Second, the representation of the Policy Board member was changed. Under the old law, two members represented the Government. Appointed members had to be selected from each of the four fields of city banking, regional banking, commerce and industry, and agriculture. Under the new law, there is no Government representative member on the Policy Board. The Policy Board members can be selected from among a much broader population, without any restriction on the fields they represent, so long as they are experts, including those on economy or finance.

The new Bank of Japan Law ensures the independence of the Policy Board members in two respects. First, the members cannot be dismissed for holding opinions at variance with those of the government. Second, the government cannot order the Bank to undertake any particular policy action or conduct any particular business operation.[42]

B. What Does the BOJ Voting Record Tell Us?

This sub section summarizes trends in BOJ Policy Board members' voting records under the new law, after April 1998, and provides some discussion. Table 2 summarizes the voting record before March 19, 2001, when the BOJ made a commitment to a procedure for money market operations until the CPI (excluding perishables, on a nationwide basis) registers stably a zero percent or an increase year on year. Table 3 summarizes the voting record from March 19, 2001 until December 2004.

The tables show that first, the Chairperson is always on the "winning" side, and second, the number of negative votes is usually at most two. Three members disagree in only two

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[42] It is premature to consider that the revision of the Bank of Japan Law reflects the theoretical argument to foster central bank independence to achieve price stability. It is well known that Japan was an outlier to this theory's prediction, in the sense that a central bank with low legal independence achieves a low inflation record (see for example, Cukierman [1992]). Walsh (1997) shows that when additional factors that might account for cross-country variation in inflation rates are incorporated into the empirical analysis, Japan no longer appears to be a

meetings (February 9, 2001 and October 10, 2003).

These voting patterns are consistent with those of the U.S. Federal Reserve. Regarding the dominance of the chairperson, Meyer (2004) says that the discussions at the Monday board meeting are the place to exchange ideas, and there are implicit commitments to support the Chairman the next day.[43]

Figure 2 and Figure 3 summarize BOJ voting patters in diagrammatical form. In constructing Figure 2, I do not include dissenting votes unless I clearly see the preferred level of call rates the member has in mind, as we have shown underlined in Table 2.[44] This selection helps my analysis in the later part of this sub section to obtain a hypothetical average voting rate.

Are the Japanese voting patterns in Figures 2 and 3 consistent with the insight of

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significant outlier.

[43] Regarding the upper limit of dissenting votes, Meyer (2004), based on his experience in the FOMC, says that the third dissenting vote in the FOMC was in open revolt against the chairman's leadership. Meyer (2004, p53) says "I came to think of the voting process as a game of musical chairs. There were two imaginary red chairs around that table – the 'dissent chairs.' The first two FOMC members who sat in those chairs were able to dissent. After that, no one else could follow the same course." Meade (2002) examined transcripts from 40 face-to-face FOMC meetings from the beginning of 1992 to the end of 1996 and obtained the policy preferences of participants (the voiced dissent) in addition to the official record of voting. The voiced dissent rate for voting officials and all participants averaged 10.5 percent and 14 percent, respectively. The official dissent rate was only 6.7 percent. Federal Reserve policy makers are more willing to speak their minds at FOMC meetings than to vote their minds on the official record, and this tendency is greater when they do not cast an official vote.

[44] For example, on September 9, 1999, we do not include the particular target level proposed by Policy Board member Ms. Shinotsuka. According to the minutes, "Ms. Shinotsuka dissented, commenting as follows. Although she acknowledged that the Bank's decision to employ the current zero interest rate policy was based on a careful consideration of its positive and negative aspects, the negative outcomes of this policy had become more prominent. They were (1) distortion in income distribution, (2) reduced awareness of credit risks, (3) delays in structural adjustment, and (4) heightened risk of confusion accompanying the termination of the long-standing policy. She also remarked that the economy was gradually becoming more stable. On the basis of this understanding, she considered that it had become even less justifiable to continue the zero interest rate policy." However, she did not mention to what extent the rate should be increased. Hence, I do not put a particular rate on September 9, 1999.

Gerlach-Kristen (2004) that the voting record of the monetary policy committee of the BOE helps predict future policy rate changes?

I construct a Japanese version of "skew" before March 19, 2001 in Table 4 to see whether it helps us to forecast the future course of monetary policy. After March 19, 2001, it is difficult to construct a measure like "skew" because of the zero bound of the nominal interest rate. Hence I focus only on the period from the introduction of the new Bank of Japan Law until Mach 19, 2001. The variable "skew," in the third column, is the gap between the chairperson's proposal (interest rate chosen, fourth column) and the average voting rate. In constructing the average voting rate, for dissenting voting members, who did not comment explicitly on the target levels of the uncollateralized overnight call rate, I cannot guess their actual voting rate. I write their names in italics and underline them in the seventh column.

Regarding the information value of these voting records, consider the case for August 11, 2000, which suspended the zero interest rate policy. On September 20, the minutes of the August 11 meeting were disclosed and we know that Mr. N. Nakahara and Mr. Ueda recorded dissenting votes. I assume that the additional value of the voting record helps to predict the policy change from August 11 to October 13, which is the closest Monetary Policy Meeting date from September 20. The changes in the policy rate from the particular meeting date to the closest Monetary Policy Meeting date after the disclosure of the minutes for the particular meeting is labeled $\Delta i(t+3)$, and listed in the table's fifth column. Timing of $\Delta i(t+3)$ reflects the lags in disclosing the minutes in Japan and supposes that the minutes at time t are informative for the third meeting from time t. More specifically, the table's sixth column shows the date of future meetings for which the disclosed minutes on the meeting dates shown in the second column are informative. For example, the minutes of the April 24, 1998 meeting (sample 1) were disclosed on June 17, 1998; thus, the additional information on the individual voting record, in addition to the decision of the meeting, helps forecast the decision of the meeting on

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June 25, 1998 (sample 4, thus, Δi(t+3)). Given the nature of this variable, I can only use skew

data up to January 19, 2001, which consists of 52 observations and 10 nonzero observations for

Δi(t+3).

Observe that the Japanese version of "skew," which is the difference between the average

voting rate and the majority interest rate, was likely to be dominated by the two Policy Board

members, Mr. N. Nakahara and Ms. Shinotsuka in Figure 2 and Table 4. One may argue that

those two members consistently voted for easing and tightening respectively, thus, once people

know the names of the dissenting voters, the information value of the voting record may not be

rich. Others may well argue that from Figure 4, which shows $\Delta i($t+3) and "skew," it is obvious

that the "skew" variable predicts the future policy changes, and that the evidence is similar to

the results of Gerlach-Kristen (2004).[45]

Is Japanese "skew" helpful to predict the future policy change, Δi(t+3)? To answer this

question formally, I begin my formal analysis with ordinary least square (OLS) regression and

move on to the Granger test.

First, OLS of Δi(t+3) on *skew* and a constant term yields the estimates of coefficient on

skew takes a positive value of 2.32 (s.e.=0.50), which is statistically significant. Adding the

lagged value of Δi(t+3), as Gerlach-Kristen (2004) did, the estimate of coefficient on *skew* is

1.73 (s.e.= 0.42).

Second, I move on to the Granger test following conventional statistical procedure. I

begin by rejecting the null hypotheses that Δi(t+3) and *skew* have a unit root by the augmented

Dickey-Fuller test with a 5 percent significance level. The results should be taken with care

because the unit root test in this small sample, 52 observations, might not be very powerful.

I then find that the Schwarz information criterion shows that the plausible order of the

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[45] One may well doubt if the "skew" is applicable to the Japanese zero interest rate policy period, because no

vector auto regression system of Δi(t+3) and *skew* is one. Finally, I obtain the results of the Granger causality test. The null hypothesis that *skew* does not Granger cause Δi(t+3) cannot be rejected (Test statistics, 1.87, p-value=0.18). The null hypothesis that Δi(t+3) does not Granger cause *skew* is not rejected (Test statistics = 1.44, p-value=0.24).

In sum, there seem to be contemporaneous correlations between *skew* and Δi(t+3), but the Granger causality test does not support the information value of *skew* on Δi(t+3). I interpret that the lack of Granger causality means that the contemporaneous correlations might be just coincidences of economic conditions judged by the majority members. My evidence before March 19, 2001, based on 52 samples, suggests that the information value of "skew" may not be so large in Japan in those periods.

Before closing this sub section, I wish to stress that the BOJ does much else to transmit its policy intention apart from revealing the voting record. For example, the Bank undertakes a wide variety of activities to inform the public, through various channels ranging from press conferences and speeches of the Governor, other Policy Board members, executives and staff, to information on its web site. Regarding the information to the Diet, a report on currency and monetary control is submitted to the Diet twice a year, and the Governor or a designated representative appears before Diet committees, on request, to explain the Bank's policies. Given the importance of these for transmitting the policy intentions of the Bank, it is not useful to concentrate only on the disclosure of voting records. Rather, we should better consider the issue of information disclosure from a central bank as an entire package.[46]

Monetary Policy Board member can propose a negative policy interest rate. I do not discuss the issue in this paper.

[46] See the Blinder (2004, pp. 25–30), regarding the practical considerations on the methods of communication to deliver the message from the central bank: "bias announcement," the minutes, official tabulations of votes, and testimony and speeches by committee members.

C. Why Did New BOJ Board Members Honor Past Members' Commitments?

Ueda (2004) points out a limitation of one of the expectation management approaches, which raises interest rates more slowly than the Taylor rule predicts as the economy improves. Ueda says, "A central bank may have to wait a desperately long time before such improvements take place. Improvements in the economy may not materialize under the policy board that made the decision." As King (2004) points out, the difficulty here is that "collective decisions today may fail to bind future collective decisions." Logically, any new Policy Board member does not have to follow the commitment made by the former Policy Board members. An interesting question is: Why did Governor Fukui maintain the BOJ's commitment, which was introduced by the members of the Policy Board as of March 19, 2001? Was the commitment so reasonable that new members accepted it? Or was there no alternative?

It is too early to know the correct answer to this question. But Japanese examples in this section show that the theoretical fiction that monetary policy is made by a single individual maximizing a well-defined preference function misses an important point. Japanese examples seem to show that the past commitment was honored if some of the Policy Board members were replaced, contrary to the idea of King (2004). In my view, monetary theorists should pay more attention to the nature of decision-making by committee, as stressed by Blinder (1998).

VIII. Conclusion

My tentative answers to the questions raised in this paper are as follows.

First, giving a long term of office to an independent central banker gives him or her an incentive to put more into the policymaking process than an elected legislator would. This extra effort translates, in expectations, into better forecasts and fewer policy mistakes. The effort increases social benefits, and the legislator's own utility increases compared with the

case in which legislators run monetary policy by themselves. Delegating responsibility to an independent central banker is an incentive that legislators would find attractive.

Second, some theoretical models show that decision making by a committee dominates that of an individual if there is an incentive for individual members of a monetary policy committee to gain reputations as inflation fighters, or if an opportunistic member of a monetary policy committee has an incentive to mimic a nonopportunistic central banker, or if there is electoral uncertainty that affects the preference for the degree of stabilization policy determined by politically appointed central bank committee members.

Third, the classic Condorcet jury theorem suggests that a larger committee will make better decisions. This policy recommendation depends on a lot of assumptions, and may not be robust if the assumptions do not hold. In practice, the committee members may vote based not only on their private signals but also on their inferences about other members' private signals, the members may not obtain signals relevant to their decisions at zero cost, and may exchange views before voting. The optimal committee size weighs the benefit of diversity of views in a larger committee against the risk of free-riding due to the cost of obtaining relevant information in a larger committee.

Fourth, in theory, voting transparency can be beneficial or problematic. In practice, with a committee that respects diversity of individual opinion and does not strive for group ownership of decisions, the disclosure of voting might make sense to provide a useful indicator of balancing the competing consideration. For a committee that prizes solidarity and strives for group ownership of any decision it makes, while potentially many interest groups may put pressure on their actions, it does make sense to suppress the voting record in the interest of maintaining group harmony.

Fifth, in theory, collective decisions made by current committee members today may fail to bind future collective decisions made by future committee members. However, the Japanese

experience of commitment to a procedure for money market operations until the CPI (excluding perishables, on a nationwide basis) registers stably zero percent or an increase year on year, shows a counter-example to the argument. Economists need to do more to interpret this experience and to present a model of the experience about which there is reasonable consensus.

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Table 1: Monetary policy decision making at selected central banks

Country	Japan	United States	Europe	United Kingdom	Australia
Central bank	**Bank of Japan**	**Federal Reserve Board**	**European Central Bank**	**Bank of England**	**Reserve Bank of Australia**
MPC	Policy Board	Federal Open Market Committee (FOMC)	Governing Council	Monetary Policy Committee	Reserve Bank Board
Size of the MPC (the number of MPC members appointed from external organizations)	9 (0)	12 (0)	18 (0)	9 (4)	9 (7)
Decision process (*)	Simple Majority Voting (b)	Voting	Simple Majority Voting (c)	Simple Majority Voting (b)	Simple Majority Voting (b)
Publication of minutes	Yes	Yes	None	Yes	None
(Frequency)	(about a month delay)	(The minutes of each meeting are made available on the Thursday after the next regularly scheduled meeting.)		(about two weeks delay + individual votes)	
Publication of transcripts (Frequency)	Yes (ten years delay)	Yes (five years delay)	None	None	None
Inflation Targeting **Target Price Index**				Consumer Prices Index (CPI)	CPI
Target Width				2 percent as measured by the 12-month increase	2 - 3 per cent, on average, over the cycle.
Inflation Forecast made by	(Policy Board)			Monetary Policy committee	staff
Evaluation of monetary policy by external organisations	None	None	None	None	None

Sources: Web sites of central banks, revised from Fracasso, Genberg and Wyplosz (2003), Table 1.2.

(*) I define three types of decision process in central banks below.

First, "Simple Majority Voting" means central banks where there are the statements in the central bank act that prescribe the majority voting or the Chairperson has the casting vote.

Second, "Voting" means central banks where the committees vote on the policy but other legal provision about decision making process are not found.

Third, "Consensus" means central banks where the collective decision-making processes in the committee are not explicitly stipulated.

(a) The Minister of Finance has the authority to direct the governor to follow a specific policy course.

(b) The Chairperson can break a tie.

(c) The President can break a tie.

Table 1: Monetary policy decision making at selected central banks (Continued)

Country	Canada	New Zealand	Norway	Phillipines
Central bank	**Bank of Canada**	**Reserve Bank of New Zealand**	**Norges Bank**	**Bangko Sentral ng Pilipinas**
MPC	Governing Council (a)		Executive Board	Monetary Board
Size of the MPC (the number of MPC members appointed from external organizations)	6 (0)	1 (0)	7 (0)	7 (0)
Decision process (*)	Voting	Governor	Simple Majority Voting	Simple Majority Voting
Publication of minutes	None	None	None	Highlights of the Meeting on Monetary Policy Issues
(Frequency)				
Publication of transcripts (Frequency)	None	None	None	None
Inflation Targeting				
Target Price Index	core CPI	CPI	CPI	headline CPI excluding food and energy,
Target Width	2 percent, target range 1 - 3 percent	1 - 3 percent on average over the medium term	2.5 percent	4.5 - 5.5 percent.
Inflation Forecast made by	Governing Council	staff	staff	staff
Evaluation of monetary policy by external organisations	None	Yes	Yes	None

Sources: Web sites of central banks, revised from Fracasso, Genberg and Wyplosz (2003), Table 1.2.

(*) I define three types of decision process in central banks below.

First, "Simple Majority Voting" means central banks where there are the statements in the central bank act that prescribe the majority voting or the Chairperson has the casting vote.

Second, "Voting" means central banks where the committees vote on the policy but other legal provision about decision making process are not found.

Third, "Consensus" means central banks where the collective decision making processes in the committee are not explicitly stipulated.

(a) The Minister of Finance has the authority to direct the governor to follow a specific policy course.

(b) The Chairperson can break a tie.

(c) The President can break a tie.

Table 1: Monetary policy decision making at selected central banks (Continued)

Country	South Korea	Sweden	Switzerland	Thailamd
Central bank	**Bank of Korea**	**Sveriges Riksbank**	**Swiss National Bank**	**Bank of Thailand**
MPC	Monetary Policy Committee	Executive Board	Governing Board	Monetary Policy Committee
Size of the MPC (the number of MPC members appointed from external organizations)	7 (4)	7 (0)	3 (0)	7 (4)
Decision process (*)	Simple Majority Voting	Simple Majority Voting (b)	Consensus	Consensus
Publication of minutes	Yes	Yes	None	None
(Frequency)		(two weeks delay)		
Publication of transcripts (Frequency)	Yes	None	None	None
Inflation Targeting				
Target Price Index	core CPI	CPI	CPI	core CPI
Target Width	2.5 - 3.5 percent for the average rate for the three year period 2004-2006.	2 percent (plus/minus 1 percentage point around this target)	less than 2 percent per annum	0 - 3.5 percent.
Inflation Forecast made by	staff	Executive Board	Governing Board	staff
Evaluation of monetary policy by external organisations	None	None	None	None

Sources: Web sites of central banks, revised from Fracasso, Genberg and Wyplosz (2003), Table 1.2.

(*) I define three types of decision process in central banks below.

First, "Simple Majority Voting" means central banks where there are the statements in the central bank act that prescribe the majority voting or the Chairperson has the casting vote.

Second, "Voting" means central banks where the committees vote on the policy but other legal provision about decision making process are not found.

Third, "Consensus" means central banks where the collective decision making processes in the committee are not explicitly stipulated.

(a) The Minister of Finance has the authority to direct the governor to follow a specific policy course.

(b) The Chairperson can break a tie.

(c) The President can break a tie.

Table 2: BOJ voting record (before March 19, 2001)

Monetary Policy Meeting dates	Target levels of the uncollateralized overnight call rate (Chairman's Policy Proposal)	The numbers of members who favored the Chairman's Proposal	The numbers of members who opposed the Chairman's Proposal	The names of members who opposed the Chairman's Proposal (see Note below)
1998/ 4/ 9	on average *slightly below the official discount rate (0.5 percent).*	9	0	------
4/24		9	0	------
5/19		9	0	------
6/12		7	2	*Miki* , N.Nakahara
6/25		8	1	N.Nakahara
7/16		8	1	N.Nakahara
7/28		8	1	N.Nakahara
8/11		8	1	N.Nakahara
9/ 9	on average *around 0.25 percent.*	8	1	Shinotsuka
9/24		8	1	Shinotsuka
10/13		8	1	*Shinotsuka*
10/28		7	2	*N.Nakahara* , *Shinotsuka*
11/13		8	1	*Shinotsuka*
11/27		7	2	N.Nakahara, *Shinotsuka*
12/15		7	2	N.Nakahara, *Shinotsuka*
1999/ 1/19		7	2	N.Nakahara, *Shinotsuka*
2/12	*as low as possible.*	8	1	*Shinotsuka*
2/25		7	2	*N.Nakahara* , *Shinotsuka*
3/12		7	2	*N.Nakahara* , *Shinotsuka*
3/25		7	2	*N.Nakahara* , *Shinotsuka*
4/ 9		7	2	*N.Nakahara* , *Shinotsuka*
4/22		7	2	*N.Nakahara* , Shinotsuka
5/18		7	2	*N.Nakahara* , Shinotsuka
6/14		7	2	*N.Nakahara* , Shinotsuka
6/28		7	2	*N.Nakahara* , Shinotsuka
7/16		7	2	*N.Nakahara* , Shinotsuka
8/13		7	2	*N.Nakahara* , Shinotsuka
9/ 9		7	2	*N.Nakahara* , *Shinotsuka*
9/21		7	2	*N.Nakahara* , *Shinotsuka*
10/13		7	2	*N.Nakahara* , *Shinotsuka*
10/27		7	2	*N.Nakahara* , *Shinotsuka*
11/12		7	2	*N.Nakahara* , Shinotsuka
11/26		7	2	*N.Nakahara* , Shinotsuka
12/17		7	2	*N.Nakahara* , Shinotsuka
2000/ 1/17		7	2	*N.Nakahara* , Shinotsuka
2/10		7	2	*N.Nakahara* , Shinotsuka
2/24		7	2	*N.Nakahara* , Shinotsuka
3/ 8		7	2	*N.Nakahara* , Shinotsuka
3/24		7	2	*N.Nakahara* , Shinotsuka
4/10		7	2	*N.Nakahara* , Shinotsuka
4/27		7	2	*N.Nakahara* , Shinotsuka
5/17		7	2	*N.Nakahara* , Shinotsuka
6/12		7	2	*N.Nakahara* , Shinotsuka
6/28		7	2	*N.Nakahara* , Shinotsuka
7/17		7	2	*N.Nakahara* , Shinotsuka
8/11	on average *around 0.25 percent.*	7	2	*N.Nakahara* , Ueda
9/14		8	1	*N.Nakahara*
10/13		8	1	*N.Nakahara*
10/30		8	1	*N.Nakahara*
11/17		8	1	*N.Nakahara*
11/30		8	1	*N.Nakahara*
12/15		8	1	*N.Nakahara*
2001/ 1/19		8	1	*N.Nakahara*
2/ 9		6	3	N.Nakahara, Taya, Ueda
2/28	on average *around 0.15 percent.*	7	2	N.Nakahara, Shinotsuka

Note: Members whose names are underlined and in italics are members who did not mention explicitly the target levels of the uncollateralized overnight call rate or insisted on other objectives than the uncollateralized overnight call rate.
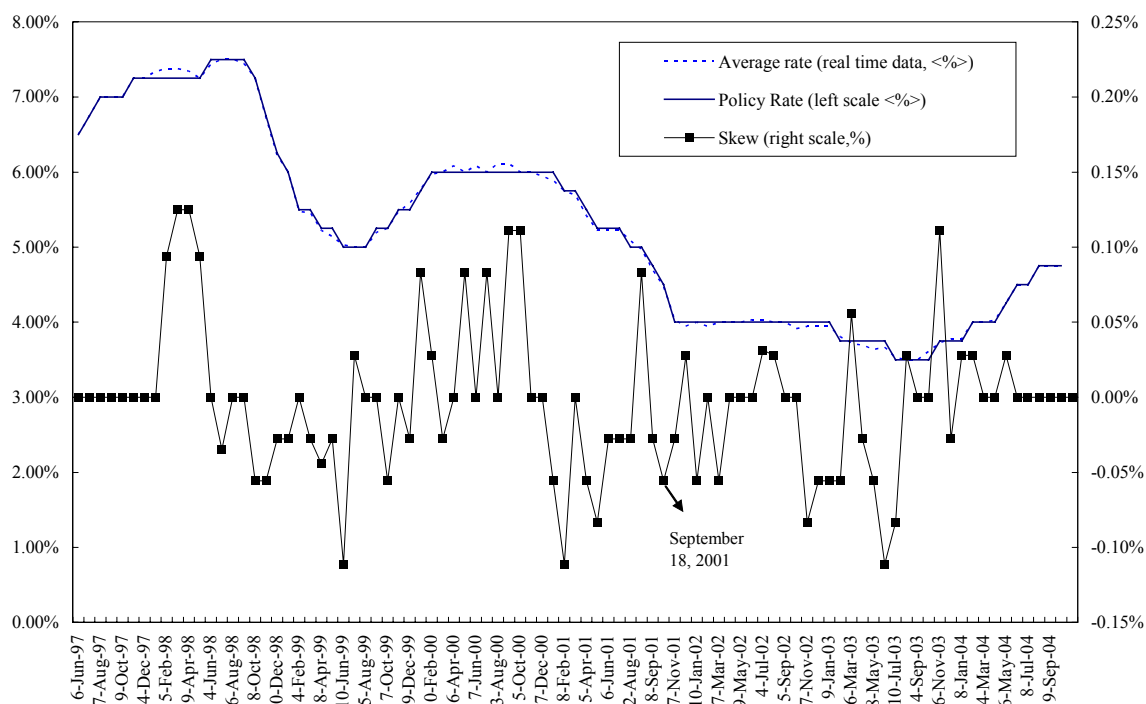
Table 3: BOJ voting record (after March 19, 2001)

Monetary Policy Meeting dates	Target levels of the outstanding balance of current accounts held at the Bank of Japan (Chairman's Policy proposal)	The numbers of members who favored the Chairman's Proposal	The numbers of members who opposed the Chairman's Proposal	The names of members who opposed the Chairman's Proposal
2001/ 3/19	*around 5 trillion yen.*	9	0	
4/13		9	0	
4/25		9	0	
5/18		9	0	
6/15		9	0	
6/28		9	0	
7/13		9	0	
8/14	*around 6 trillion yen.*	8	1	N.Nakahara
9/18	*above 6 trillion yen.*	8	1	N.Nakahara
10/12		8	1	N.Nakahara
10/29		8	1	N.Nakahara
11/16		8	1	N.Nakahara
11/29		8	1	N.Nakahara
12/19	*around 10 to 15 trillion yen.*	8	1	N.Nakahara
2002/ 1/16		8	1	N.Nakahara
2/ 8		8	1	N.Nakahara
2/28		8	1	N.Nakahara
3/20		8	1	N.Nakahara
4/11		9	0	
4/30		9	0	
5/21		9	0	
6/12		9	0	
6/26		9	0	
7/16		9	0	
8/ 9		9	0	
9/18		9	0	
10/11		9	0	
10/30	*around 15 to 20 trillion yen.*	9	0	
11/19		9	0	
12/17		9	0	
2003/ 1/22		9	0	
2/14		9	0	
3/ 5		9	0	
3/25		9	0	
4/ 8	*around 17 to 22 trillion yen.*	8	1	Fukuma
4/30	*around 22 to 27 trillion yen.*	9	0	
5/20	*around 27 to 30 trillion yen.*	7	2	Suda, Taya
6/11		9	0	
6/25		9	0	
7/15		9	0	
8/ 8		9	0	
9/12		8	1	Fukuma
10/10	*around 27 to 32 trillion yen.*	6	3	Suda, Taya, Ueda
10/31		9	0	
11/21		9	0	
12/16		9	0	
2004/ 1/20	*around 30 to 35 trillion yen.*	7	2	Suda, Taya
2/ 5		9	0	
2/26		9	0	
3/16		9	0	
4/ 9		9	0	
4/28		9	0	
5/20		9	0	
6/15		9	0	
6/25		9	0	
7/13		9	0	
8/10		9	0	
9/ 9		9	0	
10/13		9	0	
10/29		9	0	
11/18		9	0	
12/17		9	0	

Table 4: Japanese "Skew"

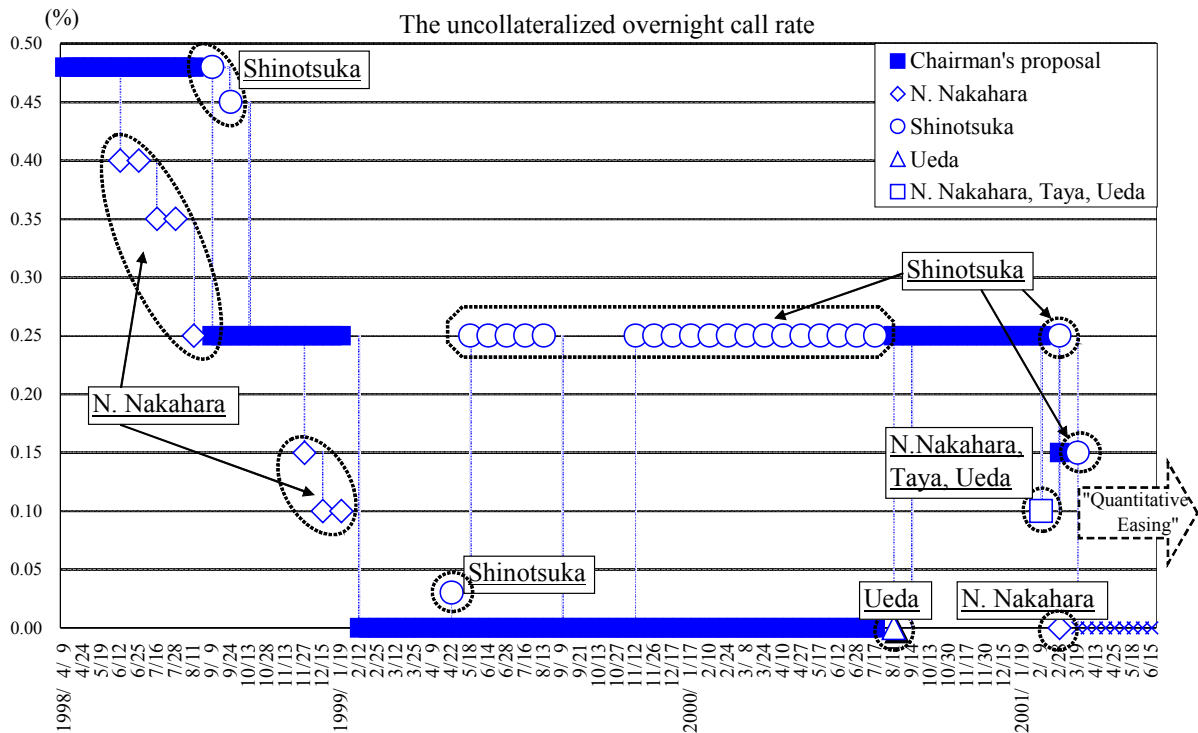| Sample	Meeting dates	skew <%>	chairman	Δi(t+3) <%>	timing of "t+3"	Dissented members
	1998/ 4/ 9	0.000	0.480		6/12/1998	------
1	4/24	0.000	0.480	0.000	6/25	------
2	5/19	0.000	0.480	0.000	7/16	------
3	6/12	-0.013	0.480	0.000	7/28	*Miki* , N.Nakahara
4	6/25	-0.011	0.480	0.000	8/11	N.Nakahara
5	7/16	-0.019	0.480	-0.230	9/9	N.Nakahara
6	7/28	-0.019	0.480	-0.230	9/24	N.Nakahara
7	8/11	-0.033	0.480	-0.230	10/23	N.Nakahara
8	9/ 9	0.033	0.250	0.000	10/28	Shinotsuka
9	9/24	0.029	0.250	0.000	11/13	Shinotsuka
10	10/13	0.000	0.250	0.000	11/27	*Shinotsuka*
11	10/28	0.000	0.250	0.000	12/15	*N.Nakahara* , *Shinotsuka*
12	11/13	0.000	0.250	0.000	1/19/1999	*Shinotsuka*
13	11/27	-0.017	0.250	-0.250	2/12	N.Nakahara, *Shinotsuka*
14	12/15	-0.025	0.250	-0.250	2/25	N.Nakahara, *Shinotsuka*
15	1999/ 1/19	-0.025	0.250	-0.250	3/12	N.Nakahara, *Shinotsuka*
16	2/12	0.000	0.000	0.000	3/25	*Shinotsuka*
17	2/25	0.000	0.000	0.000	4/9	*N.Nakahara* , *Shinotsuka*
18	3/12	0.000	0.000	0.000	4/22	*N.Nakahara* , *Shinotsuka*
19	3/25	0.000	0.000	0.000	5/18	*N.Nakahara* , *Shinotsuka*
20	4/ 9	0.000	0.000	0.000	5/18	*N.Nakahara* , *Shinotsuka*
21	4/22	0.005	0.000	0.000	6/28	*N.Nakahara* , Shinotsuka
22	5/18	0.042	0.000	0.000	7/16	*N.Nakahara* , Shinotsuka
23	6/14	0.042	0.000	0.000	8/13	*N.Nakahara* , Shinotsuka
24	6/28	0.042	0.000	0.000	9/9	*N.Nakahara* , Shinotsuka
25	7/16	0.042	0.000	0.000	9/21	*N.Nakahara* , Shinotsuka
26	8/13	0.042	0.000	0.000	10/13	*N.Nakahara* , Shinotsuka
27	9/ 9	0.000	0.000	0.000	10/27	*N.Nakahara* , *Shinotsuka*
28	9/21	0.000	0.000	0.000	11/12	*N.Nakahara* , *Shinotsuka*
29	10/13	0.000	0.000	0.000	11/26	*N.Nakahara* , *Shinotsuka*
30	10/27	0.000	0.000	0.000	12/17	*N.Nakahara* , *Shinotsuka*
31	11/12	0.050	0.000	0.000	1/17/2000	*N.Nakahara* , Shinotsuka
32	11/26	0.050	0.000	0.000	2/10	*N.Nakahara* , Shinotsuka
33	12/17	0.042	0.000	0.000	2/24	*N.Nakahara* , Shinotsuka
34	2000/ 1/17	0.042	0.000	0.000	3/8	*N.Nakahara* , Shinotsuka
35	2/10	0.042	0.000	0.000	3/24	*N.Nakahara* , Shinotsuka
36	2/24	0.042	0.000	0.000	4/10	*N.Nakahara* , Shinotsuka
37	3/ 8	0.042	0.000	0.000	4/27	*N.Nakahara* , Shinotsuka
38	3/24	0.042	0.000	0.000	5/17	*N.Nakahara* , Shinotsuka
39	4/10	0.042	0.000	0.000	6/12	*N.Nakahara* , Shinotsuka
40	4/27	0.042	0.000	0.000	6/28	*N.Nakahara* , Shinotsuka
41	5/17	0.042	0.000	0.000	7/13	*N.Nakahara* , Shinotsuka
42	6/12	0.042	0.000	0.250	8/11	*N.Nakahara* , Shinotsuka
43	6/28	0.042	0.000	0.250	9/14	*N.Nakahara* , Shinotsuka
44	7/17	0.042	0.000	0.250	10/13	*N.Nakahara* , Shinotsuka
45	8/11	-0.042	0.250	0.000	10/13	*N.Nakahara* , Ueda
46	9/14	0.000	0.250	0.000	10/30	*N.Nakahara*
47	10/13	0.000	0.250	0.000	11/30	*N.Nakahara*
48	10/30	0.000	0.250	0.000	12/15	*N.Nakahara*
49	11/17	0.000	0.250	0.000	1/19/2001	*N.Nakahara*
50	11/30	0.000	0.250	0.000	2/9	*N.Nakahara*
51	12/15	0.000	0.250	0.000	2/9	*N.Nakahara*
52	2001/ 1/19	0.000	0.250	-0.250	3/19	*N.Nakahara*
	2/ 9	-0.064	0.250			N.Nakahara, Taya, Ueda
	2/28	-0.007	0.150			N.Nakahara, Shinotsuka
	3/19	0.075	0.000			------

Note: Members whose names are underlined or in italics are members who did not mention explicitly the target levels of the uncollateralized overnight call rate or insisted on other objectives than the uncollateralized overnight call rate. Before September 9, 1998, the chairman's proposals are arbitrarily set at 0.48% for the purpose of computation. Before September 9, 1998, the policy board was not explicit about the target rate and only says "on average below the official discount rate (at that time 0.5%).

Figure 1: UK Repo rate and "Skew"

Notes: "Skew" is the gap between the repo rate (policy rate chosen by majority) and average voting rate. In computing the average rate, I assume that dissents before November 1998 deviated by 25 basis points from the majority view, following Gerlach-Kristen (2004). We need this assumption because preferred percentage decreases or decreases proposed by minority voters are not reported in the dataset disclosed by the Bank of England, titled "Voting by the Monetary Policy Committee - 1997 To Present date," downloaded from the Bank of England web site: http://www.bankofengland.co.uk/mpc/mpcvotingoct04.xls
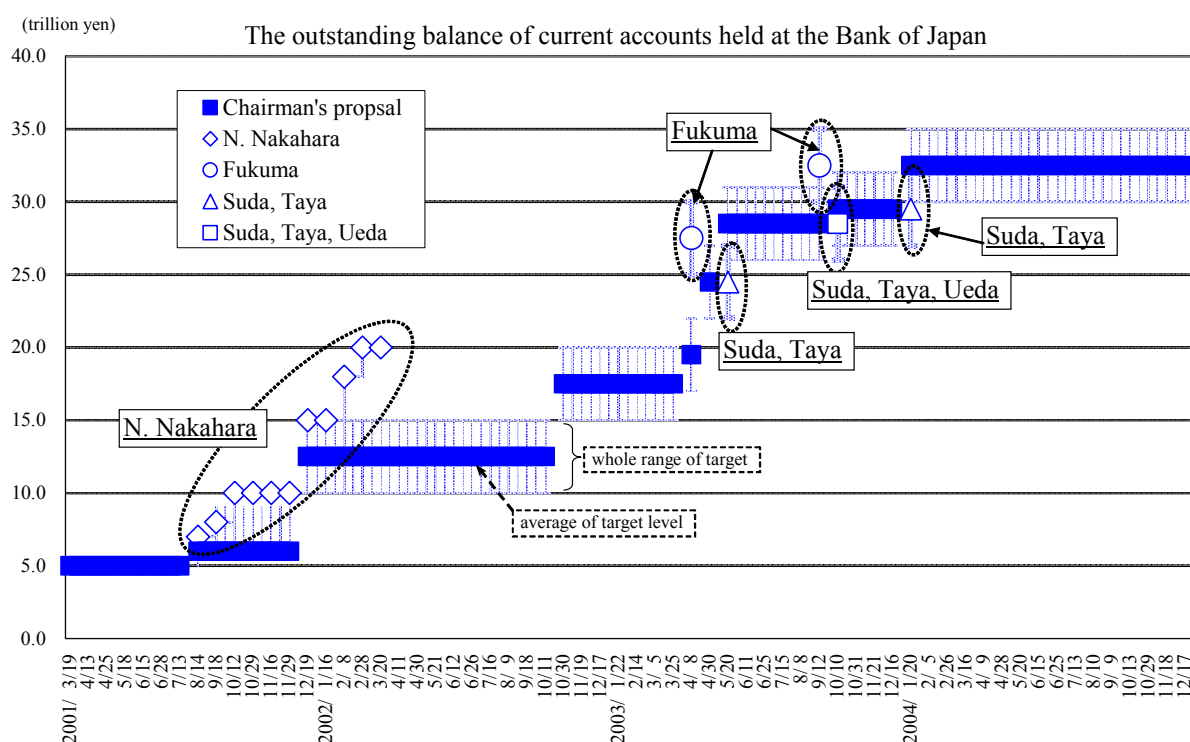
Figure 2: BOJ voting patterns

Notes: 1) On August 11, 2000, we regard Mr. Ueda as wanting to maintain the rate at zero. According to the minutes, Mr. Ueda dissented for the following reasons. First, it would be desirable to examine developments in the stock market for a little while longer. Second, the optimal interest rate had at last reached a level around zero, but it would be desirable to wait for the rate to rise clearly above zero. And third, judging from trends in inflation, the cost of waiting would be negligible. He added that his view of the economic situation did not differ significantly from that of other members.

(2) On 9, February 2001, we assume Mr. N. Nakahara, Mr. K. Ueda, and Mr. T. Taya vote in favor of this proposal, because those members vote against the Chairperson's proposal. According to the minutes, Mr. Taya proposed the following guideline for money market operations for the intermeeting period ahead and reduction of the official discount rate: The Bank of Japan will encourage the uncollateralized overnight call rate to move on average around 0.10 percent. The Bank of Japan will reduce the official discount rate, with effect from February 13, 2001, by 0.25 percentage point to 0.25 percent per annum.

Figure 3: BOJ voting patterns

(trillion yen)

The outstanding balance of current accounts held at the Bank of Japan

Legend:
- ■ Chairman's propsal
- ◇ N. Nakahara
- ○ Fukuma
- △ Suda, Taya
- □ Suda, Taya, Ueda

Fukuma

Suda, Taya

Suda, Taya, Ueda

Suda, Taya

N. Nakahara

whole range of target

average of target level

Notes: (1) May 19 and 20, 2003, we suppose that Mr. Taya and Ms. Suda prefer the outstanding balance of current accounts held at the Bank of Japan unchanged.

According to the minutes, Mr. T. Taya dissented from the above proposal and explained as follows. While he was aware that the Bank should provide more liquidity when necessary to secure financial market stability, taking into consideration the problem of Resona Bank, he considered that the Bank should deal with instability in the money market by using the contingency clause. Ms. M. Suda also dissented from the above proposal for the same reasons as Mr. T. Taya.
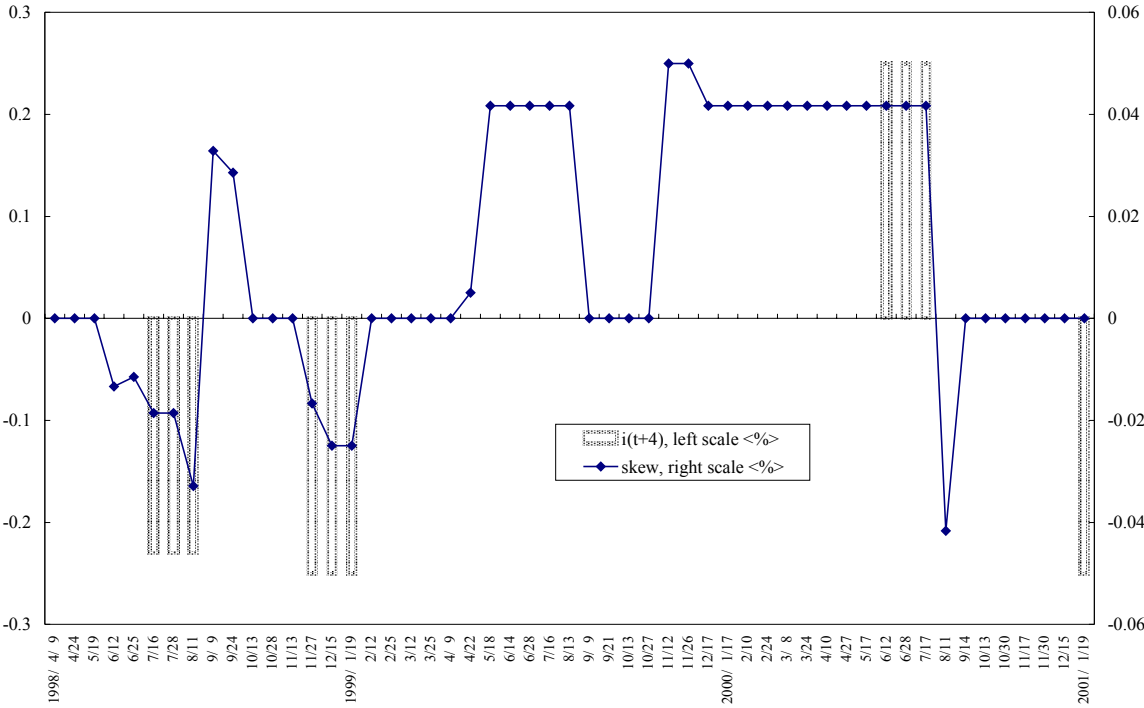
(2) October 9 and 10, 2003, we suppose that Mr. Ueda prefers the outstanding balance of current accounts held at the Bank of Japan unchanged.

According to the minutes, Mr. T. Taya dissented from the above proposal for the following reasons. First, in conducting money market operations, there was no particular problem with the current range within which the outstanding balance of current accounts at the Bank moved. And second, preemptive policy action to stabilize interest rates could impair the transparency of the Bank's conduct of monetary policy, and would also make it difficult for the Bank to explain it to the public. Ms. M. Suda also dissented from the above proposal, and gave the following reasons. First, it was appropriate to maintain the current guideline for money market operations given the Bank's assessment of the economy and the stability of the money market. Mr. K. Ueda dissented from the above proposal for reasons similar to those of Mr. T. Taya and Ms. M. Suda.

(3) January 19 and 20, 2004. We suppose that Ms. Suda prefers the outstanding balance of current accounts held at the Bank of Japan unchanged.

According to the minutes, Mr. T. Taya dissented from the above proposal for the following reasons. Positive effects could not be expected from raising the target range for the outstanding balance of current accounts at the Bank in the current situation, and there was a risk that it could lead to various misinterpretations. Ms. M. Suda also dissented from the above proposal for the following reasons. First, Japan's economy was basically in line with the standard scenario, and was, indeed, recently deviating marginally above the scenario. Second, the money market was stable. Third, there had been a fair degree of abatement of concerns about financial system stability and there were some signs of a decrease in demand for funds for the current accounts. And fourth, there was no technical problem in conducting money market operations at present. She added that the Bank should shift the focus of its quantitative easing measures from raising the target range to strengthening their transmission mechanism.

Figure 4:Japanese Skew and *Δi(t+3)*

Data Source: Table 4 of this paper.