CENTRAL BANK BEHAVIOR
A Positive Empirical Analysis

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The central bank is analyzed as a utility-maximizing unit acting in the framework of a politico-economic model. It derives utility from keeping the price level stable and is constrained by government, the structure of the economy, and the political commitment to stable exchange rates. It uses a satisficing strategy, concentrating on keeping conflicts with government below a certain level. In the case of serious conflict, the central bank follows the policy directions undertaken by government but with a time lag. The complete model comprising endogenous consumer/voters, government and central bank is econometrically tested for Germany, with good results.

1. Introduction

Economic literature abounds in normative analyses advising central banks what to do in order to maximize social welfare. There is, however, little known about the actual behavior of central banks, although such knowledge is needed.

(a) It would advance our knowledge of the behavior of an important actor that has a strong influence on the course of the economy. It can for example be shown that the modeling of fiscal policy effects of government activity in the United States is quite sensitive to the particular assumptions made about the behavior of the Federal Reserve. According to one study, if the Fed ‘leans against the wind’ by increasing the bill rate when the government is increasing expenditures for goods and services, the effect on real output after eight quarters is less than half of the effect that occurs if the Fed keeps the bill rate constant. After twelve quarters, the effect is less than one-third [see Fair (1977)].

(b) It would help provide policymakers with means for influencing the central bank’s behavior. In a democracy, there is no omnipotent and omniscient dictator who can simply tell the central bank what to do; it is

*This paper was first presented at the Fourth Interlaken Seminar on Analysis and Ideology, June 1977. The authors are grateful for helpful comments to Hans-Peter Basler, Peter Bernholz, Karl Brunner, Wolfgang H. Fautz, Scott Gordon, Alan Meltzer, Heidi Schelbert and Peter Zweifel; and to Sandra Stuber for editing the paper.
and must be considered as an institution with goals of its own, the same as all other decisionmakers. The policymaker’s task is to provide the right incentives to induce it to act as much as possible in the interests of society as a whole [see Buchanan (1975)].

c) It would help us to improve economic modelling. Presently this may be subject to serious specification errors if it is the case that instrument variables are being taken as independent when they are in fact endogenously dependent on other variables in the economic system [see Wood (1967), Crotty (1973), Goldfeld and Blinder (1972)].

d) Forecasting requires empirical knowledge of the decisionmakers’ actions, and speculative guesses that are not based on systematic observation are not a satisfactory substitute.

2. Current approaches vs. politico-economic models

Three approaches to a positive analysis of central bank behavior may be distinguished.

(a) The central bank is implicitly or even explicitly assumed to act in society’s interests. This approach wrongly applies the paradigm of utility maximization to society as a whole.\(^1\)

(b) The central bank’s implied preferences are deduced from its actual behavior with the help of reaction functions. This approach is questionable theoretically because it does not distinguish between the bank’s ideal preferences, and those developed and exhibited under the influence of externally imposed constraints. There is a serious problem in identifying the ‘preference’ weights from the estimated reaction functions, and those derived are in actuality a mixture of true preferences and constraints. It is also doubtful whether the central bank’s knowledge of the economic system corresponds exactly to that stipulated by the model builder [see Makin (1976)].

c) There are some descriptive studies of central bank behavior that have been done in the political economy tradition, but these have been either empirically or theoretically deficient. Those by Borins (1972), Chant and Acheson (1972, 1973), Acheson and Chant (1973) (among others) are quite informative, but they do not empirically test their theoretical propositions and are more qualitative than quantitative. Parkin and Bade (1978) have looked at whether the formal independence of central banks has any effect on inflation, and Gordon (1978) has examined whether the rate of growth of the money supply increases before

\(^1\)The theory of optimal control has only recently begun to take into account the fact that government and the central bank are independent decisionmakers minimizing loss functions of their own. The studies (e.g., Kydland (1976), Pindyck (1976)) are however very simple, and do not use empirical tests. The plausibility of the results is checked by simulations.
elections, but these are international cross-section studies that are exclusively empirical and do not have a sound theoretical basis.

Politico-economic models,\(^2\) on the other hand, use quite a different approach: decision-making institutions are studied in the framework of the interaction between the economy and the policy, and each one is assumed to pursue its own goals. Most of these models confine themselves to one sector of the economy (the inflation-unemployment trade-off, for example); stipulate vote maximization as the government's goal; and are only marginally concerned with empirical estimation [see for example Nordhaus (1975) and the critique of this in Frey and Ramser (1976), MacRae (1977), Lindbeck (1976)]. The present authors have econometrically tested models using the classical economic assumption of utility maximization subject to constraints, with the government and voters taken as the decision-making units, for the United States, the United Kingdom, and the Federal Republic of Germany [Frey and Schneider 1978a, b, (1979)].

Studies have been done by Fair (1977) and Cowart (1978) that have econometrically estimated a positive model of central bank behavior. They did not, however, derive testable propositions based on an explicit model but rather assumed that the central bank reacts passively to the state of the economy.

This paper develops a positive politico-economic model of central bank behavior and tests it econometrically with quarterly data for the F.R. Germany. Section 3 develops the theoretical hypotheses used, taking the central bank, government and voters as the main decisionmaking units. The next section presents empirical estimates for the period 1957:II–1977:IV. Section 5 contrasts the politico-economic model used here with the approaches used by Fair and Cowart, and section 6 offers some concluding remarks.

3. The model

3.1. The central bank

The officials of a central bank may be considered as deriving utility from keeping the price level as stable as possible. This corresponds to the organization's most important official goal,\(^3\) which its officers internalize as

\(^2\)A survey is given in Frey (1978).

\(^3\)For the official goals and what they may or may entail for the United States (and Canada), see, e.g., Borins (1972); and for Germany Duwendag (1973), for example. See also the survey by Parkin and Bade (1978). The evidence reported by the theoretically questionable reaction function studies is somewhat mixed, but on the whole indicates that price stability has been the main goal of central bank policy in most countries and for most periods. Reuber (1964) for Canada, and Wood (1967) for the USA, found that the central banks used their policy
an ideology, and reflects the feeling prevalent in the financial community, their most important reference group. A low rate of inflation and a vigorous policy directed towards achieving this thus gives them prestige and the assurance of having performed well (and, potentially, attractive job offers from private business).

The central bank is largely independent of the voters' wishes and of public opinion, but it faces three important constraints.

(a) The first constraint is imposed by government. The central bank can maximize its own utility only if its policy does not deviate too much from that pursued by the government. When the policies of the central bank and those of the government conflict — if, for example, the central bank is following a deflationary and the government an inflationary line — the government will force the central bank to change its policy and to support the government's goal. A student of the history of the Federal Reserve System has written that 'a Chairman of the Federal Reserve Board who ignores the wishes of the President does so at his peril', and that consequently 'historical records show that in each administration monetary policy fitted harmoniously with the President's economic and financial objects and plans' [Weintraub (1978, pp. 352, 353)]. Thus under President Johnson the supply of money was increased in order to finance his policy of paying for both the war in Vietnam and the war on poverty at the same time without seeming to increase the tax load.

There is usually a constitutional provision of some sort which enjoins the central bank to support government policy [for a survey see Parkin and Bade (1978)]. For example, Article 12 of the Bundesbankgesetz (German Federal Banking Law) states: 'Die Deutsche Bundesbank ist verpflichtet, unter Wahrung ihrer Aufgabe die allgemeine Wirtschaftspolitik der Bundesregierung zu unterstützen.' ('The German Bundesbank [central bank] is obliged to support the general economic policy of the federal government in the course of pursuing its own duties.') The government also has the advantage of having been elected and thus having democratic legitimacy, which the central bank does not have (or, at best, only indirectly). In the long run the government has the means to overrule the central bank, these ranging from dismissal of the central bank's president and members of the governing board and their

instruments to combat inflation, while Dewald and Johnson (1963) for the USA did not find price increases having any significant influence on central bank behavior. Christian (1968) and Froyen (1974) — both with data for the USA — have shown that inflation has significantly affected the use of monetary policy instruments in recent periods only (i.e., periods in which the rate of price increases have been comparatively high). Basier (1978) has found that for Germany, price stability was the central bank's most important goal from 1958 to 1974; if price stability is given the weight 1, equilibrium of the balance of payments has the weight 0.25 and growth of real national income, 0.72 (p. 98).
replacement with more compliant people, to the threat of completely taking over its functions. Because in the end the government does have the final say, this first constraint is stronger than and can override the next two.4

(b) Economic constraints are imposed by the nature of the economic structure, which determines the effect that monetary policy instruments will have on other economic variables and on the rate of inflation in particular.

c) The third constraint is the need to keep the exchange rate stable. In a system of freely fluctuating exchange rates, this constraint no longer holds and the central bank can pursue a policy solely concerned with domestic affairs. In a system of dirty floating and even more so in a system of adjustable pegs, on the other hand, the central bank must buy and sell foreign currency and is thus limited in its freedom of action with regard to domestic policy. Germany was committed to a policy of fixed exchange rates during most of the period considered (1955–1972).5

The central bank has neither the capacity nor the information necessary to formally solve the dynamic optimization problem of maximizing its own utility subject to the constraints imposed, especially those deriving from the fact that its survival requires a state of no-conflict with the government. It rationally follows a satisficing strategy differentiating between two states of the world:

(i) A state of no-conflict with the government (indicated by a dummy variable C=0). In this state the central bank is free to follow its own interests. As stated above, central bank officials are considered to be acting according to their ideology (IDEO) when they are pursuing an anti-inflationary, restrictive policy.

4This applies even when the central bank is constitutionally independent as for example it is in the United States. As Borins (1972, pp. 186–187) states: ‘The Federal Reserve System nominally is the most independent central bank in the Western world, as its officials are well aware. They wish to maintain this independence. Paradoxically, to maintain this general independence to set monetary policy, they may well give up their particular independence at any one time by choosing to follow policies which Congress and the President would like.’ The same is argued by Poullain [in Duwendag (1973, p. 43), our translation] for Germany: ‘If the government . . . mainly fights against unemployment and, therefore, pursues an expansionary economic policy, the central bank must accept this goal preference order . . . . If the central bank were to refuse its support, it would run the danger of losing its independence through a corresponding change in the central bank law.’ And: ‘the end result of fundamental political conflicts [i.e., between government and central bank] would necessarily be the loss of central bank autonomy’ (p. 44).

5The German mark was revalued in 1961, 1969, 1971 and 1973. Since March 1972 Germany has part of the European ‘snake’, whose members have agreed to keep their exchange rates fixed with respect to each other within a ±2.25% range. Changes in the rate of exchange are the prerogative of the federal government (Article 73 of the Constitution), with the Bundesbank having an advisory function (Article 13 of the Federal Banking Law).
(ii) A state of conflict with the government \((C = 1)\). Here central bank policy is forced to take the same direction as the government’s fiscal policy instruments.\(^6\)

To define the conflict variable \(C\) we need a measurement of when government and central bank policies are expansionary, and when they are contractionary.

The direction of government policy \((POLGOV)\) is measured by the difference between a "business cycle neutral" budget \(B^p\) and the actual budget volume \(B^a\) (here in billion DMs). When \(B^a - B^p < 0\), government fiscal policy is considered to be contractionary; and when \(B^a - B^p > 0\), expansionary.

The direction of central bank policy \((POLCB)\) is measured by the difference in free liquidity reserves \((LR, \text{in billion DMs})\) at two points in time.\(^8\) When \(LR_t - LR_{t-1} < 0\), central bank monetary policy is taken as being contractionary; and when \(LR_t - LR_{t-1} > 0\), as expansionary.

Conflict exists \((C = 1)\) if

\[
POLGOV < 0 \quad \text{and} \quad POLCB > 0, \\
\]

or if

\[
POLGOV > 0 \quad \text{and} \quad POLCB < 0, \\
\]

i.e., when fiscal and monetary policies are working in opposite directions.

Accordingly, there is no conflict between government and the central bank about business cycle policy \((C = 0)\) when \(POLGOV < 0\) and \(POLCB < 0\), and when \(POLGOV > 0\) and \(POLCB > 0\).

We can now formulate the central bank’s use of monetary policy instruments \((INSTRCB)\). In linear terms, we have for instrument \(i\)

\[
INSTRCB^i(t) = \alpha_0 + \alpha_1 \cdot INSTRCB^i(t-1) \\
+ \alpha_2 (1 - C) \cdot IDEOLCB(t-2) \\
+ \alpha_3 \cdot C \cdot POLGOV(t-2) + u(t). \\
\]

\(^6\)The authors have done an alternative specification assuming that there is a certain threshold level below which conflict may occur but where it is minor and has no consequences (and therefore may be left out of account); and above which it does have an effect and therefore must be taken into consideration. The specification produced results similar to those discussed in the text, however, and so only the simpler assumption is presented above.

\(^8\)The term ‘konjunkturneutral’ (neutral with respect to the business cycle) is employed by the German Sachverständigenrat (Council of Economic Experts). It is used when the effects of the expenditure side of the budget are of the same size but of opposite direction to those of the revenue side.

\(^8\)For the importance of this concept in Bundesbank policy, see for example Fautz (1975).
Central banks as bureaucratic organizations are reluctant to undertake sudden policy changes. As a result, past policy keeps on influencing current policy, and it can be theoretically expected that past instrument use will positively influence current use ($\gamma_1 > 0$). When there is no-conflict with the government ($C = 0$), central bank ideology (IDEOLCB) fashions a restrictive monetary policy. For example, it would be expected that $\gamma_2 > 0$ for the rate of discount because an increase in the rate of discount has a deflationary influence and thus an effect desired by the central bank's ideology. In the case of conflict ($C = 1$), the central bank's instruments follow the same direction as the government's policy, and we would expect $\gamma_3 < 0$. In both cases the central bank is assumed to need two quarters to react. $u(t)$ is a random variable accounting for all other influences.

3.2. Government

It is assumed that the government also maximizes its utility by pursuing its ideology, with a left-wing party in power tending to expand and a right-wing party to restrict government expenditures and taxes. The government must observe four types of constraints:

(a) The political constraint, consisting of the fact that the party in power must be reelected in order to be able to continue enacting its ideological goals.

(b) Economic constraints imposed by the nature of the economic structure (determines the effect of fiscal policy instruments on other economic variables), and by the effect of cost factors (prices and wage rates) on nominal public expenditures.

(c) The administrative constraint, i.e., the influence of a bureaucracy's abovementioned tendency to oppose policy changes. This hinders the government in its attempts to change the direction of or otherwise influence instrument use.

(d) Financial constraints arising from the ease or difficulty with which the government can finance its expenditures by resorting to central bank credits.

Government solves this complex dynamic maximization problem by fixing its attention on its main constraint, i.e., its need to be reelected. It differentiates between a state of popularity surplus (indicated by a dummy variable $D = 0$) in which it can afford to pursue its ideology (IDEOLGOV), and a state of popularity deficit ($D = 1$) in which it has to pursue an expansionary policy in order to increase its popularity with the voters. Current popularity ($POP$) is

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9See for example Wildavsky (1964).

10See the authors' abovementioned papers for a more extensive discussion.
taken by the government as indicative of the votes that it will receive at the next election. Popularity surplus or deficit is measured relative to a popularity share \( POP^* \) (here taken to be 52\% of the total votes cast) which, in the government's view, just suffices to guarantee reelection. \( POP^* \) depends on institutional factors and the minimal safety margin that the government considers to be necessary.

The estimation equation for the government's fiscal policy instrument \( j \) is composed of five arguments:

\[
\text{INSTRGOV}^j(t) = \beta_0 + \beta_1 \text{INSTRGOV}^j(t-2)
+ \beta_2 (1-D) \cdot \text{IDEOLOGY}^j(t-2)
+ \beta_3 D \cdot \text{REELEC}(t-2)
+ \beta_4 [\text{cost factors}, t-2]
+ \beta_5 [\text{credits from central bank}, t-2] + \varepsilon(t).
\]

\( \varepsilon(t) \) is the random error. It should be noted that all time lags are assumed to be two quarters. The past use of an instrument is taken as having a positive influence on its current use and it is thus expected that \( \beta_1 > 0 \).

The second argument (\( \text{IDEOLOGY} \)) indicates that the government pursues its own ideological policy when its popularity exceeds \( POP^* \) \((D = 0)\). Government ideology is defined in the following manner for either a left-wing (\( LW \)) or right-wing (\( RW \)) party in power:

\[
\text{IDEOLOGY}(t) = [i_{RW} \cdot P_{RW} + i_{LW} \cdot P_{LW}] [POP(t-2) - POP^*]^2, \tag{3}
\]

where \( P_{RW} = 1 \) for those periods in which a right-wing party is in power (and is otherwise zero). \( i_{RW} \) indicates the corresponding ideological bias. \( P_{LW} \) and \( i_{LW} \) are the corresponding variables applying when a left-wing party is governing. It is a priori expected that left-wing governments will tend to increase public expenditures and raise taxes \((i_{LW} > 0)\); and that right-wing governments will tend to decrease them \((i_{RW} < 0)\). The squared popularity surplus \([POP(t-2) - POP^*]^2\) shows how much leeway the government has available to it for ideologically-oriented action.

The third argument in eq. (2), \( \text{REELEC} \), applies in the case of a popularity deficit, i.e., when \( POP(t) < POP^* \) \((D = 1)\). The government's efforts directed towards reelection (\( \text{REELEC} \)) are greater, the larger are both the squared popularity deficit and the time elapsed since the last election (\( \text{TSLE} \)) (i.e., the nearer is the next election).

\[
\text{REELEC}(t) = \rho_1 \cdot [POP(t-2) - POP^*]^2 + \rho_2 \cdot \text{TSLE}(t). \tag{4}
\]
The government expects its popularity and thus its reelection chances to rise when it undertakes an *expansionary* policy. The theoretical hypothesis is thus \( \rho_1^{G_S}, \rho_2^{G_S} > 0 \) for public expenditures \((G_S)\) used as the fiscal policy instruments, and \( \rho_1^{T_A X}, \rho_2^{T_A X} < 0 \) for tax instruments.

The fourth component of eq. (2) consists of cost factors and is relevant for expenditure instruments only: \( \beta_4^{G_S} > 0, \beta_4^{T_A X} = 0 \). The last argument shows the influence of credits granted by the central bank to the government. It may be expected that an increase in credits enables the government to increase its expenditures as this leads to greater liquidity and a less restrictive budget constraint \( (\beta_5^{G_S} > 0) \), at least in the short run. The impact on taxes is more difficult to predict: on the one hand, increasing credits gives the government a chance to reduce taxes, at least for a brief period; but on the other hand, it can be expected that the central bank will only grant credits when the government is *not* planning to use them to decrease taxes, and may even wait until it sees the government attempting to close the budget deficit by *increasing* taxes. The latter seems to be somewhat more probable, so we can expect \( \beta_5^{T_A X} = 0 \).

3.3. Voters\(^\text{11}\)

Voters show their pleasure or displeasure with the performance of the party in power at the ballot box [see Kramer (1971)]. Empirical research has shown that the voters' memory is rather short. Their evaluation of the government depends mainly on its ability to bring about a favorable state of the economy: the greater the rates of unemployment \((U)\) and inflation \((I)\), and the smaller the growth rate of real disposable income \((GDYR)\), the smaller is government's popularity.

Specification of the popularity function can be improved by allowing for unequal basic popularity shares for right- and left-wing parties:

\[
POP(t) = \pi_1 U(t-1) + \pi_2 I(t-1) + \pi_3 GDYR(t-1)
+ \pi_{RW} P_{RW} + \pi_{LW} P_{LW} + u(t).
\]

\(u(t)\) is a random variable capturing all other influences. It is a priori expected that \( \pi_1, \pi_2 < 0, \pi_3 > 0 \).

3.4. An overview

It may be useful to summarize graphically the relationship between the central bank, government (and its bureaucracy), the voters, and the economy.

\(^{11}\)For a discussion of the existing literature, its main assumptions and results, see again the authors' abovementioned papers.
The model is one of circular interdependence, with the economy affecting the voters' evaluation of the government, this evaluation affecting the government's behavior, and this in turn influencing the state of the economy through its policy instruments. The central bank enters into the network through its mutual interaction with the government on the one side, and the economy on the other. The government influences the central bank, but it should be noted that the central bank can also affect the government through its use of credits to the public sector.

**Fig. 1. Schematic representation of the politico-economic model.**

### 4. Empirical estimation

The model developed has been econometrically (or rather politometrically) estimated for Germany with quarterly data (see appendix) for the period 1957:II through 1977:IV. The period begins with the initiation of the law establishing the Bundesbank and its formal independence from the government (Bundesbankgesetz, 1957). At that point full convertibility of the mark had been achieved, and the structural unemployment of the post-war years had been almost overcome.

There were several growth cycles during the period 1957–1977. After a standstill that extended into 1958, there was a boom in 1958–1960 which was followed by another standstill in 1962–1963. The upswing of 1963–1965 led to rates of inflation going up to 4% and over (customary level, 1–2%). The
first major post-war recession of 1966-1967 led to the breakdown of the Christian Democrat (CDU) government under Ludwig Erhard and the election of a 'Grand Coalition' composed of Christian Democrats and Social Democrats (SPD) under Chancellor Kiesinger (CDU). The rate of unemployment rose to almost 4.5% in the second quarter of 1966. The new government — and especially its minister of finance, Karl Schiller — managed to produce a quick upswing with an expansionary fiscal policy accompanied by an expansionary monetary policy on the part of the Bundesbank. The boom continued through 1968, with inflation remaining low (ca. 2% on the average). In 1971-1972 there was another standstill. The upswing of 1973 — which produced inflation rates of over 7% — was abruptly brought to a halt by the first oil crisis in December 1973, which led to the second major post-war recession. The rate of unemployment went to a record post-war high of over 5%. The economy has today still not really recovered from this blow. The rate of unemployment continued to stay at over 4% even reaching 5.4% in the first quarter of 1977. The rate of inflation was gradually reduced from around 7% in 1974 to around 4% in 1977.

Our model is not intended as an attempt at capturing the intricacies of Germany's institutional set-up, but rather to demonstrate that such a politico-economic model can be empirically tested. It consists of eqs. (1), (2) and (3). The following policy instruments are considered:

(a) Monetary policy instruments:¹²¹³
— Credits from the Bundesbank to the federal government (CR, billion DMs).
— Minimum reserve requirements (average) (MRR, percentage rate).
— The nominal rate of open market papers (ROMP, percentage rate).
— Rate of discount (ROD, percentage rate).
— Interest rate on Lombard credits (LOMR, percentage points).

(b) Fiscal policy instruments:
— Government expenditures for goods and services (GS, billion DMs).

¹²In the last few years the Bundesbank has also used its control of the monetary base as a policy instrument. However, there are too few observations available to empirically test the use of this instrument.

¹³The monetary policy instruments are not as highly correlated as one would a priori expect.

<table>
<thead>
<tr>
<th></th>
<th>MRR</th>
<th>ROD</th>
<th>LOMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROMP</td>
<td>0.37</td>
<td>0.79</td>
<td>0.78</td>
</tr>
<tr>
<td>MRR</td>
<td>—</td>
<td>0.46</td>
<td>0.51</td>
</tr>
<tr>
<td>ROD</td>
<td>—</td>
<td>—</td>
<td>0.97</td>
</tr>
</tbody>
</table>

Only the rate of discount and the interest rate on Lombard credits are highly correlated.
— Government transfer payments to households \((\text{TRANS}, \text{billion DMs})\).
— Total government revenue, mainly tax income \((\text{TAX}, \text{billion DMs})\).

Total expenditures (exhaustive and transfer) are referred to as \(\text{EXP}\).

Table 1 gives the empirically estimated parameters \(\hat{\beta}\) of the Bundesbank’s use of monetary policy instruments.

Eqs. (1a)-(1e) account for a large share of the variance \((\hat{R}^2)\) and the \(h\)-test indicates an absence of autocorrelation of the residuals. All the parameters differ from zero in a statistically significant way according to the \(t\)-test, and all the parameters reported have the theoretically expected signs. The past level of every instrument has a positive effect on its current use \((\hat{\beta}_j > 0)\). Net credits of the Bundesbank to the federal government decrease when the Bundesbank is able to act according to its own ideological beliefs \((C = 0)\), i.e., when it can pursue an anti-inflationary policy \((\hat{\beta}_2^R < 0)\). In the case of conflict with the government \((C = 1)\), the Bundesbank must follow the direction of government policy: \(\hat{\beta}_3^R > 0\) shows that government’s expansionary policy \((\text{POLGOV} > 0)\) is accompanied, with a small time lag, by an expansionary increase in credits on the part of the Bundesbank; and that the reverse is true for a deflationary policy. The interest rates \((\text{IR})\) explained by eqs. (1b)-(1e) have parameters of a sign opposite to that of eq. (1a) (except, of course, for \(\hat{\beta}_1\)): an anti-inflationary policy when \(C = 0\) (no-conflict) brings with it an increase in interest rates \((\hat{\beta}_4^R > 0)\). If due to conflict with the government \((C = 1)\) the Bundesbank is forced to apply its instruments in the same direction as fiscal policy, an expansionary government policy will require a decrease in interest rates \((\hat{\beta}_4^R < 0)\).

The central bank has various instruments available to it with which to influence the economy, and we have made the assumption that it will use them simultaneously, taking into account their relative efficacy as parts of the overall policy. (This does not apply to credits given directly to the government.) Table 2 presents the two-stage least squares estimates for the simultaneous use of interest rate instruments.

A comparison of tables 1 and 2 shows that the signs and significance of the parameters \(\hat{\beta}_1\), \(\hat{\beta}_2\), \(\hat{\beta}_3\) are unaffected.

In Germany, the discount rate and the interest rate on Lombard credits are traditionally used in a very similar fashion, and the respective parameters \(\hat{\beta}_4^\text{ROD,LOMR}\) and \(\hat{\beta}_4^\text{LOMR,ROD}\) are thus positively related. There is also a positive relationship between these two and the interest rate on open market papers \((\text{OMP})\) (i.e., \(\hat{\beta}_4^\text{ROD,OMP}\), \(\hat{\beta}_4^\text{LOMR,OMP}\), \(\hat{\beta}_4^\text{OMP,ROD}\), \(\hat{\beta}_4^\text{OMP,LOMR} > 0\)). The minimum reserve requirements and the two interest rates \(\text{ROD}\) and \(\text{LOMR}\) are used substitutively \((\hat{\beta}_4^\text{MRR,ROD}, \hat{\beta}_4^\text{MRR,LOMR}, \hat{\beta}_4^\text{ROD,MRR}, \hat{\beta}_4^\text{LOMR,MRR} < 0)\). Overall, the simultaneous estimate performs somewhat better than the OLS estimates presented in table 1 and explains a higher share of the variance (the adjusted \(R^2\) rises). Again, the \(h\)-test shows no autocorrelation of residuals.
Table 1
The Central Bank's monetary policy (OLS-estimates) 1957:II–1977:IV.*

<table>
<thead>
<tr>
<th>Eq.</th>
<th>Dependent variables: monetary policy instruments</th>
<th>Constant</th>
<th>$INSTRCB(t-1)$</th>
<th>$C=0$</th>
<th>$C=1$</th>
<th>Test statistics</th>
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<td></td>
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<td>$z_3$</td>
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<td>(1a)</td>
<td>Credits</td>
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<td>0.99</td>
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<td></td>
<td></td>
<td>(6.08)</td>
<td>(3.36)</td>
<td>(-2.51)</td>
<td>(2.31)</td>
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</tr>
<tr>
<td>(1b)</td>
<td>Open market papers</td>
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<td>0.923</td>
<td>0.1647</td>
<td>-0.3260</td>
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<td></td>
<td></td>
<td>(2.09)</td>
<td>(12.41)</td>
<td>(2.49)</td>
<td>(-2.67)</td>
<td></td>
</tr>
<tr>
<td>(1c)</td>
<td>Minimum reserves</td>
<td>1.643</td>
<td>0.9741</td>
<td>0.2673</td>
<td>-0.3604</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.43)</td>
<td>(19.47)</td>
<td>(2.84)</td>
<td>(-2.21)</td>
<td></td>
</tr>
<tr>
<td>(1d)</td>
<td>Rate of discount</td>
<td>0.507</td>
<td>0.9438</td>
<td>0.2506</td>
<td>-0.4309</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.03)</td>
<td>(16.03)</td>
<td>(2.50)</td>
<td>(-2.61)</td>
<td></td>
</tr>
<tr>
<td>(1e)</td>
<td>Lombard credit rate</td>
<td>1.084</td>
<td>0.9713</td>
<td>0.3317</td>
<td>-0.5841</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.17)</td>
<td>(18.47)</td>
<td>(2.47)</td>
<td>(-2.57)</td>
<td></td>
</tr>
</tbody>
</table>

*The figures in parentheses indicate t-values; $h$ is the $h$-statistic to check for autocorrelation; $df.$ is the degree of freedom. Two dummy variables are introduced to account for discontinuities in the statistical data for net credits ($D_1 = 1$ for 1961:II–1974:IV, otherwise $D_1 = 0$; $D_2 = 1$ for 1968:1–1977:IV, otherwise $D_2 = 0$). The respective parameter estimates are $\hat{\delta}_1 = 5.60(7.04)$ and $\hat{\delta}_2 = 3.06(5.02)$. 

Table 2
The Central Bank's interdependent interest rate policy (TSLS estimates).

<table>
<thead>
<tr>
<th>Dependent variables: monet. policy instr.</th>
<th>Constant</th>
<th>INST(t-1)</th>
<th>C = 0</th>
<th>C = 1</th>
<th>ROMP(t)</th>
<th>MRR(t)</th>
<th>ROD(t)</th>
<th>LOMR(t)</th>
<th>Test statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eq.</td>
<td>x₀</td>
<td>x₁</td>
<td>x₂</td>
<td>x₃</td>
<td>x₄</td>
<td>x₅</td>
<td>x₆</td>
<td>x₇</td>
<td>R²</td>
</tr>
<tr>
<td>(2b) ROMP</td>
<td>1.4137</td>
<td>0.8548</td>
<td>0.1580</td>
<td>-0.317</td>
<td>-</td>
<td>0.631</td>
<td>0.391</td>
<td>0.413</td>
<td>0.96</td>
</tr>
<tr>
<td></td>
<td>(2.03)</td>
<td>(0.01)</td>
<td>(2.21)</td>
<td>(-2.47)</td>
<td></td>
<td>(2.09)</td>
<td>(1.71)</td>
<td>(1.86)</td>
<td></td>
</tr>
<tr>
<td>(2c) MRR</td>
<td>0.2614</td>
<td>0.9882</td>
<td>0.2316</td>
<td>-0.341</td>
<td>0.813</td>
<td>-</td>
<td>-0.581</td>
<td>-0.521</td>
<td>0.98</td>
</tr>
<tr>
<td></td>
<td>(0.97)</td>
<td>(18.04)</td>
<td>(2.37)</td>
<td>(-2.19)</td>
<td>(3.08)</td>
<td></td>
<td>(-2.71)</td>
<td>(-2.67)</td>
<td></td>
</tr>
<tr>
<td>(2d) ROD</td>
<td>0.3153</td>
<td>0.5903</td>
<td>0.2399</td>
<td>-0.376</td>
<td>0.161</td>
<td>-0.184</td>
<td>-</td>
<td>0.501</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>(1.71)</td>
<td>(5.51)</td>
<td>(2.09)</td>
<td>(-2.51)</td>
<td>(2.79)</td>
<td>(-2.12)</td>
<td></td>
<td>(11.47)</td>
<td></td>
</tr>
<tr>
<td>(2e) LOMR</td>
<td>0.3150</td>
<td>0.6017</td>
<td>0.2847</td>
<td>-0.451</td>
<td>0.220</td>
<td>-0.182</td>
<td>0.691</td>
<td>-</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>(1.39)</td>
<td>(6.09)</td>
<td>(2.19)</td>
<td>(-2.50)</td>
<td>(1.96)</td>
<td>(-2.02)</td>
<td>(10.46)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3 gives the estimated parameters of government fiscal policy instruments according to eq. (2). However, in line with table 2, a sixth argument has been added which takes into account the fact that the government applies its instruments simultaneously, taking into account their relative effectiveness in achieving its goals. It is expected that expenditure instruments are substitutive. An increase in one expenditure category leads to either a decrease in other expenditure categories \( (\beta_{6,GS}^{TAX,TRANS} < 0) \) or an increase in taxes \( (\beta_{6,GS}^{TAX} > 0) \) in order not to violate the budget constraint. Accordingly, the estimates presented in table 3 use the two-stage least squares method. From 1957 to 1966 the government was formed (or at least dominated) by the CDU, which is considered to have a right-wing ideology. There was no discernible ideological bias from 1967 to 1969, the period of coalition between the CDU and the SPD. Each party suffered from a popularity deficit during that time and was unable to form a government on its own; consequently both were interested in policies that would increase their popularity and election chances. The SPD-dominated governments from 1970 to 1975 are considered to have had a left-wing ideology.

The three equations shown in table 3 account for a large share of the variance and there is no autocorrelation. All the parameters except one are statistically significant and have the theoretically expected sign.

The past level of expenditures and taxes has a strong and positive influence on the current level \( (\beta_1 > 0) \). As expected, and in line with their ideologies, the right-wing CDU governments tend to spend and tax significantly less than the left-wing SPD governments do when they are free to behave as they prefer \( (D = 0) \) \( (\hat{t}_{RW} < 0 \text{ and } \hat{t}_{LW} > 0) \). All governments increase total expenditures and decrease taxes when confronted with a popularity deficit \( (D = 1) \), and do so all the more, the more time has elapsed since the last election \( (\hat{t}_{1,EXP}^{EXP} > 0; \hat{t}_{1,TRANS}^{TAX} < 0) \) in order to increase their popularity and reelection chances. An increase in the price level and in wage rates increases the nominal value of public expenditures \( (\beta_0 > 0) \). The immediate effect seems to be quite small, but in the steady state an increase in the level of prices of 1 DM tends to increase nominal exhaustive expenditures by an equivalent amount \( (\beta_2^{GS} \cdot (1 - \beta_3^{GS}) = 0.096 \cdot 0.087 \approx 1) \), and to raise transfers more than proportionately \( (0.413 : 0.206 \approx 2) \). Both exhaustive and transfer expenditures also rise more than proportionately as wage rates increase.

Central bank credits encourage the government to significantly increase public expenditures \( (\beta_5^{EXP} > 0) \). When the central bank increases its credits to the government, the government also responds by raising taxes \( (\beta_3^{TAX} > 0) \). This suggests that the central bank’s pressure on the government to behave in a financially responsible way, i.e., to not decrease taxes despite the increase in credits, dominates the desire to use the credits to finance tax cuts. It is not implausible that the central bank may resist giving credits to
<table>
<thead>
<tr>
<th>Dependent variable: fiscal policy instr.</th>
<th>Constant</th>
<th>Endog. lagged instr.</th>
<th>Right-wing CDU ( \beta_1 )</th>
<th>Left-wing SPD ( \beta_2 )</th>
<th>Squared popul. deficit ( \beta_3 )</th>
<th>Time elapsed since last elec. ( \beta_4 )</th>
<th>Price level ( \beta_5 )</th>
<th>Wage rate ( \beta_6 )</th>
<th>Exhaust, expend. ( GOV\ EXP(t) )</th>
<th>Transfer expend. ( TRANS(t) )</th>
<th>Gov. receipts ( TAX(t) )</th>
<th>Credits from central bank ( \beta_7 )</th>
<th>Test statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3a) GS</td>
<td>1.30</td>
<td>0.913</td>
<td>0.913</td>
<td>0.0004</td>
<td>0.515</td>
<td>0.0038</td>
<td>0.251</td>
<td>0.096</td>
<td>0.271</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>0.118</td>
</tr>
<tr>
<td>(3b) TRANS</td>
<td>0.001</td>
<td>0.794</td>
<td>0.794</td>
<td>0.0001</td>
<td>0.054</td>
<td>0.0031</td>
<td>0.004</td>
<td>0.413</td>
<td>0.037</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>0.153</td>
</tr>
<tr>
<td>(3c) TAX</td>
<td>0.20</td>
<td>0.931</td>
<td>0.931</td>
<td>0.0061</td>
<td>0.156</td>
<td>0.0648</td>
<td>0.014</td>
<td>0.241</td>
<td>0.116</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>0.173</td>
</tr>
</tbody>
</table>
finance tax decreases, while not objecting to using them to finance expenditure increases.14

There is clear evidence that German governments use their various policy instruments simultaneously. As theoretically expected, an increase in exhaustive government expenditures ceteris paribus decreases transfer outlays ($\beta_{GS}^{TRANS} < 0$) and motivates the government to increase taxes ($\beta_{GS}^{TAX} > 0$). Similarly, when transfer expenditures increase the government reduces other outlays ($\beta_{TAX}^{TRANS/EXP} < 0$) but again increases taxes ($\beta_{TAX}^{TRANS/TAX} > 0$). If government income rises, the party in power can afford to increase expenditures without endangering the budget ($\beta_{TAX}^{TAX} > 0$).

The empirical (OLS) estimate of the voters’ evaluation of the government — the popularity function — is

$$\text{POP}(t) = -1.82U(t-1) - 1.60I(t-1) + 0.32GDYR(t-1)$$

$$\begin{align*}
&(-4.36) \quad (-3.02) \quad (1.59) \\
&+ 56.02P_{CDU} + 89.47P_{GC} + 54.13P_{SPD} \\
&(47.94) \quad (59.09) \quad (51.08)
\end{align*}$$

$$R^2 = 0.97, \quad D-W = 1.84, \quad d.f. = 75$$

This equation accounts for a large share of the variance and the residuals are not serially correlated. An increase in the rate of unemployment of 1 percentage point reduces government popularity by 1.82 percentage points; a rise in the rate of inflation of 1 percentage point reduces popularity by 1.6 percentage points; and a 1 percentage point increase in the growth of real disposable income raises government popularity by 0.32 percentage points. While the parameters referring to unemployment and inflation are statistically significant, this does not seem to be true for growth of income.

14The equations presented in table 3 may be subject to multicollinearity. The correlation matrix between the instruments and central bank credits is

<table>
<thead>
<tr>
<th></th>
<th>GS</th>
<th>TRANS</th>
<th>TAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>0.910</td>
<td>0.882</td>
<td>-0.251</td>
</tr>
<tr>
<td>GS</td>
<td></td>
<td>0.663</td>
<td>0.914</td>
</tr>
<tr>
<td>TRANS</td>
<td></td>
<td></td>
<td>0.901</td>
</tr>
</tbody>
</table>

Central bank credits are thus strongly correlated with public expenditures, while their correlation with taxes is small and negative.
This is due to multicollinearity among the economic variables.\textsuperscript{15} By deleting the economic variables from the estimation equation one at a time, it may be shown that all three have a statistically significant impact on government popularity.\textsuperscript{16}

The course of events is well explained by the politico-economic model presented. Over the period covered, there are seven time spans in which there was a conflict between the central bank and government in the sense defined above. The conflict always arose because the Bundesbank was pursuing a restrictive policy, and the government an expansionary one.\textsuperscript{17} In the end the Bundesbank yielded to the pressure and undertook an expansionary monetary policy.

For reasons of space, no account of all the phases in the relationship between the central bank and the government can be given here. A description of one of the more dramatic conflicts, which occurred during the first major post-war recession in Germany, 1966–1967 [see Duwendag (1973, p. 6)], can however serve as a concrete example. In 1966 a state of conflict existed between the government and the central bank. The government was pursuing an expansionary policy in order to raise its popularity, which had been negatively affected by a sharply falling rate of real growth and rapidly rising unemployment. The Bundesbank’s policy on the other hand was contractionary. The rate of discount, which had been at 3% since 1961, was gradually raised to a post-war record height of 5% (1966:II) because the central bank wanted to combat rising inflation. These opposing policies led to grave tensions between the two decisionmakers. In the fourth quarter of 1966 the conflict was solved in favor of the government’s policy; central bank policy was turned in an expansionary direction, the rate of discount was

\textsuperscript{15}The correlation matrix is

\begin{tabular}{c c c}
  & $I$ & GDYR \\
  $U$ & 0.51 & -0.62 \\
  $I$ &  & 0.80 \\
  GDYR &  &  \\
\end{tabular}

The relatively low $t$-value (1.59) of the parameter estimate referring to the growth of income variable may be due to significant correlation with the rates of both unemployment and inflation.

\textsuperscript{16}See our papers mentioned above.

\textsuperscript{17}There is one exception: from 1957:III to 1958:III the Bundesbank was expansionary (because its goal of price stability was not being threatened as the rate of inflation dropped significantly over 1958, even reaching the negative figure of -0.5% in 1959:1), while the government was contractionary (because its goal of full employment was not in danger as the rate of unemployment went down a good deal in late 1957 and early 1958). In 1958:IV the Bundesbank’s policy began to turn contractionary, the same direction as government’s. Conflict arose again in 1959:IV when government became expansionary, while a seriously increasing inflation rate kept the Bundesbank contractionary.
lowered to 3%. The combined expansionary effects of fiscal and monetary policy led to a very rapid recovery of the economy, with the real growth rate jumping from around 2% at the beginning of 1968 to 10% in 1969–1970.

5. Comparison with other approaches

As pointed out in the introductory section, there have only been two contributions so far that have estimated positive models of central bank behavior. Fair (1977) and Cowart (1978) essentially assume that the central bank reacts passively to the state of the economy, increasing the rate of interest when inflation rises and decreasing it when the rate of unemployment rises. Neither study views the central bank as part of an interconnected politico-economic system. Fair completely neglects the crucial relationship of the central bank to the government, which is at the heart of the model presented here. He explains the U.S. Federal Reserve's treasury bill rate policy (RBILL) by the following equation [Fair (1977, p. 1170)]:

\[
RBILL = a_0 + a_1 \cdot RBILL(t-1) + a_2 \cdot I(t-1) + a_3 \cdot LMT(t) + a_4 \cdot GDYR(t) + a_5 \cdot GDYR(t-1) + a_6 \cdot M_1(t-1) + u_t,
\]

where \(LMT\) is a measure of labor market tightness, and \(M_1\) is the annual percentage rate of change of the money supply.

Fair estimates this model for the United States over the period 1954:1–1976:II. However, only \(a_1\), \(a_3\) and \(a_6\) are significantly different from zero (they are all positive). Substituting the rate of discount for the bill rate, and applying the equation to Germany for the period used by us (1957:II–1977:IV) gives the following result:

\[
ROD(t) = 0.21 + 0.904 ROD(t-1) + 0.061 I(t-1) \quad (1.84) (18.89) (1.56)
\]

\[
-0.107 U(t) + 0.471 GDYR(t-1). \quad (-2.91) (3.41)
\]

\(R^2 = 0.90, \quad h = 2.41, \quad d.f. = 76.\)

The rate of growth of \(M_1\) was not included by us among the explanatory variables because of its very high correlation with the growth of income. The lagged endogenous variable, the rate of unemployment and the rate of real growth have a statistically significant effect on the discount rate; unemployment has a negative and real growth a positive sign. The variable to which the Bundesbank says that it pays the most attention to, the rate of inflation, somewhat surprisingly has no significant effect on central bank
policy in Fair's model. This suggests that the equation may not be well specified. In the politico-economic model presented here, the German central bank does react in a statistically significant way to changes in inflation — but only when there is no conflict with the government.

Cowart (1978) presents three models explaining the discount rate. Model I simply assumes that the central bank reacts to unemployment and inflation; the growth of income is neglected. The estimation equation is

\[ ROD(t) = b_0 + b_1 ROD(t-1) + b_2 \sum_{t-1}^{t-4} \Delta U(t) + b_3 \sum_{t-1}^{t-4} I(t) + u_t, \]

where

\[ \Delta U(t) = U(t) - U(t-1). \]

Model II empirically tests whether the level of the rate of discount varies according to whether a left-wing or right-wing government is in power. The estimation equation is

\[ ROD(t) = c_0 + c_1 ROD(t-1) + c_2 \sum_{t-1}^{t-4} \Delta U(t) + c_3 \sum_{t-1}^{t-4} I(t) + c_4 G(t) + u_t, \]

The dummy variable \( G(t) \) equals 1 with a left-wing government and is otherwise zero. It is (without theoretical explanation) assumed that the rate of discount is higher with a left-wing government, i.e., the constant \((c_0 + c_4 G) > c_0\).

Model III tests whether both the level of the rate of discount and the reaction to economic conditions differ according to which type of government is in power. The estimation equation is

\[ ROD(t) = d_0 + d_1 ROD(t-1) + (d_2 + d_3 G_t) \sum_{t-1}^{t-4} \Delta U(t) + (d_4 + d_5 G_t) \sum_{t-1}^{t-4} I(t) + u_t. \]

Cowart expects that a left-wing government will react more strongly to unemployment than a right-wing government will, i.e., that \((d_2 + d_3 G_t) > d_2\); and that the opposite will be true in the case of inflation \((d_4 < 0)\). He also offers other hypotheses of how left- and right-wing governments may differ with respect to monetary policy, but the theoretical arguments are ad hoc.
Cowart applies the model to Germany for the period 1951:1–1975:1 as well as to other countries. Few of the parameters turn out to be statistically significant besides the lagged endogenous variable. Aside from this one—which is statistically significant in all the models—no parameter is so in Model I, only \( c_4 \) in Model II, and only \( d_3 \) and \( d_5 \) in Model III (all at the 95\% level).

Applying the models to the sample period used in this paper gives the results shown in table 4.

<table>
<thead>
<tr>
<th>Model I</th>
<th></th>
<th></th>
<th></th>
<th>R²</th>
<th>h</th>
<th>d.f.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( b_0 )</td>
<td>0.434</td>
<td>0.90</td>
<td>-0.116</td>
<td>0.005</td>
<td>0.87</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>(2.36)</td>
<td>(18.40)</td>
<td>(-2.93)</td>
<td>(1.48)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( b_1 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( b_2 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( b_3 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Model II  |       |       |       |        |       |      |      |
|-----------|-------|-------|-------|--------|-------|------|
| \( c_0 \) | 0.442 | 0.899 | -0.117| 0.005  | 0.001 | 0.87 | 0.90 | 76   |
|           | (1.84)| (17.45)|(-2.72)| (0.92) | (0.005)|      |      |      |
| \( c_1 \) |       |       |       |        |       |      |      |
| \( c_2 \) |       |       |       |        |       |      |      |
| \( c_3 \) |       |       |       |        |       |      |      |
| \( c_4 \) |       |       |       |        |       |      |      |

| Model III |       |       |       |        |       |      |      |
|-----------|-------|-------|-------|--------|-------|------|
| \( d_0 \) | 0.454 | 0.896 | -0.109| -0.001 | 0.005 | 0.001| 0.86 | 0.97 | 75   |
|           | (1.55)| (16.79)|(-1.59)| (-0.17)| (0.59)| (0.19)|      |      |      |
| \( d_1 \) |       |       |       |        |       |      |      |
| \( d_2 \) |       |       |       |        |       |      |      |
| \( d_3 \) |       |       |       |        |       |      |      |
| \( d_4 \) |       |       |       |        |       |      |      |
| \( d_5 \) |       |       |       |        |       |      |      |

With the exception of the lagged endogenous variable (represented by \( b_1 \), \( c_1 \), \( d_1 \)), very few of Cowart’s variables have a statistically significant effect on German central bank policy. In his Models I and II, an increase in unemployment leads to a significant reduction in the discount rate (\( b_2 \), \( c_2 \) < 0). In Model III this variable is no longer significant, nor does the rate of inflation affect monetary policy. The same is true for all the dummy variables that try to capture the influence of the type of party in power. On the whole, Cowart’s models perform rather poorly. The relationship between the central bank and government is inadequately modeled by simply introducing dummies to influence the level and slopes of a ‘purely economic’ behavioral equation for the central bank. It seems to us to be preferable — as done in this paper — to look at the central bank as just one actor — but an important one — in a whole system of politico-economic interdependence in which other decisionmakers, in particular the government and voters, also act.
6. Concluding remarks

The theoretical and empirical study of central bank behavior presented here is exploratory only. The politico-economic model developed should be more closely tied to an econometric model. Many problems have been neglected: interest groups, for example, have not been accounted for so far. Within the framework established, it is in principle possible to do so, but this must await further research.

Though the present model is simple and incomplete, the empirical test presented for the example of Germany yields good results per se and in comparison to other approaches that have been tried. The model seems to capture the most important features of central bank behavior in a democratic society reasonably well. This can contribute to increasing our knowledge of this important actor in the politico-economic system, help to improve forecasting, and help to form a basis for successful normative policy.

Appendix: Sources for the empirical estimations of the variables used

General comments: All economic variables are seasonably adjusted and are shown in percentage points for rates of change, and otherwise in billion DMs. All of the OLS-TSLS estimates were done with the REGAN econometric program at the Institute for Empirical Economic Research at the University of Zürich.

\( B^* \) Variable for the actual value of the federal budget. Yearly values were taken from the annual report of the Council of Economic Advisors for 1970–1978 and interpolated to quarterly values with the Spline method.

\( B^n \) Variable for the 'business cycle neutral' federal budget. Source and calculation by quarterly dates: see \( B^* \).

\( C \) Dummy variable = 1 in the case of conflict between the central bank and the government, and otherwise = 0 (no conflict).

\( CR \) Credits to the government, in billion DMs. Source: Deutsches Institut für Wirtschaftsforschung, Vierteljährliche Volkswirtschaftliche Gesamtrechnung (German Institute for Economic Research, Quarterly National Account), Berlin, 1969–1978.

\( D \) Dummy variable for government popularity = 1 when reelection of the government is in danger (popularity deficit) and otherwise = 0 (popularity surplus).

\( EXP \) Total government (federal) expenditures, composed of exhaustive (\( GS \)) and transfer (\( TRANS \)) expenditures. Source: see \( GS \) and \( TRANS \).

\( GS \) Government (federal) expenditures for goods and services. Sources: see \( CR \).
GDYR Yearly growth rate for real disposable income. Source: see CR.


IDEOLCB Variable for the central bank’s ‘ideological’ economic goals; takes the value of I (rate of inflation).

IDEOLGOV Variable for the economic-political ‘ideological’ goals of the federal government.

INSTRCB Central bank’s use of monetary policy instruments.

INSTROGV Government’s use of fiscal policy instruments.

IR Interest rates (of any nature).


MRR Minimum reserve requirements (average). Source: see LOMR.

PLW Dummy variable = 1 if a left-wing (SPD-dominated) government is in power, otherwise = 0.

PRW Dummy variable = 1 if a right-wing (CDU-dominated) government is in power, otherwise = 0.

POLCB Variable for the direction of central bank policy, given by LR, \(-LR_{t-1}\).

POLGOV Variable for the direction of government policy, given by \(B^a - B^p\).

POP Current popularity of the federal government (sum of the popularity of the individual parties participating in the government, an additive value). Percentage of respondents stating in an Allensbach survey that they would vote for a particular party at the present point in time. Source for the monthly data from which quarterly averages were then computed: Jahrbuch der öffentlichen Meinung 1974–1976 (Almanac of Public Opinion), Allensbach 1976; and various Allensbach reports, 1977–1978.

POPA Popularity share viewed by the government as being just sufficient to ensure reelection.
REELEC Variable denoting government's efforts directed towards reelection.

ROD Rate of discount of the German Bundesbank. *Source*: see LOMR.

ROMP Interest discount of the German Bundesbank. *Source*: see ROD.

TAX Total revenue of the federal government. *Source*: see CR.

TRANS Transfer amounts to private households. *Source*: see CR.

ISLE Dummy variable for the time elapsed since the last election (and therewith time left before the next one) = 1 up to and including the 7th quarter (in legislative periods with 16 quarters) and = 1, 2, 3, ..., 8 from the 8th quarter on when D = 1, and is otherwise 0.


W Yearly rate of growth of the gross wage index for wage earners. *Source*: see CR.

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