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Do Words Speak Louder Than Actions?
Monetary Policy at the Bundesbank*

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ABSTRACT

This paper proposes a novel way to explain how the Bundesbank conducts monetary policy. We argue that communication by senior central bank officials with the public and government represents an instrument of monetary policy which complements discount rate changes or announcements of target growth rates for the money supply. Moreover, the communications instrument can help explain how a central bank can deal with the uncertainties inherent in monetary policy which are not appropriately transmitted via frequent changes in interest rates or monetary growth targets. Empirical evidence, using monthly data since 1982, vividly shows how speeches by Bundesbank officials, especially by its President, complement interest rate behavior.

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1. Introduction

Among central banks in the industrial world, the Bumdesbank consistently ranks as perhaps the most autonomous. Some attribute its success to Germany's infamous experience with hyperinflation in the 1920s. Others point to the Bundesbank Law of 1957 which guarantees its autonomy. Others still point to a population which places relatively more trust in the institution itself than in other public institutions, most notably the federal government. Finally, there are those who would emphasize the role of the personalities at the head of the Bundesbank, the proverbial "conservative" central bankers. While there is doubtlessly a grain of truth in all of the foregoing explanations, macroeconomists interested in the reactions of central banks to economic developments that have a direct bearing on the conduct of monetary policy have had a difficult time quantifying these in a meaningful fashion.

Taylor (1993) proposes a simple expression to explain how the US Federal Reserve follows a straightforward rule linking an interest rate (the Fed funds rate) to inflation and the output gap. Clarida, and Gertler (1997) show that a variant of this rule explains Bundesbank behavior reasonably well and is applicable to other central banks in the industrial world (also see Clarida, Gali and Gertler 1998). Estimates and the interpretation of monetary policy based on such rules are subject to some difficulties and criticisms which we briefly review below.

Unfortunately, estimates of reaction functions are not generally no better at explaining variations in an interest rate instrument.[1] While economists have long known

[1] Except perhaps when the central bank targets inflation. See Murchison and Siklos (1999) and references

that central banks have many instruments of policy it has been standard practice to assume that an interest rate alone represents an adequate proxy, in part because this approach seems to describe the practice of monetary policy in the US experience (e.g., see Bernanke and Blinder 1992). Bernanke and Mihov (1996), however, correctly point out that the Bundesbank, in particular, relies on a variety of instruments to implement monetary policy. Nevertheless, they find only marginal improvements from considering additional instruments in their model. Another problem is that the interest rate the central bank controls, namely a discount rate, tends to change rather less frequently than the market rates it is supposed to influence. The resulting smoothing of interest rates (Goodfriend 1991) is well known, of course, and we suggest a way in which it can be explained by resorting to an instrument of monetary policy hitherto not formally considered in the literature.

The instrument we consider is novel and highlights, we believe, a potentially important idiosyncrasy of the Bundesbank with lessons for other central banks.[2] To our knowledge, this aspect of policy making by the Bundesbank has gone almost unnoticed in the empirical central banking literature.[3] An institutionalist analysis of the German central bank reveals the importance of speeches by senior central bank officials at the Bundesbank as an instrument of monetary policy.[4] Unlike other central banks, the

therein.

[2] As we shall see, the relevant lesson is one that many central banks have since learned.

[3] Posen (1998, 1998a) mentions in general terms the role of Bundesbank communications with the public as one of the ingredients of its success. Also, see Bernanke et al. (1999).

[4] After undertaking this study we became aware of Guthrie and Wright (1998) who also rely on the notion of "open mouth operations" to explain how the Reserve Bank of New Zealand influences interest rates. However, in their framework, what matters are precise announcements about the stance of monetary policy and how these influence interest rates at high frequencies. The communications instrument considered in

Bundesbank is statutorily expected to comment publicly and give private advice to the government not only on matters of monetary policy but also about economic policy more generally. Therefore, we estimate a model where interest rate changes, along with proxies for communications with the public or with government, represent the principal instruments of monetary. We suggest that the role of communication with the public and government is a device that may also explain how a central bank can deal with the uncertainties inherent in monetary policy which are not appropriately transmitted via frequent changes in interest rates or changes in monetary growth targets. This aspect of the conduct of the monetary authorities may also serve to explain recent interest in transparency and accountability among central bankers in industrial countries.

Finally, while it is fairly well accepted that monetary policy in the US can be influenced not only by the President but also by the Congress, there has been little recognition that the federal structure of German politics and that of the Bundesbank Council can also have a separate influence (see, however, Kennedy 1991, Lohmann 1998, Vaubel 1997). Consequently, we are also interested in the role of electoral and partisan factors not only at the federal level but also how such considerations at the Länder (State) level may indirectly influence Bundesbank behavior.

The paper is organized as follows. The next section briefly describes how monetary policy is conducted at the Bundesbank and the role played by communications with the public and government. Section 3 derives the Bundesbank's reaction function.

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the present paper is of an altogether different variety.

Section 4 presents empirical evidence while the concluding section summarizes our results and their implications for the conduct of monetary policy more generally.

2. Monetary Policy at the Bundesbank

There exists a rich literature describing the actual behavior and performance of the Bundesbank (Buba). Recent comprehensive references include Kennedy (1991), Deutsche Bundesbank (1995, 1999), Heisenberg (1999), Maier and de Haan (1998), and Froyen and Pringle (1998). The objective of the present section is to briefly summarize some of the salient features of recent monetary policy experience in Germany.

The era covered in this study, namely the period since the early 1980s, with an emphasis on the years since German Economic and Monetary Unification (GEMU), is one where the monetary targeting policy introduced in the 1970s (see von Hagen 1999, 1999a, 1995) came to be seen as facilitating the goal of attaining and maintaining price stability. While it is well-known that the Bundesbank has often missed its money growth targets (e.g., see Bernanke and Mishkin (1992) and Baltensperger 1999), it is also clear that such targets were not really intended to be met rigorously at all times (e.g., Deutsche Bundesbank 1995, pp. 78-87). For von Hagen (1999a), the adoption of monetary targets served a political purpose, namely to emphasize the fact that the Bundesbank took the long view of the consequences of monetary policy actions and would not necessarily respond to every wiggle in the financial marketplace. Svensson (1999) argues that monetary targeting means less effective communication with the public because he assumes that the public interprets the credibility of Bundesbank actions through the lens of monetary targeting. As we shall see, we believe this may be a misreading of Bundesbank actions.

Three features of the laws governing the Bundesbank stand out in the present study. First, until the Maastricht Treaty came into force, the federal government could request that the Buba defer, but not overturn, a monetary policy decision it disagreed with. This power has never been formally invoked.[5] Thus, while the Buba is "independent of instructions..." from the federal government (Deutsche Bundesbank Act, section 12), it is expected to "...support the general economic policy..." of the same government. No doubt such wording raises the probability of conflict between the federal government and the Central Bank Council which is responsible for the conduct of monetary policy in Germany. Nevertheless, the politicians at the time, who understood the dangers inherent in establishing this kind of relationship between the Buba and the political authorities, felt that institutional structures to avoid such conflicts could not be adequately designed (Kennedy 1991; Wahlig 1998, pp. 45-55).

Also noteworthy is the formal recognition that the Bundesbank expected to provide advice to the federal government on "...monetary policy matters of major importance..." (Deutsche Bundesbank Act, section 13). The advisory role of the monetary authorities, while not surprising, is generally more informally established at other major central banks (e.g., the US Federal Reserve). While fear of the loss of autonomy may be one reason, it could also be argued that such a formal arrangement actually enhances

[5] Although Pöhl's resignation in 1991 comes close, at least in spirit, since he disagreed with the exchange rate conversion between the East German ostmark and the Deutschemark (DM) at the time of GEMU. The Buba is not formally responsible, of course, for exchange rate policy.

independence by permitting a form of "moral suasion" to operate in both directions. Indeed, more than one former President of the Bundesbank (e.g., Tietmeyer 1998) considers this aspect to be an important one in understanding the relationship between the federal government and the central bank.[6]

The third relevant element in the Buba's institutional role is the federal structure of German politics. While some authors have recently emphasized this feature (e.g., Lohmann 1998, 1994; Vaubel 1997; Maier and de Haan 1998; and Kennedy 1991, p. 20), it remains underemphasized in the wider discussion of central bank operations. This is somewhat surprising since federalism plays a significant role in political-economic discussions of the behavior of government agencies (e.g., Lijphart 1997). It is widely believed, for example, that the appointment process of boards at central banks can lead to partisan-like behavior by the monetary authority, at least in the US experience (e.g., Havrilesky 1995), and there is some evidence for this type of influence in German monetary policy (and of partisan cycles more generally (Vaubel 1997); Frey and Schreider 1981; Soh 1986; Alesina, Cohen, and Roubini 1992; Johnson and Siklos 1996). The problem is that a majority of the Bundesbank's Central Bank Council (CBC; currently 9 of 17 members down from 11 prior to 1992) consists of appointments made at the Länder level[7] while the remaining members, including the Bundesbank President, are nominated by the federal government. Even if the President is considered "primes inter pares",

[6] Neumann (1999, p. 277) produces the following quote from the 1972 Bundesbank Annual Report: "This means that the Bundesbank ... can approach the Federal Government on its own initiative, and must do so if it considers, in its duty-bound judgement, advice ... to be called for."

[7] To be more precise, the Presidents of the Länder Central Banks are nominated by the Bundesrat and are appointed by the President of the Federal Republic. See Deutsche Bundesbank (1995).

much like the Chair of the US Federal Reserve Board, and the Directorate pre-eminent in monetary policy decision-making, there is at least the potential for conflicts arising within the CBC, and this aspect of the relationship between the Bundesbank and the political authorities may, at times, be decisive.[8]

The foregoing considerations suggest that rivalry between the Bundesbank and the federal government is a constant.[9] Hence, the mere reliance on conventional measures of the direction of monetary policy implicit in the use of monetary aggregates and/or interest rates omits a potentially important element in the conduct of monetary policy at the Bundesbank. We argue that an important feature of monetary policy in Germany lies

[8] The CBC meets less often than the Directorate and the latter is considered closer to the conduct and operations of monetary policy. Consequently, CBC members "face" politicians frequently while the Länder representatives are somewhat more removed from political aspects of monetary policy decision-making. Lohmann (1998) goes into more detail in explaining the differences between the US and German institutional arrangements at this level, as well as reviewing the literature on partisan/electoral influences on the Bundesbank.

[9] Berger and Schneider (1997) also take this view in their study of Bundesbank behavior from the 1950s through the early 1970s. However, they conclude that the Buba always "got its way" even in the realm of exchange rate policy. The literature is far from being in agreement with this view.

in public (and private) communication by senior Bundesbank officials with the general public (and government officials). As Bundesbank President Tietmeyer (1998, p. 5) wrote:

> "...the Bundesbank's role as a guardian of monetary stability must of necessity extend beyond its decision-making powers in the field of monetary policy. It has to draw attention – at as early a stage as possible – to potential risks to stability in other areas and parallel behavioral patterns in the economy or in society."

Later he goes on to add:

> "[The Bundesbank] ... has placed itself under the obligation to explain and justify its policy as well as its assessment of developments that are relevant to monetary policy. Its target group is the general public, which it addresses through the speeches of the members of its governing bodies..." (Ibid., p. 5).

To be sure, the "instrument" of monetary policy implied by the foregoing discussion is a subtle one. We hypothesize that it can be proxied by the number and topic of speeches given by senior central bank officials. Of course, such an approach can only represent a noisy indicator of its role as an instrument of policy. Nevertheless, it is reasonable to suppose that the number of speeches on a given topic during some specified period reflects the intensity with which the Central Bank Council wishes to "draw attention" to "potential risks" in the economy with implications for monetary policy. Moreover, communication with the public is the obvious means through which the Bundesbank can maintain favorable public opinion of its policies, deemed to be a key ingredient of its success (e.g., Neumann 1999 and Richter 1999). This form of communication may or may not be noisy, as in "cheap talk", but the instrument used by the Bundesbank and considered here is not intended to compromise their stated objective.

Instead, the goal of such speeches is quite the opposite. In terms of Garfinkel ond Oh's (1995) framework then, the Bundesbank "speaks" precisely to minimize the "ambiguity" of its policies.

The above discussion, however, also makes clear the potential for conflict between the Bundesbank and the federal government.[10] While communication with the public may represent one device through which such activity may emerge there is doubtless also a less public manner in which disagreements surface and are dealt with.[11] We, therefore, attempt to quantify such conflicts via a proxy derived from the behavior of economic fundamentals which, we argue, can explain, in probabilistic terms, the likelihood of such conflicts.[12]

3. Reaction Functions of the Bundesbank

3.1 Taylor's Rule and the Bundesbank

It is well-known that the Bundesbank sets its "normative" or "unavoidable" inflation rate on the basis of a quantity-theoretic relationship (e.g., Deutsche Bundesbank 1992). Moreover, the monetary authorities are interested in the path of the growth rates of the variables of interest relative to their desired rates of change. Consequently, we can write

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[10] Frey and Schneider (1981), Berger (1997) and Berger and Schneider (1997) also use "conflict" as an indicator of sorts of monetary policy. However, the construction of their proxy not only differs markedly from the one proposed here but its role is rather different in nature. In their model, conflict essentially stems from a divergence between fiscal and monetary policies. Here conflict is viewed as originating from a much broader set of circumstances.

[11] Tietmeyer's (1998a) recollections of events surrounding GEMU represent one such example, albeit one that is very likely non-recurring in nature.

[12] One can imagine such conflicts as part of the Bundesbank's "loss" function. A typical formulation would be written Install Equation Editor and double-click here to view equation. where deviations from desired levels of output (y) and inflation (π) are the usual sources of conflict between the government and the central bank (with the former possibly placing greater emphasis on *a* while the latter gives greater weight to *b*). The standard formulation is augmented by

$$\Delta M = \pi + \Delta y - \Delta V \qquad (1)$$

where ΔM is the growth rate of the money stock ($M3$ for our purposes), π is the inflation rate, Δy is the growth rate of output, and ΔV is the rate of change in velocity. Targets for $M3$ then are set according to (1) or:

Install Equation Editor and double-click here to view equation.

where the bars over the variables indicate notional values. As noted earlier, the Bundesbank is unlikely to respond to every economic shock by changing interest rates.

$$\overline{\Delta R_t} = \alpha (\Delta M - \overline{\Delta M})$$
$$0 < \alpha < 1$$

Hence, desired interest rate changes could evolve according to:

The fact that $\alpha < 1$ implies that other instruments are used in central bank policy making, such as "communication" with the public and government. In order to highlight Bundesbank policy in terms of the now familiar Taylor rule, we omit these other considerations for the moment. Now, let $\overline{R}_{t-1} = R_{t-1}$, so that actual and desired interest rates coincide in the previous period.

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a partially observable measure of conflict (K) not necessarily directly related to either y or π.

Assuming the Bundesbank reacts to deviations between ΔM and $\overline{\Delta M}$ we can use

$$\overline{R}_t = R_{t-1} + \delta(\pi_{t+1} - \overline{\pi}) + a(\Delta y_{t+1} - \overline{\Delta y}) + \theta(\Delta V_{t+1} - \Delta\overline{V})$$

(1), (2), and (3) to obtain

Equation (4) is akin to a Taylor rule except that the central bank reacts to deviations in output growth and not its level. Moreover, deviations from the notional growth rate in velocity also influence the current period notional interest rate level. In addition, the reaction function is forward-looking which is also compatible with how the Bundesbank conducts monetary policy. Equation (4), however, omits other "instruments" of monetary policy stemming from political factors, which we consider below. For the time being, however, we proceed with two versions of (4). In one variant, we assume $\Delta V_{t+1} = \overline{\Delta V}$, while this assumption is relaxed in the second version. The reason for this approach is that it is unclear whether the Bundesbank considers adjustments in trend velocity in the short-run.[13] Instead, deviations from some desired level of velocity may be viewed as a long-run restriction which may not be useful for short-run forecasting purposes.[14]

3.2 The Estimation Framework

While our approach to estimating a reaction function for the Bundesbank can be traced to some of the existing approaches in the literature, namely Johnson and Siklos (1996), Murchison and Siklos (1999), Bernanke and Mihov (1996), Evans and Kuttner (1998),

[13] A reading of Bundesbank policy actions during the period covered in this paper (e.g., Baltensperger 1999) suggests little variation in $\Delta\underline{V}$.

[14] In a cointegration interpretation it is not clear whether the error corrections resulting from $\Delta V - \Delta\underline{V}$ would

Clarida, Gali and Gertler (1998), and others, we introduce several new features to the estimation process which essentially proceeds in two stages.

In implementing monetary policy, we assume that the Bundesbank uses some model to forecast the future course of the German economy, along with other relevant information.[15] Since not all this information is observable to the econometrician we assume that the forecasting model is a VAR. Let

$$X_t = B(L)X_{t-1} + C(L)I_{t-1} + \mu_{1t} \tag{5}$$

$$I_t = B'(L)X_{t-1} + C'(L)I_{t-1} + \mu_{2t} \tag{6}$$

where $B(L)$, $B'(L)$, $C(L)$ and $C'(L)$ are distributed lag functions for the vectors X_t and I_t. The vectors X_t and I_t, respectively, represent the variables which are the focus of monetary policy, namely inflation, output or the unemployment rate, and the direct instruments of monetary policy, that is, an interest rate and money growth. Equations (5) and (6) are similar to the specifications used by Johnson and Siklos (1996) and Bernanke and Mihov (1996). However, we introduce two modifications to the basic VAR formulation. First, (5) and (6) are estimated recursively, as did Johnson and Siklos (1996), as well as in a rolling fashion.[16]

Many (e.g., Rudebusch 1998, Evans and Kuttner 1998) have pointed out that the coefficients from a VAR may change over time in a manner that is not captured by full sample estimation. An obvious alternative then is to estimate a baseline VAR model and

be useful for short-run forecasting purposes.

[15] As is likely at central banks elsewhere, projections from some economic model usually represent the starting point for policy-making. Deutsche Bundesbank (1999) also highlights the role of alternative scenarios used by members of the Bundesbank CBC in reaching a consensus about the future direction of the economy.

[16] Murchison and Siklos (1999), who considered a longer sample for a group of 19 OECD economies in a

reestimate it either by adding one observation at a time or by fixing the length of the sample. The resulting forecasts then more accurately reflect the information available to the policy maker at the time the forecast is made, as well as explicitly taking into account potential instability in the underlying relationships of interest.

Potentially problematic is the fact that forecasts based on (5) and (6) are conditional on information available at time *t-1*. There is, however, convincing evidence (e.g., see Orphanides (1997), and Ghysels, Swanson, and Callan 1998) that data revisions can have a significant impact on estimates of reaction functions. In addition, as noted most recently by Goodhart (1999), there are good reasons why central banks do not immediately act on the arrival of new information, either because they are unsure about the implications of new information or their natural caution or "conservativeness" leads to a "wait and see" attitude. To account for this possibility, we also consider a modification of (5) and (6) by restricting the information set to $t-k$, $k>1$ so that data in the period $k-j$, $j<k$, are not used to generate the forecasts of interest. Details are provided below.

The Bundesbank is assumed to use (5) and (6) to generate forecasts for the elements of X_t and I_t. Changes in the instruments are assumed to respond to shocks in X_t and I_t. In what follows, however, we first focus on the reactions of the Bundesbank on the interest rate. Given estimates of (5) and (6) we form the Bundesbank's interest rate reaction function as follows:

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panel, also advocate rolling VARs.

$$\Delta R_t = \alpha_0 + \alpha'_{1i}(L)\hat{\mu}_{it} + \alpha'_{2i}(L)\,\text{boldP}_t + \alpha_3(L)\Delta R^f_t + \alpha_4(L)\Delta R_{t-1} + u_{1t}$$

where ΔR_t is the change in the interest rate instrument, and $\hat{\mu}$ is the vector of forecast errors from (5) and (6), while P_t is a vector representing partisan, electoral, or other institutional pressures on monetary policy. The variable ΔR_t^f is the change in some foreign interest rate. There is little doubt that Germany's role in the European Monetary System (EMS) in the years leading up to European Monetary Union (EMU) warrants reactions to interest rate developments abroad. The US Fed funds rate is the natural candidate as a proxy for R^f. The vector P can be viewed as capturing the salient domestic political pressures on monetary policy, while ΔR^f captures foreign pressures on the Bundesbank. While the model is assumed to represent the central bank's view about the future evolution of the aggregates of interest, the fitted parameters in the reaction functions do not describe the structure of the economy. Nevertheless, the fitted parameters for α' can still be thought of in a sense as representing the preferences of the central bank since identification is not really as much an issue when the objective is to forecast the future course of the economy. The criteria are instead purely statistical.

Over and above direct or conventional instruments of monetary policy, we argue that communication with the public is critical to understanding how the Bundesbank sets interest rates. Separate equations are therefore specified to describe the public and private communications instruments of the Bundesbank. We begin with the observable component of the communications instrument. The relevant "reaction" function is described by the following equation:

$$PC_t = \beta_0 + \beta_{1'i}(L)\,\hat{\mu}_{it} + \beta_{2'i}(L)\,\text{boldP}_t + \beta_3(L)\,\text{BUBA}_t + \beta_4(L)\,\Delta R^f_t + \beta_5(L)\,\Delta R_{t-1} + u_{2t}$$

where PC_t proxies communications via speeches by the President of the Bundesbank in public (or through a public medium), and all other variables have been previously defined. Since our data set also includes speeches by the Vice-President and other members of the CBC (most notably the Chief Economist and Presidents of the Länder central banks) we consider various versions of the dependent variable. To avoid burdening the notation, however, we refer to all variants with the same definition (i.e., *PC*). The variable BUBA captures a potential bias inherent in the construction of PC_t which arises because some speeches may be the result of regular monetary policy events (e.g., CBC meetings, announcement of monetary targets, release of annual reports), and not necessarily intended to convey monetary policy stance or objectives. Moreover, the definition of PC encompasses a variety of topics which are the focus of various speeches. Details are provided in the next section.

When the information set used to generate the forecast is restricted, for reasons articulated above, the $\hat{\mu}$ in (7) and (8) are replaced by ${}_{t-k}\hat{\mu}_t$ where it is clear that the forecast errors are conditional on information used only until time *t-k*. For example, in the case of inflation we write

$${}_{t-k}\hat{\mu}^{\pi}_t = \pi_t - {}_{t-k}\hat{\pi}_t$$

where ${}_{t-k}\hat{\pi}_t$ is the inflation forecast for time *t* from a VAR estimated using data until time *t-k*, *k*> 0.

It is not clear, of course, the extent to which speeches represent pure surprises to markets.[17] Nevertheless, the Bundesbank may feel it is necessary at times to communicate via speeches the reasons for the changes, or to explain how Bundesbank Council arrived at a decision.

A potential difficulty with reaction functions (7) and (8), as specified, is that any "surprise" at *t-k*, *k*≥1, can potentially elicit an interest rate reaction. It is unclear, however, whether this view reasonably describes how the CBC arrives at a decision to change interest rates. Instead it is conceivable that, consistent with the 'conservative' central banker approach, the Bundesbank waits for an accumulation of evidence before changing its position on the stance of monetary policy. Alternatively, the Buba may be viewed as reacting only when a shock is larger than some threshold.

To account for these separate possibilities, we also consider the following variants of $\hat{\mu}$ in (7) and (8). They are:

$$T_t = \begin{cases} \hat{\mu}_t & \text{if } |\hat{\mu}_t| \geq 2\sigma_{\hat{\mu}} \\ 0 & \text{otherwise} \end{cases}$$

$$\hat{\mu}^* = \sum_{j=1}^{3} \hat{\mu}_j$$

[17] It is, therefore, clear that speeches by Bundesbank officials are rather different in nature from the pure surprises in the framework of Guthrie and Wright (1998) since speeches may, but need not always, contain an element of surprise.

In the first expression, the Bundesbank acts in response to the accumulation of forecast errors over a three-month period.[18] In the second equation, we define an indicator such that any shock larger than two standard deviations of forecast errors over the chosen sample prompts reaction by the central banks; otherwise, there is no economic pressure to change interest rates.

While there is admittedly some arbitrariness in the specification of the nature or size of forecast errors which might lead to a decision by the Bundesbank's Council to change interest rates, both variants attempt to capture the flavour of the concept of "unavoidable" inflation. This expression conveys the notion that frequent reactions by the Buba are undesirable in order to maintain its image among the public and the financial markets at large. Hence, each shock leading to, say, more inflation may be unavoidable thereby not eliciting an interest rate response by the Buba. However, cumulative shocks of this kind, or unduly large shocks, may prompt the appropriate interest rate response. In this sense it becomes clear that communication by Bundesbank officials are seen as complementing interest rate policy.

3.3 Advice to the Government and Conflicts.

As noted previously, the Bundesbank is expected to give advice to the government not only in the sphere of monetary policy but it can and does comment, either privately or publicly, about the government's overall economic policy, and fiscal policy in particular. Both forms

[18] We also considered a 6 month horizon with no impact on the conclusions.

of communications may give rise to conflicts, some of which may spillover into the public sphere.

What might give rise to such conflicts and how might the Bundesbank react? One of the most visible ways of creating or exacerbating an existing conflict is obviously through a change in the discount rate. Alternatively, senior officials of the Bundesbank may galvanize public opinion via speeches and force the government to change course or accept the Bundesbank's view. Finally, it is likely that communications between the federal government and the Buba take place in private and this is more likely the greater the divergence in views between the two authorities and, hence, the greater the atmosphere of conflict in monetary policy. This aspect of policy is, of course, unobservable but we may presume that there exist observables which mirror the intensity of conflicts between the monetary and federal authorities. As a result, a further influence on estimates of (7) and (8) is present since conflict, as such, is not necessarily reflected in the reaction functions as currently specified.

To account for this bias we generate a proxy for conflicts between the Bundesbank and the various levels of the German government constructed by estimating of the following specification:

$$K_t = \delta_0 + \delta'_1(L)\,P_t + \delta_2(L)\,\Delta \ln DR_t + \delta_3(L)\,ERM_t$$
$$+ \delta_4(L)\,[M3_t - M3^*] + \delta_5(L)\,PC'_t + v_t$$

where P_t is as previously defined. K_t is a two state variable depending upon whether the economy is in a recession or not. In the former $k=1$, while $k=0$ in the no recession case. We assume that conflicts between the central bank and the government are more likely to flare up during an economic downturn than during an expansion. The variable *DR* is the German discount rate and it is assumed that conflicts are more likely when $DR>0$ than when changes are zero or negative.[19] The variable *ERM* is set to 1 in the month an exchange rate realignment takes place, and is 0 otherwise.[20] The foregoing variable attempts to capture the notion that government-central bank conflicts can also occur because their policies are at odds with those of their major trading or political partners, even if no formal conflict exists between each other. Moreover, such conflicts can arise because exchange rate policy is not the direct responsibility of the Bundesbank. The variable $[M3_t - M3^*]$ measures deviations from the money growth targets announced by the Bundesbank. There has been considerable discussion about the role and significance of these targets which we do not review here (see, however, von Hagen 1999, and Svensson 1999). Nevertheless, we entertain the possibility that significant departures from the stated target may signal a divergence from desired monetary policy. To the extent that such deviations reflect the impact of fiscal or exchange rate policies these may produce conflict with the government.

Finally, PC_t represents a proxy for the influence of private communications between the government and the Bundesbank as an indicator of conflict. Given the nature of the central bank as independent of, but not from, government it may be that not all conflicts spillover into the public domain. Since such a variable is not directly measurable we resort to a proxy by assuming that public communication by senior central bank officials of the

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[19] We also consider the log transformation for DR to cover the possibility that a given change in the discount rate is more likely to create a conflict when interest rates are low than when they are high.

[20] We also considered the variable Install Equation Editor and double-click here to view equation. which is the inflation differential between Germany (G) and the average inflation rates in France and Italy. Such differentials have often been a source

Bundesbank is a device used by the Bundesbank to signal a portion of the conflict with government.

3.4 Estimation.

As noted earlier, estimation proceeds in two stages. First, VARs are estimated to generate the forecasts used as inputs into the reaction functions (7) to (9). Estimates of (7) to (9) are then used to interpret how the Bundesbank conducts monetary policy. We initially provide baseline estimates of (7) – (9) by estimating them individually. Whether the two principal instruments of monetary policy, namely *R* and *PC*, complement each other or not is, of course, an empirical question. Note that the nature of the dependent variables in (8) and (9) require a somewhat different estimation approach.

4. Data and Econometric Issues

We consider two separate VAR models which are used to generate the central bank's

$$(X_{It}, I_t)' = (y_t, \pi_t, M3_t, R_t)'$$

forecasts. They are:

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of conflict within the European Union as have the frequent realignments in the EMS. The variable was dropped because it proved highly insignificant in all specifications and, in any event, seems to mimic the EMS dummy.

where y_t = annual real GDP growth

π_t = annual CPI inflation

$M3_t$ = annual growth in M3

U_t = unemployment rate

R_t = call money rate (tagesmarktgeldsatz)

All series are monthly, not seasonally adjusted. The basic VARs also include deterministic seasonal dummies, in addition to a constant and a deterministic trend. All growth rates are evaluated as annualized monthly log differences. The data are from Deutsche Bundesbank (1998) as well as from various issues of the *Monthly Reports* of the Deutsche Bundesbank. The initial VARs are estimated over the sample 1984:01 – 1989:12, or 1977:06 – 1982:01. Each of the VARs were then reestimated by adding one observation at a time until the end of the sample, 1998:12. Hence, in the first case, the first forecast is for 1990:01 so that 108 monthly forecasts were generated for each case. There were 203 separate forecasts generated using the VAR for the longer sample. We also experimented with the selection of the lag length in the VAR. Essentially, we considered 6 or 9 lags, mindful of the need to preserve a reasonable number of degrees of freedom for the initial VARs especially. As the sample size increases, the information content is reduced. However, Evans and Kuttner (1998) argue that this may, in fact, be beneficial in the present context. An alternative is either to roll the baseline VAR or keep the lag length, as a fraction of the sample, roughly constant. For these VARs we imposed a fixed sample of either 72 observations (1985:01-1989:12) or 55 observations for the case where the sample begins in 1977:06.

Separate forecasts were also generated by restricting the information set, as explained in the previous section. We allowed for either a 3 or a 6 month lag between the end of a particular sample and the first forecast period. For example, an initial VAR was estimated for the sample 1985:01 – 1989:10 to produce a forecast for 1990:01. Data for 1989:11 – 1999:01 are thus ignored. In the case of a six month lag, the initial sample would be 1985:01 – 1989:07. Forecasts from the VAR are then updated recursively. For the purposes of this exercise only 6 lags are included in all VARs and a similar experiment was undertaken for the longer sample. In all then, several hundred forecasts and VARs were generated.

To estimate reaction functions (7) to (9) we require other data, in addition to the forecast errors generated from (10) and (11) used as inputs. Electoral variables were constructed from the Statistisches Jahrbuch (various issues). Moreover, we distinguish between federal (BUNDES) and Länder (LANDES) elections. "Left-wing" governments are assigned a value of –1 while "right-wing" governments are assigned a value of +1. To economize on the loss of degrees of freedom we simply aggregated the dummies for the individual Länder.[21] While our results may be sensitive to a form of aggregation bias we could not estimate reaction functions using separate partisan dummies for Bavaria (Bayern) and Baden-Würtenberg (BW), considered to be the two most influential Länder in Germany,

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[21] In constructing the partisan and electoral dummies we only considered the 11 original Länder omitting the new Länder which joined following GEMU.

since they are considered to have been governed by "right-wing" governments throughout our sample. The relevant data were also obtained from the Statistisches Jahrbuch.

A variety of formulations were considered for the electoral variables. In much of the political business cycle literature electoral or partisan dummies are set to +1 for some months prior to an election and zero thereafter. We experimented with a number of different formulations but ended up making the electoral/partisan dummies active the election month and 3 months before the election. Alternatively, as in Johnson and Siklos (1996), we also considered the possibility that political pressure on the monetary authorities might lead to a deferral of a necessary tightening of monetary policy until after an election, or an artificial loosening of policy which is then reversed after an election. In this case, the dummy BUNDES is active before an election (with the variable set to +1) as well as after the election (with a value of –1) so that the sum is zero.

It is also conceivable that the Bundesbank relies on indicators other than forecast errors from VARs in deciding whether to influence interest rates or communicate more frequently with the public or government. Therefore, we wish to consider the possibility that the Bundesbank reacts to "disequilibria" specified in alternative forms. For example, it is popular to fit a Hodrick-Prescott (1998) filter, especially to time series such as output or unemployment rates. Consequently, we modify $\hat{\mu}^{U}$ and $\hat{\mu}^{y}$ to consider these alternatives in defining some underlying "equilibrium"in some of the variables of interest.

Bundesbank monetary policy is also characterized by the adoption of monetary targeting. Data for the target ranges for M3 (M3*) are taken from various issues of the Deutsche

Bundesbank *Monthly Reports*. Hence, we also consider deviations from the mid-point of the target range as a proxy for $\hat{\mu}^{M3}$.

The Bundesbank publishes on a bi-weekly basis a summary and/or full texts of speeches by senior central bank officials. The publication is known as Auszüge aus Presseartikeln (press excerpts). It contains primarily the speeches by the President (roughly 90% of them) while a smaller fraction of speeches deemed "important" by the vice-president and other senior officials (see below) are reproduced. [22] The speeches are classified by topics. After some experimentation we aggregated data on the frequency of speeches along three sets of topics. They are:

Exchange rate policies [111] (Währungs-, Geld-, Krecht-, und Devisenpolitik)
Economic Policy [131] and Prices [132] (Wirtschaftpolitik, Arbeitsmarkt, Löhne, und Preise).
EMU [231] and EURO [232] (Europaische Wirtschafts-und Währungsunion, Europaische Währungs-institut, Europaische Zentralbank),

where the numbers in brackets are the codes used to identify the type of speech.

The speeches were further classified according to the senior official who gave the speech. Three categories were created here. They are:

Speeches by the President of the Bundesbank (PR).
Speeches by the Vice-President of the Bundesbank (VP).
Speeches by other senior officials (Chief Economist, President of Landeszentralbanken; OT).

Hence, in total, twelve categories of data on speeches were created (PR111, PR131, PR132, ...). Finally, data related to announcements related to changes in the discount rate, events

[22] Since approximately 1996, all speeches by senior Bundesbank officials are published on their website (http:/www.bundesbank.de). In discussing the ideas of this paper with officials of the Bundesbank we were (pleasantly) surprised that such counting of speeches is also done by the Press Office.

in the European Union or other news items noted by the Bundesbank were taken from various issues in the Deutsche Bundesbank's Annual Report which publishes separate chronologies of events in the policy and economic spheres. The data span the 1982:01 – 1998:12 period. Prior to 1989, speeches dealing with the Euro are not recorded. It may be that the frequency or intensity with which Bundesbank officials coment on other aspects of policy may be influenced by such events, so we also consider a sub-sample (1990-98).

Due to the nature of the dependent variable in (8), a natural approach is to use the count model approach (e.g., see Cameron and Trivedi 1998, and Winkelmann 1997). Expected counts are assumed to follow the (log) Poisson distribution and maximum likelihood is used to estimate (8) while the standard errors are estimated by the Huber-White procedure which is robust to certain misspecifications. Finally, the binary nature of the dependent variable in (9) suggests that it be estimated via the logit approach. Dates for recessions were obtained from Artis, Kontolemis and Osborne (1997) who constructed reference cycle dates based on German industrial production following an NBER-like approach . Estimates are generated via maximum likelihood using the BHHH algorithm while the standard errors are also estimated via the Huber-White procedure.

A frequent problem in many count model applications is the dominance of zero events (i.e., no speeches) leading to a skewed distribution or oversdispersion. Tests show this to be a problem in about half of the speeches by the Bundesbank President (results not shown) and is a more serious problem for the speech count by other senior officials. A variety of techniques may be used to handle such situations but attempts to consider these did not impact on our conclusions. In any event, there appears to be considerably less overdispersion than in typical count model studies (see Cameron and Trivedi 1998, Winkelmann 1997).

5. Empirical Results

5.1 The Shocks to Monetary Policy

Summary information about the "shocks" or forecast errors generated via the various estimated VARs (not shown) reveal that the initial sample, the length of the information set used to generate the VAR-based forecasts, as well as whether the forecasts are based on recursions or are produced via rolling VARs all have an important bearing on forecast performance. The role of the estimation procedure becomes clear on inspection of simple correlations between forecast errors generated from various data restrictions on the VARs (not shown). While forecast errors between recursive and rolling VARs are fairly high the most interesting result is the low correlation between forecast errors which use data available until *t-1* as opposed to limiting the sample to either three (i.e., *t-3*) or six (i.e., *t-6*) months prior to the first forecast period. Clearly, whether policy makers use the latest available data or not has an important impact on VAR-based forecasts. In general, one concludes that forecasts which are derived from models which omit the last few available observations actually outperform ones based on the fully available data set based on the RMSE criterion. Of course, we have no way of knowing a priori whether, and under what circumstances, policy makers will choose to ignore the latest data.

Table 1 provides summary information about the number and topic of speeches since 1982. Not surprisingly, speeches dealing with EMU and the exchange rate dominate in sheer numbers since 1989, but it is the timing of the speech, the type of speech, and the official who delivers them, that may provide new insights about how monetary policy is conducted at the Bundesbank.

5.2 Reaction Function Estimates: Interest Rates and Public Communication.

We begin with a discussion of baseline estimates of (7) and (8) which are shown in Table 2. As noted above, a wide variety of proxies were considered for the purely economic shocks the Bundesbank may or may not respond to. Accordingly, we present only a selection of results deemed "best" where the choice was made according to the explanatory power of the various regressions, as well as whether the coefficients were consistent with predictions from economic theory. The first eight columns present results for equation (7), which represents the Bundesbank's interest rate reaction function, while the remaining four columns are the count model-based estimates of the determinants of "speeches" by the President of the Bundesbank (i.e., equation (8)).

The slowly changing nature of interest rates is partially captured by the fact that current interest rate changes are to some extent a function of changes occurring in the previous three months[23] That is, a 100 basis point rise in the call money rate one to three months ago accounts for anywhere from 15 to roughly 40 percent of a current change in the interest rate.

Turning to the impact of various economic shocks, a positive shock to money growth generally leads, as expected, to higher interest rates but the effect is strongest when the shocks are permitted to accumulate over time. This is true regardless of the chosen sample, although the link between lagged money growth shocks and current interest rate changes

[23] We experimented with different lag lengths for all the variables mindful of the need for parsimony, especially

is more prominent in the 1990-98 sample. The impact of inflation shocks is very much dependent on how they are constructed. If the VAR based forecasting model is used, past inflation shocks result in lower current interest rates, a reflection perhaps of the Bundesbank's policy of gradual increases in interest rates in anticipation of previously forecasted inflation shocks. This could be interpreted as the outcome of pre-emptive strikes against future inflation. Of course, the same result could alo be explained by a politically motivated central bank which defers necessary interest rate. However, as explained below, the almost total absence of partisan or electoral effects on interest rate changes (i.e., the variables BUNDES and LANDES) suggests little support for the politically motivated interest rate determination view. Also, if inflation forecast errors are generated from an AR(1) model, output shocks are measured in deviations from HP filtered output, and shocks to money growth are proxied by deviations from the Bundesbank's money growth targets, then the Bundesbank is seen to respond positively to past inflation shocks. Overall then, the evidence is not supportive of a politically motivated Bundesbank.

It is also noteworthy that the Bundesbank responds to real shocks by generally raising interest rates when a positive output shock is forecast (columns (3), (5), (7), and (8)). Finally, there is ample evidence that roughly one tenth of a 100 basis point increase in the German interest rate originates from US monetary policy actions, as proxied by lagged changes in the Fed funds rate.

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for the 1990-98 sample. Improvements in explanatory power were trivial beyond the three month lag.

The count model estimates reveal strongly that more speech making by the Bundesbank President supplements interest rate changes. The same is true of changes in the US Fed funds rate. More importantly, however, is the finding that the topic of the speech is vitally important in producing this result. Hence, speeches dealing with prices and economic policy are consistently better explained by the right hand side variables in (8) relative to any of the other specifications considered. In addition, previous interest rate increases speak for themselves, in the sense that these prompt fewer speeches dealing with prices (PR132) or economic policy in general (PR131). The importance of public communication and, in particular, the topic of speeches is further underlined by the fact that the cumulative impact of past interest rate changes on speeches dealing with the Euro (PR232) or the EU/EMU (not shown) are highly insignificant. Consequently, these types of speeches are essentially unrelated to the interest rate policy of the Bundesbank.

It is also interesting to note that lagged shocks to inflation and output also prompt more frequent speeches, which suggests that communication is indeed a separate device used by the Bundesbank to conduct monetary policy. Finally, while political influences are not evident from the interest rate change equations there is some evidence that these may manifest themselves instead in the frequency with which the Bundesbank communicates with the public. Partisan influences at the Länder level (LANDES) result in fewer speeches about prices although federal elections (BUNDES) do appear to prompt more speeches (on all topics) in the longer sample considered. Finally, it is worth noting that our correction for selection bias (SIGNAL) is generally significant, indicating that some speeches underscore regular announcements or other events of relevance to the Bundesbank.[24]

5.3 Reaction Function Estimates: Conflicts with the Government.

Table 4 presents selected estimates of equation (9) which attempts to capture the determinants of the likelihood of conflict between the Bundesbank and the government. All estimates show that speeches by the President of the Bundesbank on matters dealing with economic policy (column (1)), and prices (column (2)), all significantly raise the probability of a government central bank conflict.

Not surprisingly, past interest rate increases also raise significantly the likelihood of conflict as do increases in the Fed funds rate.[25] Political variables, however, have no statistical bearing on the likelihood of a conflict.[26] Finally, the evidence is mixed regarding the role of ERM realignments in triggering conflicts between the fiscal and monetary authorities. A plot of the predicted probability of conflict ($\hat{K}_t$; not shown) reveals that GEMU sparked a sharp rise in the likelihood of a government-central bank conflict, as one would expect. Tensions in the ERM in 1992 and 1993 were additional significant sources of conflict while 1998 also saw a resurgence of conflict probabilities perhaps related to the stability pact agreement and the imminent introduction of the euro. It is striking that, other than for large

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[24]None of the results change when (7) and (8) are estimated simultaneously in a seemingly unrelated regression framework (SURE; results now shown). Indeed, the residual correlation matrix of the residuals from the SURE model are low (0.13) suggesting that one should view speeches not as a substitute for speeches but as a complementary tool of monetary policy. The fact that "words" appear to empirically complement interest rate actions is important because it suggests that speeches by Bundesbank officials represent something other than just "cheap talk".

[25] We found virtually no difference between using DR and R in estimates of (9). Consequently, estimates using the call money rate are reported.

[26] The BUNDES variable was highly insignificant in all regressions and was therefore omitted from the final specification.

and usually non-recurring events, the likelihood of a conflict remains typically around 0.40 or less. Perhaps communication between the central bank and the public assists in making these events rare.

Table 5 then revisits reactions functions (7) and (8) and adds the estimated probability of conflict as an additional regressor in the reaction function specification. Previous estimates are largely unaffected while, in three of the four specifications shown, an increase in the probability of conflict dampens interest rate changes. In the fourth specification the cumulative impact of conflict is not significantly different from zero. Hence, to the extent that political influences on monetary policy exist, these affect interest rate determination in a more subtle manner than suggested by the usual specification of electoral/partisan variables. Interestingly, if government-central bank conflicts matter, they impact interest rate determination partially via speeches by the Bundesbank President on exchange rates and economic policy in general.[27]

6. Concluding Remarks.

The title of the paper asks whether "words", that is, the communication by Bundesbank senior officials with the public and government speak louder than the interest rate decisions of the Bundesbank. The tentative answer seems to be no. Rather, communication via frequent speeches, especially on issues dealing with price developments and economic policy in general, appear to *complement* interest rate decisions by the Bundesbank. Moreover, to the extent that conflict arise between the fiscal and monetary authorities, these manifest themselves infrequently but, interestingly, appear to be exacerbated by speeches by the

Bundesbank President on matters dealing with the exchange rates or economic policy. Also noteworthy is the lack of significance of political factors when these are proxied via the usual electoral/partisan dummies. Political influence may instead operate on a more subtle plane, either via the Bundesbank's reaction to conflict or its reactions to successive economic shocks.

The aim of this study was to empirically demonstrate the role of communication in the making of central bank interest rate policy. It appears that such communication is indeed a significant feature of Bundesbank behavior. This lesson is probably not lost on the monetary authorities of several industrial countries who have made a concerted effort to improve and highlight these skills as well as in steps taken to increase central bank transparency. Indeed, it is now common for central banks to publish with little delay speeches by their senior officials, and to disseminate them as widely as possible. To be sure, "communication" is more general than just speechmaking as it is likely to include accountability and transparency. Nevertheless, we have formally shown that at least an important communication device does matter in the making of monetary policy at the Bundesbank.

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[27] Equations (7) to (9) were also estimated via SURE but the results in Table 6 are unaffected.

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Table 1 Speeches by the President of the Bundesbank: Summary Statistics

Topic [Variable Symbol]	Frequency	
	1989:01-1998:12	1982:01-1998:12
Exchange rate policy [PR111]	229	47
Economic Policy [PR131]	89	44
Prices [PR132]	132	31
EU/EMU [PR231]	297	41
Euro [PR232]	126	n/a

Sources: Auszüge aus Presseartikeln (various issues) and BIS Review (various issues). The BIS does not classify speeches by topic. n/a mans not applicable.

Table 2 Reaction Function Estimates: Interest Rates and Communication with the Public

Explanatory Variables	Dependent Variable: ΔR_t								Dependent Variable: PC_t		
	Sample: 1982-98				Sample: 1990-98				Sample: 1990-98		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	PR132(9)	PR131(10)	PR232(11)
Constant	-.005 (.015)	-.003 (.015)	-.017 (.017)	-.015 (.017)	.007 (.021)	.005 (.021)	-.016 (.021)	-.034 (.022)@	-.107 (.145)	-.698 (.179)*	-.002 (.112)
ΔR_{t-1}	.177 (.075)+	.140 (.027)*	.195 (.083)*	.207 (.070)*	.111 (.140)	.151 (.051)*	.127 (.149)	.045 (.120)	-1.568 (.719)+	-1.159 (.598)+	2.316 (.869)*
ΔR_{t-2}	.099 (.067)		-.001 (.071)	.087 (.078)	.070 (.063)		.059 (.064)	-.037 (.082)	-1.984 (.795)*	-1.285 (.534)*	-2.123 (.731)*
ΔR_{t-3}	.152 (.065)+		.150 (.065)*	.175 (.068)*	.257 (.130)+		.237 (.124)@	.166 (.124)@	-1.427 (.725)+	-1.526 (.492)*	-1.140 (.976)
$\hat{\mu} M3_{t-1}$	.023 (.025)	.028 (.013)+	.039 (.036)	.018 (.032)	.031 (.032)	.024 (.016)@	-.059 (.038)	-.024 (.022)	.058 (.236)	.196 (.221)	-.043 (.175)
$\hat{\mu} M3_{t-2}$	.031		-.038 (.042)	-.066 (.025)*	.012 (.041)		.078 (.034)*	-.021 (.030)	-.784 (.220)*	-.255 (.187)@	.082 (.223)
$\hat{\mu} M3_{t-3}$	.020 (.034)		.003 (.019)	.047 (.029)+	.023 (.050)		.081 (.028)*	-.007 (.027)	-.232 (.216)	-.295 (.262)	-.360 (.224)+
$\hat{\mu} \pi_{t-1}$	-.137 (.059)*	-.069 (.028)*	.047 (.051)	.083 (.066)	-.119 (.066)+	-.070 (.033)+	-.109 (.093)	.044 (.054)	.636 (.403)+	-.188 (.548)	.198 (.556)
$\hat{\mu} \pi_{t-2}$	-.032 (.053)		.108 (.048)*	.009 (.066)	-.038 (.060)		-.013 (.071)	.117 (.059)+	.446 (.527)	.275 (.537)	.703 (.431)+
$\hat{\mu} \pi_{t-3}$	-.036 (.056)		.065 (.056)	.073 (.058)@	-.009 (.068)@		.034 (.083)	.014 (.064)	1.161 (.417)*	.949 (.465)+	1.136 (.520)+
$\hat{\mu} y_{t-1}$	.004 (.005)	-.001 (.002)	.011 (.004)*	-.0002 (.005)	.004 (.006)	.002 (.003)	.001 (.013)	.014 (.004)*	.108 (.045)*	.034 (.046)	1.722 (.695)*
$\hat{\mu} y_{t-2}$	-.001 (.001)		.013 (.006)*	-.008 (.004)+	.008 (.004)+		.023 (.016)@	.008 (.006)@	.085 (.038)*	.063 (.044)@	.129 (1.034)
$\hat{\mu} y_{t-3}$	-.007 (.004)+		.001 (.005)	-.003 (.005)	-.006 (.006)		-.004 (.006)	.002 (.006)	-.012 (.040)	-.038 (.054)	-.366 (1.078)
BUNDES	-.049 (.043)	-.046 (.042)	-.021 (.038)	-.001 (.043)	-.030 (.056)	-.018 (.054)	-.002 (.045)	.036 (.039)	-.245 (.344)	.011 (.306)	.046 (.252)
LANDES	-.007 (.010)	-.008 (.010)	-.005 (.011)	-.009 (.009)	-.001 (.013)	-.006 (.011)	.001 (.015)	-.005 (.012)	-.338 (.141)*	-.038 (.054)	.097 (.110)
SIGNAL	-.019 (.010)	-.024 (.024)	-.017 (.021)	-.025 (.024)	-.038 (.030)	-.032 (.030)	-.031 (.034)	-.047 (.033)@	.216 (.150)@	.240 (.199)@	-.081 (.163)
ΔR^f_t									-.764	-1.512	-4.782

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	PR132(9)	PR131(10)	PR232(11)
									(2.908)	(.575)*	(2.716)+
ΔR^f_{t-1}	.071	.029	.133	.069	-.166	-.004	-.159	-.168	6.286	-1.199	.196
	(.039)@	(.020)@	(.036)*	(.040)+	(.113)@	(.043)	(.132)	(.120)@	(3.148)+	(.864)@	(2.598)
ΔR^f_{t-2}	.037		.050	.042	-.027		-.138	-.152	.305	.525	-4.484
	(.034)		(.034)@	(.035)	(.127)		(.149)	(.148)	(2.712)	(.776)	(2.942)
ΔR^f_{t-3}	-.012		-.015	-.015	.161		.156	.156	3.582	-.976	4.255
	(.023)		(.029)	(.021)	(.090)+		(.094)+	(.142)	(2.829)@	(.645)@	(2.460)+
$\bar{R}^2$	.170	.179	.213	.172	.076	.100	.092	.107	.227	.234	.171
F(Sig. level) Level)	3.20(.00)	6.44(.00)	3.98(.00)	3.31(.00)	1.47(.12)	2.45(.02)	1.59(.08)	1.70(.06)	40.35(.00)	37.921(.01)	25.98(.13)
Obs.	201	201	199	201	105	105	105	105	98	105	98

Notes: Standard errors (Newey-West for columns (1)-(8); Huber-White for columns (9)-(12)). Poisson distribution assumed for counts in columns (9)-(12).
* signifies statistically significant at the 1% level (+, 5%; @, 10%) of significance.

Legend for Columns:
Columns represent different models used to estimate forecast errors.

(1) $\hat{\mu} = {}_{t-k}\hat{\mu}_t$ is used where k=3, derived from VAR(10).

(2) $\hat{\mu} = \hat{\mu}^* = \sum_{j=1}^{3} \hat{\mu}_j$, derived from VAR(10).

(3) $\hat{\mu}^y$ = deviation from Hodrick-Prescott filter applied to the log of industrial production with smoothing parameter 14400.

$\hat{\mu}^{M3}$ = deviation from middle of Bundesbank announced money growth target.

$\hat{\mu}^{\pi}$ = π - AR(1), where AR(1) is an estimate of expected inflation from an AR1 model fitted to inflation and estimated recursively.

(4) $\hat{\mu}$ from VAR(10) with 9 lags.

(5) $\hat{\mu} = {}_{t-k}\hat{\mu}_t$ where k=6, derived from VAR(10).

(6) $\mu = \hat{\mu}^* = \sum_{j=1}^{3} {}_{t-6}\hat{\mu}_t$,, derived from VAR(10).

(7) $\hat{\mu} = {}_{t-6}\hat{\mu}_t$,, derived from VAR(10).

(8) Same as column (3).

(9) $\hat{\mu}$ from VAR(10) with 9 lags.

(10) Same as column (9).

(11) $\hat{\mu}$ from VAR(11) with 9 lags.

(12) $\hat{\mu}$ from VAR(11) with 6 lags.

Table 3 Count Model of Communication with the Public

Explanatory Variables	Sample: 1990-98	
	(1)	(2)
ΔR_{t-1}	-1.304 (.708)+	-1.089 (.579)+
ΔR_{t-2}	-1.538 (.640)*	-1.541 (.630)*
ΔR_{t-3}	-1.727 (.556)*	-1.008 (.468)+
$\hat{\mu} M3_{t-1}$	.197 (.258)	.227 (.268)
$\hat{\mu} M3_{t-2}$	-.377 (.238)@	-.619 (.232)*
$\hat{\mu} M3_{t-3}$	-.296 (.296)	-.159 (.290)
$\hat{\mu} \pi_{t-1}$	.331 (.661)	.375 (.564)
$\hat{\mu} \pi_{t-2}$	.257 (.616)	.002 (.665)
$\hat{\mu} \pi_{t-3}$	.957 (.587)+	.374 (.523)
$\hat{\mu} y_{t-1}$	.022 (.054)	-.033 (.049)
$\hat{\mu} y_{t-2}$	.073 (.051)@	/087 (.037)*
$\hat{\mu} y_{t-3}$	-.039 (.056)	-.001 (.052)
BUNDES	.039 (.344)	-.105 (.293)
LANDES	-.063 (.062)	-.049 (.054)
SIGNAL	.268 (.226)	.323 (.197)+
ΔR^f_t	-1.578 (.683)*	-.778 (.604)@
ΔR^f_{t-1}	-1.427 (.863)+	-2.001 (.646)*
ΔR^f_{t-2}	.609 (.773)	1.117 (.650)+
ΔR^f_{t-3}	-1.267 (.739)+	-.315 (.501)
R^2	.167	.093
LR (sig. Level)	41.10 (.00)	44.53 (.00)

Legend: In all cases $\hat{\mu}$ derived from VAR (10) with 9 lags.

Notes: See notes to Table 4, columns (9)-(12).

Table 4 Logit Model of Bundesbank-Government Conflict Estimates [Equation (9)]

Explanatory Variables	Dependent Variables: K_t	
	Samples	
	1989-98 (1)	1989-98 (2)
Constant	-2.810 (.574)*	-2.471 (.490)
ΔR_{t-1}	3.231 (1.570)+	2.916 (1.470)+
ΔR_{t-2}	4.113 (1.081)	3.646 (1.014)+
ΔR_{t-3}	3.920 (1.074)*	3.474 (1.170)*
ERM	1.927 (1.010)	1.532 (1.008)
$(M3_{t-1} - M3^*)$	-.073 (.340)	-.035 (.318)
$(M3_{t-2} - M3^*)$	.353 (.521)	.440 (.536)
$(M3_{t-3} - M3^*)$	-.270 (.375)	-.338 (.418)
PC′	.962 (.349)*	.449 (.279)@
LANDES	-.033 (.041)	-.063 (.144)
SIGNAL	.392 (.431)	-.304 (.448)
ΔR^f_{t-1}	3.469 (1.754)+	3.090 (1.643)+
ΔR^f_{t-2}	1.389 (1.700)	1.073 (1.616)
ΔR^f_{t-3}	-2.184 (1.628)	-1.772 (1.617)
LR (Sig.)	41.023 (.000)	35.860 (.001)
Pseudo R^2	.350	.300
Obs. = 0	95	95
Obs. = 1	24	24

Notes: Estimates are based on a logit model estimated via quasi-maximum likelihood with Huber-White standard errors. See earlier table for variable definitions and interpretation of statistical significance.
ERM is a dummy variable = 1 in the month when any ERM currency was realigned in the ECU system and 0 otherwise. In column (1), PC′ is PR131, PC′ = PR132 in column (2).

Table 5 Extended Reaction Function Estimates

Explanatory Variables	Dependent Variables: ΔR_t			
	1982-98 (1)	1989-98 (2)	1989-98 (3)	1989-98 (4)
Constant	.058 (.042)	.038 (.040)	-.008 (.041)	-.042 (.049)
ΔR_{t-1}	.325 (.075)*	.252 (.124)+	.246 (.122)+	.247 (.108)+
ΔR_{t-2}	.129 (.093)	.093 (.117)	.023 (.099)	.085 (.106)
ΔR_{t-3}	.224 (.066)*	.302 (.148)+	.258 (.154)@	.144 (.132)
$\hat{\mu}M3_{t-1}$	.049 (.029)	.017 (.029)	.031 (.041)	.038 (.039)
$\hat{\mu}M3_{t-2}$	-.091 (.032)*	-.078 (.029)*	-.057 (.030)@	-.047@ (.034)
$\hat{\mu}M3_{t-3}$	.038 (.033)	-.009 (.038)	.007 (.040)	.002 (.038)
$\hat{\mu}\pi_{t-1}$	.062 (.082)	.212 (.110)*	.188 (.108)+	.111 (.079)@
$\hat{\mu}\pi_{t-2}$	-.018 (.111)	-.038 (.068)	-.179 (.078)*	-.030 (.065)
$\hat{\mu}\pi_{t-3}$	.008 (.081)	.042 (.082)	.033 (.087)	.061 (.069)
$\hat{\mu}y_{t-1}$	.211 (.196)	.008 (.008)	.004 (.009)	.002 (.007)
$\hat{\mu}y_{t-2}$	.093 (.217)	-.004 (.006)	-.012 (.007)+	-.004 (.007)
$\hat{\mu}y_{t-3}$	-.046 (.147)	-.003 (.009)	-.005 (.009)	-.002 (.007)
ΔR^f_{t-1}	.047 (.055)	-.034 (.146)	-.021 (.143)	.005 (.150)
ΔR^f_{t-2}	.019 (.037)	-.114 (.135)	-.148 (.128)	-.030 (.132)
ΔR^f_{t-3}	-.019 (.022)	.006 (.129)	.021 (.113)	.072 (.145)
BUNDES	-.019 (.046)	-.011 (.061)	.024 (.048)	.006 (.065)
LANDES	-.014 (.012)	-.048 (.024)+	-.005 (.010)	-.020 (.025)
SIGNAL	-.032 (.029)	-.046 (.029)	-.039 (.025)	-.039 (.031)
$\hat{K}_t$	-.363 (.204)@	-.551 (.198)*	-.476 (.169)*	-.489 (.200)*
$\hat{K}_{t-1}$	-.034 (.133)	.066 (.128)	.150 (.118)	.153 (.157)
$\hat{K}_{t-2}$	.118 (.124)	.238 (.158)	.267 (.181)	.551 (.183)*
R^2	.183	.222	.215	.104
F (sig. Level)	2.96 (.00)	2.26 (.00)	2.30 (.00)	1.535 (.09)
Obs.	193	98	105	102

Notes: See notes to Table 4 for additional details. $\hat{K}$ is the predicted probability of conflict. See Table 5 for estimates and Figure 2. In column (1), μ is from a rolling VAR with the unemployment rate as the output measure; in (2), μ is from a recursive VAR with 6 lag and industrial production as the output proxy; in (3) a 4 lag VAR with industrial production generates the μ; in (4) a recursive VAR with 9 lags and industrial production results in the estimated μ.

$\hat{K}$ in (1) and (4) relies on PR111 (Exchange Rte) speeches. $\hat{K}$ in (2) and (3) on PR131 (Economic Policy) speeches.

Appendix:
Additional Results

Table A1 The Distribution of Bundesbank and BIS Speeches

	Samples	
Speech	**1982:01 - 1998:12** Mean (Var)/zero events (%)	**1989:01 - 1998.12** Mean (Var)/zero events (%)
PR111	1.56 (2.10)/54 (26.47)	2.03 (2.31)/17 (14.17)
PR131	0.74 (0.77)/99 (48.53)	0.77 (0.85)/59 (49.17)
PR132	0.76 (0.94)/104 (50.98)	0.97 (1.08)/51 (42.50)
PR231	1.88 (3.72)/58 (28.43)	2.61 (4.16)/15 (12.50)
PR232	n/a	1.13 (1.30/43 (35.83)
VP111	0.74 (.083)/104 (50.98)	0.83 (.098)/58 (48.33)
VP131	0.38 (0.41)/142 (69.61)	0.27 (0.31)/95 (75.17)
VP132	0.40 (0.49)/142 (69.61)	0.39 (0.55)/86 (71.67)
VP231	0.50 (0.67)/134 (65.59)	0.74 (0.92)/63 (52.50)
VP232	n/a	0.42 (0.62)/88 (73.33)
BIS	4.65 (7.13)/10 (5.13)	3.89 (6.10)/9 (8.11)

Table A2 Tests for Overdispersion*

	Sample	
Speech	**1982:01 - 1998:12**	**1989:01 - 1998:12**
PR111	-5.27 (0.00)	-1.99 (.05)
PR131	-.056 (0.57)	-0.99 (0.32)
PR132	-2.57 (0.01)	-1.19 (0.24)
PR231	-13.71 (0.00)	-5.97 (0.00)

* t-statistic (significance level in parentheses) for the null hypothesis that the estimate of the variance (see Table A1) is significantly different from the estimate of the mean.

Table A3 Forecast Errors Derived from VARs: Summary Statistics

Series	Restriction	Source VAR: (10) Sample		Source: VAR: (11) Sample	
		82:01-98:12	90:01-98:12	82:01-98:12	90:01-98:12
$\hat{\mu}^{y}$	6	-.300 (2.875)	-.237 (3.180)	N/A	N/A
	9	-.124 (2.512)	-.197 (2.950)	N/A	N/A
	4, t-3	-.287 (2.883)	-.225 (3.181)	N/A	N/A
	4, t-6	-.320 (2.890)	.008 (.123)	N/A	N/A
	4, Roll	.084 (2.632)	-.361 (2.762)	N/A	N/A
$\hat{\mu}^{U}$	6	N/A	N/A	.008 (.125)	.012 (.125)
	9	N/A	N/A	.012 (.116)	.003 (.113)
	4, t-3	N/A	N/A	.008 (.123)	.012 (.123)
	4, t-6	N/A	N/A	.008 (.123)	.012 (.122)
	4, Roll	N/A	N/A	-.014 (.083)	-.014 (.103)
$\hat{\mu}^{\pi}$	6	.017 (.249)	-.024 (.231)	.004 (.244)	-.014 (.220)
	9	.006 (.232)	-.043 (.197)	-.001 (.225)	-.013 (.185)
	4, t-3	.019 (.249)	-.022 (.231)	.005 (.244)	-.014 (.220)
	4, t-6	.006 (.243)	-.020 (.229)	.006 (.243)	-.011 (.218)
	4, Roll	-.024 (.202)	-.034 (.230)	-.024 (.202)	-.032 (.221)
$\hat{\mu}^{M3}$	6	.030 (.593)	.127 (.567)	.109 (.586)	-.030 (.600)
	9	.029 (.538)	.136 (.502)	.068 (.511)	-.033 (.541)
	4, t-3	.020 (.583)	.101 (.553)	.082 (.573)	-.040 (.589)
	4, t-6	-.041 (.587)	.082 (.554)	.077 (.571)	-.041 (.587)
	4, Roll	-.011 (.483)	.029 (.507)	.029 (.507)	-.030 (.489)
$\hat{\mu}^{R}$	6	-.023 (.225)	-.062 (.137)	-.052 (.218)	-.069 (.129)
	9	-.023 (.205)	-.020 (.120)	-.049 (.201)	-.039 (.117)
	4, t-3	-.024 (.227)	-.058 (.138)	-.052 (.218)	-.052 (.218)
	4, t-6	-.054 (.209)	-.053 (.139)	-.054 (.219)	-.051 (.218)
	4, Roll	.0003 (.168)	-.025 (.123)	-.006 (.155)	-.003 (.126)

Table A4 Forecast Errors: Selected Correlations, VAR (10), 1982-98*

		I Recursive: 6 lags				II Recursive: 9 lags				III Information to t-3				IV Information to t-6				V Roll: 4 lags			
		$\hat{\mu}^{Y}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$	$\hat{\mu}^{Y}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$	$\hat{\mu}^{Y}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$	$\hat{\mu}^{Y}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$	$\hat{\mu}^{Y}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$
I	$\hat{\mu}^{Y}$																				
	$\hat{\mu}^{\Pi}$																				
	$\hat{\mu}^{M3}$																				
	$\hat{\mu}^{R}$																				
II	$\hat{\mu}^{Y}$	.94																			
	$\hat{\mu}^{\Pi}$		.93																		
	μ^{M3}			.94																	
	$\hat{\mu}^{R}$				.91																
III	$\hat{\mu}^{Y}$	.03				.08															
	$\hat{\mu}^{\Pi}$		.14				.08														
	$\hat{\mu}^{M3}$			.11				.08													
	$\hat{\mu}^{R}$				.12				.10												
IV	$\hat{\mu}^{Y}$	.03				.04				-.06											
	$\hat{\mu}^{\Pi}$		-.03				.01				.10										
	$\hat{\mu}^{M3}$			.14				-.02				.11									
	$\hat{\mu}^{R}$				-.14				-.19				.02								
	$\hat{\mu}^{Y}$	.77				.71				-.07				.15							
	$\hat{\mu}^{\Pi}$		.71				.66				-.05				-.13						
	$\hat{\mu}^{M3}$			.78				.73				.06				.05					
	$\hat{\mu}^{R}$				.57				.50				-.01				-.22				

* In Tables A4 to A7, velocity is excluded from the VAR. Results including velocity are available from the first author on request.

Table A5 Forecast Errors: Selected Correlations, VAR (11), 1982-98.

		I Recursive: 6 lags				II Recursive: 9 lags				III Information to t-3				IV Information to t-6				V Roll: 4 lags			
		$\mu^{\wedge Y}$	$\mu^{\wedge \Pi}$	$\mu^{\wedge M3}$	$\mu^{\wedge R}$	$\mu^{\wedge Y}$	$\mu^{\wedge \Pi}$	$\mu^{\wedge M3}$	$\mu^{\wedge R}$	$\mu^{\wedge Y}$	$\mu^{\wedge \Pi}$	$\mu^{\wedge M3}$	$\mu^{\wedge R}$	$\mu^{\wedge Y}$	$\mu^{\wedge \Pi}$	$\mu^{\wedge M3}$	$\mu^{\wedge R}$	$\mu^{\wedge Y}$	$\mu^{\wedge \Pi}$	$\mu^{\wedge M3}$	$\mu^{\wedge R}$
I	$\mu^{\wedge Y}$																				
	$\mu^{\wedge \Pi}$																				
	$\mu^{\wedge M3}$																				
	$\mu^{\wedge R}$																				
II	$\mu^{\wedge Y}$	.94																			
	$\mu^{\wedge \Pi}$		.90																		
	μ^{M3}			.94																	
	$\mu^{\wedge R}$				.91																
III	$\mu^{\wedge Y}$	.08				.12															
	$\mu^{\wedge \Pi}$		.12				.07														
	$\mu^{\wedge M3}$			.11				.11													
	$\mu^{\wedge R}$				.15				.12												
IV	$\mu^{\wedge Y}$	.10				.04				.09											
	$\mu^{\wedge \Pi}$		-.01				.01				.12										
	$\mu^{\wedge M3}$			.11				-.02				.11									
	$\mu^{\wedge R}$				.15				-.19				.12								
V	$\mu^{\wedge Y}$	.68				.64				-.04				.003							
	$\mu^{\wedge \Pi}$		.67				.60				-.05				-.13						
	$\mu^{\wedge M3}$			.80				.75				.09				.003					
	$\mu^{\wedge R}$				.60				.55				.04				.04				

Table A6 Forecast Errors: Selected Correlations, VAR(10), 1990-98

		I Recursive: 6 lags				II Recursive: 9 lags				III Information to t-3				IV Information to t-6				V Roll: 4 lags			
		$\hat{\mu}^{Y}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$	$\hat{\mu}^{Y}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$	$\hat{\mu}^{Y}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$	$\hat{\mu}^{Y}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$	$\hat{\mu}^{Y}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$
I	$\hat{\mu}^{Y}$																				
	$\hat{\mu}^{\Pi}$																				
	$\hat{\mu}^{M3}$																				
	$\hat{\mu}^{R}$																				
II	$\hat{\mu}^{Y}$	.92																			
	$\hat{\mu}^{\Pi}$		.92																		
	$\hat{\mu}^{M3}$			.78																	
	$\hat{\mu}^{R}$				.91																
III	$\hat{\mu}^{Y}$	.13				.05															
	$\hat{\mu}^{\Pi}$		.02				.04														
	$\hat{\mu}^{M3}$			.16				.04													
	$\hat{\mu}^{R}$				.15				.13												
IV	$\hat{\mu}^{Y}$	.10				.04				.12											
	$\hat{\mu}^{\Pi}$		-.08				.03				.02										
	$\hat{\mu}^{M3}$			.08				-.02				.16									
	$\hat{\mu}^{R}$				-.01				-.09				.16								
V	$\hat{\mu}^{Y}$	.77				.77				-.08				.09							
	$\hat{\mu}^{\Pi}$		.77				.70				-.02				-.18						
	$\hat{\mu}^{M3}$			.84				.62				.14				.11					
	$\hat{\mu}^{R}$				.41				.47				-.05				-.22				

Table A7 Forecast Errors: Selected Correlations, VAR (11), 1990-98

		I Recursive: 6 lags				II Recursive: 9 lags				III Information to t-3				IV Information to t-6				V Roll: 4 lags			
		$\hat{\mu}^{U}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$	$\hat{\mu}^{U}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$	$\hat{\mu}^{U}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$	$\hat{\mu}^{U}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$	$\hat{\mu}^{U}$	$\hat{\mu}^{\Pi}$	$\hat{\mu}^{M3}$	$\hat{\mu}^{R}$
I	$\hat{\mu}^{U}$																				
	$\hat{\mu}^{\Pi}$																				
	$\hat{\mu}^{M3}$																				
	$\hat{\mu}^{R}$																				
II	$\hat{\mu}^{U}$	.90																			
	$\hat{\mu}^{\Pi}$		.90																		
	μ^{M3}			.86																	
	$\hat{\mu}^{R}$				.85																
III	$\hat{\mu}^{Y}$	.17				.18															
	$\hat{\mu}^{\Pi}$		-.01				-.04														
	$\hat{\mu}^{M3}$			.17				.07													
	$\hat{\mu}^{R}$				.11				.01												
IV	$\hat{\mu}^{U}$	.18				-.02				.18											
	$\hat{\mu}^{\Pi}$		.09				.13				-.01										
	$\hat{\mu}^{M3}$			.03				-.14				.13									
	$\hat{\mu}^{R}$				.04				-.09				.13								
V	$\hat{\mu}^{U}$	.77				.68				-.05				.08							
	$\hat{\mu}^{\Pi}$		.81				.70				-.09				-.14						
	$\hat{\mu}^{M3}$			.79				.64				.17				-.21					
	$\hat{\mu}^{R}$				.61				.51				.10				-.02				

Table A8 Calendar Year Variation in Speeches by the President of the Bundesbank, 1989-98

Month	Topic				
	Exchange rate policy	Economic policy	Prices	EU/EMU	EURO
January	2.13	1.13	1.25	2.88	1
February	13.8	.25	.5	1.5	.25
March	2.25	.88	.88	2.38	1.13
April	2.75	.25	.88	2.25	1
May	1.88	.88	1	2.50	1.25
June	2.13	1.13	1	3.50	1.25
July	1.50	1	1.38	1	.75
August	1.13	.13	.25	.50	.50
September	3	1.5	1.75	2.28	1.63
October	3.13	1.13	1.38	3.25	2.25
November	1.75	1	1.38	4.50	1.25
December	3	1.5	1.75	3.13	.75

Figure 1

Key German Time Series, 1982-1998

Sources: See text for data sources and series definitions. The shaded area highlights the period since GEMU.

Figure 2
Estimation of the Probability of Conflict Between the Bundesbank and the Government*

* Data in Figure 2(a) before 1989 are coincident with the recession dummy since speech data from the Bundesbank were not used.

LIST OF DISCUSSION PAPERS

No. 9503 Framing and Incentive Effects on Risk Attitudes When Facing Uncertain Losses, by John Fountain, Michael McCosker and Bruce Macfarlane.

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