The German political business cycle: money demand rather than monetary policy

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Abstract

Arguably, Germany had the world's most independent central bank. Surprisingly, however, recent work has found political business cycles in German monetary aggregates. It is hard to explain this with standard models of opportunistic government behavior. Instead we show that the cycles originate from shifts in money demand tolerated by the Bundesbank. Such shifts occur because, when inflation preferences differ between political parties and election results are uncertain, rational investors avoid entering into long-term financial contracts before elections. Contrary to the Bundesbank's stated commitment to a monetaristic policy rule, it appears to have allowed these changes to have an impact on monetary aggregates.

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1. Introduction

There is a paradox in the literature on central banking. While it is generally believed that central bank independence is a means of preventing opportunistic Nordhaus-type monetary policy around elections, there is strong evidence that the German Bundesbank – repeatedly described as "one of the most independent central banks of the world" (Eijffinger and De Haan (1996), Cukierman (1998)) and the European Central Bank's role model – tolerated a political business cycle in German monetary aggregates.[1] Results to that end were reported by Alesina, Cohen, and Roubini (1992) and confirmed by Berger and Woitek (1997a), who found an increase in the growth rates of various German monetary aggregates before elections and a matching decline afterwards. The cycle was small in quantitative terms (+/– 0.2 to 0.4 percentage points) but extremely strong statistically. The result is robust with respect to the specific (real or nominal) monetary aggregate analyzed, the univariate or multivariate specification of the estimated time series model, alternative data frequencies, and different methods of modeling seasonality.[2] Including or excluding the turmoils of German unification after 1989 in the analysis also does not change the outcome.

There are two possible explanations for the discrepancy between the Bundesbank's reputation and a political business cycle in German money. One is that it is not a contradiction in the first place, but rather a consequence of the interaction between the Bundesbank and the German government. If the Bundesbank Council had partisan preferences, it might in fact (mis-) use its independence to either support or oppose an incumbent government depending on the ideological beliefs of the Council's median voter (Vaubel (1997a), Sieg (1997)). If the partisan beliefs of the two actors coincide (do not coincide) before an election, the bank follows an expansionary (a contractionary) monetary policy stance, which it will then correct after the event. In other words, the opportunistic cycle might be an anomaly in the data.

[1] Alesina, Cohen, and Roubini (1992) find a significant political business cycle in monetary aggregates in most OECD countries. For the theory of opportunistic political business cycles see Nordhaus (1975) and Rogoff and Sibert (1988). The literature is surveyed in Nordhaus (1989).

[2] Most results are based on nominal monetary aggregates. See Table A2.1 in Appendix 2 for evidence for a political business cycle in the growth rates of German real M3. Additional variables introduced in the literature include a proxy for the world business cycle (Alesina, Cohen, and Roubini (1992)), the balance-of-payments, and the exchange rate (Berger and Woitek (1997a)). See Lang and Welzel (1992) for a critical view.

Obviously this hypothesis can only be tested if the partisan preferences of the Bundesbank can (at least *ex post*) be known. Assuming the party preferences of a Council member to be identical with those of the government body that nominated the individual, Vaubel (1993, 1997a) was unable to refute the hypothesis. His results were questioned by Berger and Woitek (1997b) using data on the individual voting behavior of the Bundesbank Council.[3]

There is an alternative explanation for the coexistence of central bank independence and political business cycles in German monetary aggregates. If the Bundesbank were as devoted a supporter of monetarist principles as it claimed to have been since the mid-1970s, the conclusion that it actively steered monetary policy in an opportunistic fashion around elections could hardly be avoided. On the other hand, the Bundesbank might instead have followed an interest-rate policy aimed at stabilizing the economy around presumed long-run equilibrium values of key variables in its target function such as inflation and real activity (Taylor (1993a, 1993b)). A number of recent econometric results point in the latter direction (Bernanke and Mihov (1996), Clarida and Gertler (1997), Clarida, Galí, and Gertler (1998)). Section 2 of the paper will extend the literature by providing results based on the Bundesbank's performance since the early 1950s. If the above outcomes can be supported, the Bundesbank's money supply was elastic and shifts in money demand rather than money supply determined the volume of monetary aggregates. But in that case, why should money demand have been influenced by politics?

The answer may lie in the uncertainty created by upcoming elections. Alesina and Rosenthal (1995) argue that politicians have partisan preferences that are distinct enough to introduce permanent differences in the way they conduct fiscal policy or try to influence monetary policy.[4] If this is correct (or at least cannot be ruled out), interest rate forecasts extending into

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[3] The findings by both Alesina, Cohen, and Roubini (1992) and Berger and Woitek (1997a) of significant straightforward political business cycles in the data on monetary aggregates suggests that the partisan preference hypothesis is difficult to distinguish empirically from the simple opportunistic case. See, however, Vaubel (1997b).

[4] Alesina, Cohen, and Roubini (1992) find support for a variant of this hypothesis that focuses on actual government changes in German and international data. Berger and Woitek (1997a) obtain differnt results but point out that the relative (ex post-) stability of Germany's political history severely restricts the number of relevant observations. Note that the *absence* of a reliable partisan policy pattern can lead to an equivalent amount of electoral uncertainty. For instance, the policy of a future government might depend on certain characteristics of its cabinet members that are observable only after the election.

post-election periods depend on a weighted average of the inflation rates expected for all possible election results. To avoid this uncertainty, financial investors can find it beneficial to postpone certain commitments. They will trade longer term assets for shorter term assets and thus – with an elastic money supply – enlarge monetary aggregates as defined, for instance, in M3, M2 or M1.[5] If the policy stance of the new government is known with certainty after the election, the process will be reversed at this time.[6] For an uninformed outside observer, however, the phenomenon, which is really a demand-induced pattern caused by the uncertainty connected with elections and, possibly, partisan politics, might look like a Nordhaus or Rogoff/Sibert type opportunistic political business cycle. Section 3 provides tests for the impact of elections on money demand. Section 4 contains our conclusions.

2. Bundesbank policy

2.1 A standard reaction function

Was the political business cycle in German monetary aggregates 1950-96 the doing of the Bundesbank? To answer this question, we extend the standard reaction function approach to monetary policy.[7] We look at the following model for i_t, the day-to-day or short-term interest rate that was tightly controlled by the Bundesbank:

$$i_t = \lambda i_t^0 + (1-\lambda)\sum_{i=1}^{k} \omega_i \, i_{t-i} + \delta D_t^{pol} + \varepsilon_t \qquad (1)$$

5 We have conducted a number of interviews with experts specializing in bond and interest rate research for German commercial banks. It would seem that at least some market participants are well aware of the effects of political uncertainty on the market's preference for short-term assets. For instance, before the 1994 election, Union Bank of Switzerland/Frankfurt conducted an investigation showing a regular surge in long-term interest rates before federal elections. Interestingly, market participants also point to electoral regularities in the German stock market. See Gärtner and Wellershof (1995) for evidence of an election cycle in the U.S. stock market.

6 An obvious question is why markets do not develop instruments to cope directly with electoral uncertainty, e.g. bonds conditioned on the type of government. One reason might be transactions costs: the interest rate differentials might not be large enough to make this worthwhile. Another argument put forward by market participants is that such contracts would hardly be complete enough to control for all ex ante unobservable characteristics of a future government that might influence its policy.

7 See for a similar approach, among others, Bernanke and Mihov (1996), Clarida and Gertler (1997), and Clarida, Galí and Gertler (1998). A critical examination is in Solveen (1998).

To capture both the potential economic and political targets, i_t is a weighted average of i_t^0, the Bundesbank's target for the day-to-day rate and a weighted sum of past interest rates ($\sum_{i=1}^{k} w_i = 1$) to allow for partial adjustment over time.[8] The dummy variable D_t^{pol} captures political influences, and ε_t is a white-noise random variable capturing the bank's stochastic control problems. We assume that i_t^0 is given by

$$i_t^0 = E_t\left[\hat{p}_{t+k_1}\right] + ri^* + g^{\hat{p}}(E_t\left[\hat{p}_{t+k_1}\right] - \hat{p}^*) + g^{\hat{y}}(E_t\left[\hat{y}_{t+k_2}\right] - \hat{y}^*) + g^{\hat{m}}(E_t\left[\hat{m}_{t+k_3}\right] - \hat{m}^*) \qquad (2)$$

where E_t is a k_i (i=1,2,3) period forward looking expectations operator conditioned on the information available to the Bundesbank in period t. The k_i represent the lags the Bundesbank anticipates for monetary policy to influence its target variables. ri^* is the central bank's target rate rate of ri, the real short-term interest rate. $\hat{\pi}_{t+k_1}$ ($\hat{m}_{t+k3}$) is the inflation rate (the growth rate of the real money stock) in $t+k_1$ ($t+k_3$) and $\hat{\pi}^*$ ($\hat{m}^*$) is the target rate of inflation (growth rate of the real money stock). $\hat{y}_{t+k_2}$ and $\hat{y}^*$ are the growth rate of real output in $t+k_2$ and its target rate, respectively.

The reaction function specified in (1) and (2) implies that, as far as its economic targets are concerned, in the long run, the Bundesbank aims at a certain target real day-to-day interest rate (note that the right hand side includes the term $E_t\left[\hat{\pi}_{t+k1}\right]$ with a coefficient restricted to 1). In the short run, the Bundesbank reacts to inflationary pressures whenever the expected inflation rate is higher than target inflation, or whenever output rises over its targeted value. If the bank conducts its policy "benevolently", the political influences captured in D_t^{pol} will play no role in the determination of i_t in addition to the economic policy targets, i.e., δ will be 0.

Two issues, one technical and one institutional, require our attention before we can turn to the empirical investigation of Bundesbank behavior. The first issue concerns the computation of the RHS variables, i.e., of the target levels and of expected inflation, output and real money growth. We assume that, with the possible exception of the monetary goal (see below), the Bundesbank targeted the long run equilibrium values of the RHS variables. Again following

[8] Woodford (1999) argues that a certain degree of policy inertia is optimal.

standard methods, we compute the long run equilibrium values, expected inflation, output and money growth as well as the lag-structure (k_i) in equation (2) from a structural VAR model described in Appendix 1 (also see Clarida and Gertler (1997)).

The second issue arises, because in order to maximize the number of observations on elections, we extend the sample of the empirical exercise to include the Bretton Woods period 1950-73. The empirical literature on German monetary policy, as a rule, excludes the 1950s and 1960s from its analysis. This is, however, an unnecessary, and possibly also misleading, limit to the data set. As argued by Berger (1997) and Berger and de Haan (1999), the Bundesbank[9] between 1950 and 1973 was very similar to the pre-EMU conservative and independent institution. Of course, simply including the 1960s, the “hard period” of the Bretton Woods system (Obstfeld (1993)) in the VAR model and, thus, in the estimation of the Bundesbank reaction function described in (1) and (2), could also be a mistake. While during the “soft period” of Bretton Woods in the 1950s the D-Mark was not convertible and the Bundesbank was essentially unrestricted by the exchange rate system, it faced a sometimes binding policy constraint from January 1959, when currency markets were fully liberalized, to March 1973, when the system was finally dissolved.

To control for the effects of the fixed exchange rate regime, we extent the VAR model used to compute the RHS variables for the estimation of the Bundesbank reaction function. For the duration of the “hard” Bretton Woods system, we introduce two additional exogenous variables to the model described in Appendix 1: the U.S. Federal Funds Rate and the nominal D-Mark/Dollar exchange rate.[10] The former variable is an indicator for the monetary policy conducted by the dominant central bank under the fixed exchange rate system, the U.S. Federal Reserve. As expected, the federal funds rate has a significant and positive effect on the day-to-day rate during this period. This also holds for the second variable. The reason is that nominal appreciations of the D-Mark, for instance in 1961, 1969, and 1971, gave the Bundesbank some leeway to raising its own interest rate. It turns out that the forecasts and long-run equilibria of the VAR model are rather robust to the introduction of controls for the

[9] Before 1957 the German central bank was named *Bank deutscher Länder*.
[10] These variables are excluded for the rest of the observation period.

fixed exchange rate regime and that this is also true for a number of alternative types of controls.[11]

2.2 Results for the reaction function

Building upon Section 2.1, we estimated the following empirical model of the reaction function of the Bundesbank (see equations (1) and (2)):

$$i_t = c + a_1\left(\hat{\pi}_t^h - \hat{\pi}^*\right) + a_2\left(\hat{y}_t^h - \hat{y}^*\right) + a_3 mt_t + a_4 D_{jt}{}^{pol} + \sum_{j=1}^{3} b_j i_{t-j} + u_t \,, \qquad (3)$$

where c is a constant, $\hat{\pi}_t^h - \hat{\pi}^*$ and $\hat{y}_t^h - \hat{y}^*$ are the deviations of the predicted inflation rate and production growth from their long run equilibrium values, h is the forecast horizon, and $D_{jt}{}^{pol}$ is the election dummy.[12] $\hat{m}_t^h - \overline{m}$ is the deviation of the predicted real money growth rate from a target value. $\overline{m}$ will either be the long run equilibrium value ($\overline{m} = \hat{m}^*$) or, alternatively, the Bundesbank's politically defined money growth target (see below).[13] As to the policy lags, we choose h = 6 for production and inflation, and h = 12 for money growth.[14] Table 1 presents the long run equilibrium or steady state values stemming from the VAR model described above and compares them to the means of the respective time series.

(Table 1 about here)

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[11] For instance, we obtain strikingly similar results, if instead we estimate the structural VAR for different subperiods, allowing it to adapt to the particularities of the "soft" Bretton Woods period up to the end of 1958, the "hard" Bretton Woods period up to March 1973, when the system was finally dissolved, and the post-Bretton Woods era thereafter. (The subperiods can also be justified by statistical tests on structural breaks.) In this alternative set-up we allowed the lag length of the VAR part of the model to differ between the subperiods and introduced a time trend when appropriate. Around the regime changes (1959:1 and 1973:4), we assumed that the Bundesbank relied on the forecasts made with the help of the previous model until the available number of observations allows the new model to be used. Using the forecasts taken from the previous model as starting points for the new model did not change the results much. Details available on request.

[12] The expression is derived by substituting equation (2) into (1), expanding by ($\hat{\pi}^* - \hat{\pi}^*$) and rearranging terms. The constant is $c = \lambda\left(ri^* + \hat{\pi}^*\right)$, while the coefficients are $a_1 = \lambda\left(1 + \gamma^{\hat{\pi}}\right)$, $a_2 = \lambda\gamma^{\hat{y}}$, and $a_3 = \lambda\gamma^{\hat{m}}$.

[13] Note that our approach assumes that the Bundesbank formulates its policy targets in real terms and that the early policy targets were formulated for base money not for M3. It turns out, however, that using nominal instead of real M3 and keeping track of the changing definitions of the aggregates targeted by the Bundesbank, has no influence on the results. Therefore, for the sake of consistency, we restrict ourselves to the findings based on real M3.

[14] See Appendix 1 for the data used and a discussion of the policy lags. Taking into account the instruments (see Table 2), the actual lags estimated become 8 and 14 periods, respectively.

The political variables fall into two cases: (1) the dummy D_{1t}^{pol} covers the pre-election period, and (2) D_{2t}^{pol} covers the post-election period. Three different lags for the pre- and the post-election dummies are used, covering the periods 18 months (pre-election: *D_3*; post-election: *D3*), 12 months (pre-election: *D_2*; post-election: *D2*), and 6 months (pre-election: *D_1*; post-election: *D1*). A new model is estimated for every political variable. While the time structure of the dummy variables remains simple, it is flexible enough to capture attempts of the Bundesbank to increase M3 prior to elections and to decrease it after them. For the AR-part of the above equation, lag 5 is chosen in order to deal with the autocorrelation in the residuals.

Table 2 contains the results for the reaction function with the monetary target as defined in equation (2) as well the outcomes with the monetary targets as announced by the Bundesbank. Since the Bundesbank did not formulate explicit policy targets for the growth rate of monetary aggregates before 1975, the observation period in latter case is only 1975:01-1996:05 while in the former case it is 1950:01-1996:05.[15]

(Table 2 about here)

We first discuss the results for the monetary target defined as the long run equilibrium value (part (i) of Table 2). We find that both inflation and output have the correct signs and are (with exceptions for real activity) significant at conventional levels.[16] Somewhat surprisingly, however, the deviations of the monetary growth rate from its long run equilibrium value ($\hat{m}^*$) seem to be without conventionally significant influence on the Bundesbank's decisions.[17] One way to interpret this outcome is that, despite its rhetorical commitment to a Friedman-type policy rule, the German central bank followed an interest rate rule that rendered money supply

[15] We also estimated a model for the period 1973:3 to 1989:11 to make sure that the effects of German re-unification do not significantly alter our results, which is not the case. See Appendix 1 for the data.

[16] Since a_1, which theoretically is defined as $1+g^{\hat{p}}$, is strictly smaller than 1, we have to conclude that the Bundesbank does allow the real interest rate to deviate from its target value. See equation (2). Clarida and Gertler (1997) have a similar result for their period of observation.

[17] This is in line with the results in Bernanke and Mihov (1996).

elastic.[18] As to the political variables, part (i) of Table 2 shows that the election dummies, too, lack a convincing impact on the Bundesbank's policy. The only dummy variable significant at least at a 5 percent level is *D1,* which is active in the six months after the election. This may be interpreted as a sign that the Bundesbank sometimes postponed an increase in the of its interest rate until immediately after elections. There is, however, no sign of a systematic decline of short-term interest rates before the election – something we would expect if the Bundesbank deliberately created political business cycles in German monetary aggregates. As we will see in Section 3, the last two results have important consequences for the explanation of the political business cycles found in German monetary data. Before we turn to these consequences, however, we consider a counter-argument concerning the Bundesbank's monetary target procedure.

As mentioned, the Bundesbank did not formulate explicit policy targets for the growth rate of monetary aggregates before 1975. Inasmuch as these explicit targets defined a factual policy change and deviated from the long-run equilibrium values used for the results presented in section (i) of Table 2, the model may be biased in favor of a rejection of the Friedman rule. To test this counter argument, we estimate a second set of reaction functions that takes account of the Bundesbank's explicit policy targets. Since the Bundesbank usually set an upper and a lower bound for its target rate rather than a single number, we allow for two alternative interpretations of the policy target: the mean of the two bounds (part (ii) of Table 2) and deviations from the upper and lower bound (part (iii)). However, the parameters for deviations from the monetary targets are not significant. Again the Bundesbank seems to have followed an interest rate rule focusing on inflation and real economic activity rather than monetary aggregates, and, once more, there is no evidence that the Bundesbank reacted to elections in the way predicted by political business-cycle models.

[18] The result is robust across alternative forecast rules. For instance, a similar pattern can be found following the so-called Taylor rule.

3. Money demand and elections

Since we have rejected the notion that the Bundesbank actively created the political business cycle in monetary aggregates, these regularities must have had another source. In this section we put forward the hypothesis that the cycles originated from shifts in money demand that were tolerated by the Bundesbank, because – as we have just shown – the bank followed an interest rate policy rule. We argue that changes in money demand prior to elections occured because, when political parties have different inflation preferences and election results are uncertain, rational investors avoid entering long-term financial contracts before elections (see e.g. Alesina and Rosenthal (1995)).

To understand how the effect might work for money demand, consider a simple portfolio model, where real demand in every time period depends positively on the output level, negatively on the ratio of long- and short-term interest rates, and positively on a pre-election dummy D_1^{pol},

$$M^D = M^D(y, \frac{i^L}{i}, D_1^{pol}) . \qquad (7)$$

The long-term interest rate (i^L) is an indicator of the opportunity costs of holding real money (*M*), i.e., the yields resulting from holding the alternative long-term asset (*B*). The short-term rate reflects the fact that broad monetary aggregates such as M3 encompass assets that yield a positive return. This return can be approximated by the money-market rate. Total wealth is $V = M+B$.

(Figure 1 about here)

In Figure 1, *M* (*B*) is measured from the left (right). The negative slope of M^D is due to the fact that, everything else being equal, individuals want to increase their money holdings by selling bonds to the central bank as i^L decreases and i increases. For a given money supply M_0, the interest-rate ratio $(i^L/i)_0$ clears both the money and the bond markets and point A is an equilibrium. Now, assume that $\Delta D_1^{pol} > 0$ before an election. As mentioned above, the prospect of an election will increase the uncertainty in bond yields faced by investors. Hibbs (1977), Alesina (1988, 1989), and Alesina and Rosenthal (1995) argue that politicians differ in their partisan preferences for inflation. Since these differences might suffice to introduce permanent differences in the way fiscal policy is conducted or the extent to which a conservative monetary policy will go unchallenged, interest rate forecasts extending into post-election periods will depend on a weighted average of the inflation rates expected for all possible election results. To avoid this uncertainty, investors will want to go "short", that is, they will try to sell bonds to the central bank for money. In the context of Figure 1, $\Delta D^{pol} > 0$ will cause M^D to shift to the right ($M^{D}{}'$): for any given interest-rate ratio, real money demand will be higher than before. In line with the empirical evidence introduced above, we can safely assume the money supply to be perfectly elastic with respect to *i* and unaffected by the upcoming election. If money supply in addition would also be able to satisfy the increased demand for money without delay, i.e. expand the stock by the difference M_0–M_1, we would immediately jump from point A to the new equilibrium at point C in Figure 1. The interest rates would remain unchanged. To see what would happen if, instead, the adjustment process takes some time, assume that *M* is constant. The shift in money demand would then cause (i^L/i) to rise to $(i^L/i)_1$ to clear markets at point B. At the same time, as money supply partially adjusts to increased demand, a point like E, were $M>M_0$ and $(i^L/i)<(i^L/i)_1$, would be reached instead. So what we should observe with non-immediate adjustment in pre-election periods is a positive correlation between the interest rate ratio and *M*. The result guarantees that our explanation of the political business cycle in German monetary aggregates can be empirically tested. While we should observe a negative relation between the interest rate ratio and *M* as predicted by standard money demand theory in non-election periods, we ought to observe a positive correlation in pre-election periods. This is also true for the opposite movement from a point like C to F, when $\Delta D_1^{pol} < 0$ after the election. When money supply adjusts only gradually, the shift back to M^D will cause both the interest- rate ratio and *M* to decrease.

(Figure 2 about here)

A straightforward implication of the portfolio model is that we expect the yield curve to become steeper before elections.[19] The upper panel of Figure 2 presents pre- and post-election estimates of the German yield curve computed by the Bundesbank based on the method set out by Dahlquist and Svensson (1996).[20] The observation period starts in 1973 and ends in 1998. For each maturity (in years), Figure 2 displays the averages of the estimated interest rates 6 months before and 6 months after an election. The lower panel shows the interest rate differences between both periods at each maturity.[21] It is obvious that the slope of the yield curve changes in the way predicted by the model: the yield curve is steeper before an election, indicating that indeed, investors go "short" to avoid the uncertainty about the election outcome. While suggestive, the evidence in Figure 2 is based on 6 elections only, however.

To allow a meaningful statistical test, we instead rely on the ratio of long-term over short-term interest rates, i^L/i.[22] The series runs from 1951:01 to 1996:05 and contains observations on 12 elections. A necessary condition for the hypothesis of a demand-induced political business cycle in German monetary aggregates to be true is that, on average, i^L/i rises before elections and falls after elections. To see whether this condition is fulfilled, Table 3 presents the results for a set of election dummies in a simple regression of the form

$$\frac{i_t^L}{i_t} = c + \sum_{j=1}^{3} b_j \frac{i_{t-j}^L}{i_{t-j}} + aD_{jt}^{pol} + u_t \ . \qquad (8)$$

[19] The logic of the portfolio model above extends to multiple assets of differing maturity. For instance, consider a model with three assets: money, short-term bonds, and long-term bonds. The disincentive stemming from electoral uncertainty will be larger the longer the maturity of the asset. This leads to a portfolio shift from long-term to short-term bonds and from short-term bonds to money. As a consequence, the yield curve will become steeper. This mechanism always holds for bonds that mature in the period for which the election is held. If the probability that a government stays in power beyond that period is sufficiently large or the consequences of policy decisions outlast the election period, the argument should extend to bonds of longer maturity as well.

[20] The data is on the Bundesbank CD-Rom "Deutsche Bundesbank: 50 Jahre Deutsche Mark. Monetäre Statistiken 1948-1997", Munich, C.H. Beck/Vahlen. For a detailed discussion see Schich (1997).

[21] Results for periods of 12 or 18 months around elections are broadly similar.

[22] i is the day-to-day interest rate (see above). i^L is the (volume weighted) average monthly long-term rate of return on bonds with fixed nominal interest rates and an average remaining term length of at least 3 years. The series is published by the Bundesbank under the code WU0017. 1950:01 to 1958:12 supplemented with data computed from the Bundesbank's Monthly Reports (various issues). Details available from the authors.

The dummy variable D_{jt}^{pol} is active in the 6/12/18 months before (*j* =1) and 6/12/18 months after (*j* = 2) the election month. The interest rate ratio exhibits the presumed characteristics. There is a significant increase before an election and a fall after the election. Note, however, that the strength of the effect of electoral uncertainty is not perfectly symmetric. For instance, the interest rate ratio increases by almost 0.5 percentage points in the 18 months prior to the election, but decreases only by about 0.3 percentage points in the 18 months thereafter.[23]

(Table 3 about here)

Before we estimate equation (6) for money demand, we consider the issue of seasonal integration. As the HEGY-test for the variables of interest suggests, there is integration at seasonal frequencies.[24] Given this result, we allow for seasonal cointegration relationships as well. Therefore, we used the following error correction model:

$$\hat{m}_t = c + \sum_{j=1}^{n} d_j \hat{y}_{t-j} + \left(a_1 + a_2 D_t^{pol}\right)(1 - B^{12})\frac{i_t^L}{i_t} + \sum_{j=1}^{p} b_j \hat{m}_{t-j} + \sum_{j=1}^{7} g_j ecm_{j,t-1} + u_t \qquad (9)$$

The growth rate of (real) M3 is denoted by $\hat{m}_t$, $\hat{y}_t$ is the output growth rate, and i_t^L is the long-term interest rate. *B* denotes the backshift operator. The variables ecm_j, with j = 1,..7, are the residuals from the cointegration equations at each of the relevant seasonal frequencies.[25] The exact lag structure for the short run dynamics is determined by standard t-statistics (5 per cent significance level). We chose lag 1 for $\hat{y}_t$ and lags 1 and 3 for $\hat{m}_t$, but the results are fairly robust with regard to the lag length used. The observation period is again 1951:01 to 1996:06.

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23 We obtain similar results for annual changes of the ratio. The asymmetry is due to the behavior of the day-to-day rate. While the long-term interest rate shows a symmetric and significant election cycle (see Table A2.1 in Appendix 2), the short-term interest rate shows a tendency to decline after elections (cf. Section 2.2).

24 See Hylleberg, Engle, Granger, and Yoo (1990). Detailed results are available on request.

25 See Muscatelli and Hurn (1992) for a description of the procedure for quarterly data. Detailed results are available on request. Note that, while our results do not change much with a less sophisticated approach to seasonal integration, the chosen approach is appropriate for the data set at hand.

The portfolio model described above does suggest a joint test of the correlation between money demand and the interest rate ratio in the pre- and post-election periods. Therefore Table 4 presents the results for three alternative variables, D_t^{pol} = DI, DII, DIII , which are 1 in the 18, 12, and 6 months before and after the election month and 0 otherwise. The parameter a_1 should be negative, i.e. if there is an increase in i_t^L / i_t, there will be a portfolio shift from money to bonds. If our model is correct, a_2 should be positive and larger than a_1 for the election effect to have an overall positive impact on money demand.

(Table 4 about here)

We find that both output growth and the parameter for the relation of long-term to short-term rates show the expected signs. The former variable is marginally significant in most cases, the latter is highly significant at the 1 percent level in every case. However, as predicted by the argument made above, the correlation between the interest rate ratio and money demand seems to change during the election period. In fact, as $a_2 > |a_1|$ in the case of DI and DIII, the election effect is strong enough to change the sign of the aggregated effect of (changes in) i_t^L / i_t on $\hat{m}_t$. The coefficients are significant at the 1 and 5 percent levels respectively. Only in the case of DII is a_2 just marginally significant and slightly smaller than a_1. Based on these results, we conclude that the evidence supports our hypothesis: the political business cycle observable in German monetary aggregates is due to demand rather than to supply factors. The effect is also within the quantitative range of the political business cycle identified in the literature.[26]

4. Conclusions

There seems to be a paradox in the empirical literature on the German Bundesbank. On the one hand, Germany is often said to have one of the most independent and also one of the most

[26] Table A2.1 in Appendix 2 shows that the growth rate of real M3 increases by 0.1 percentage points within 18 months before elections. This is about the change implied by the estimated reaction of the (change in the) interest rate ratio on the growth rate of real M3 during this period.

successful central banks in the world. On the other hand, recent work on political business cycles shows that such a cycle exists in German monetary aggregates.

One possible explanation for this contradiction is that politics rather than economics actually drove the Bundesbank. The bank might have misused its independence in order to support governments before elections. It is hard, however, to bring this hypothesis in line with the available evidence. The Bundesbank seemed to sometimes postpone interest rate rises until immediately after elections, but it did not cause the political business cycle in German monetary aggregates.

We argue (and show empirically) that the answer to the puzzle may lie in the uncertainty created by upcoming elections. If partisan preferences of governments introduce permanent differences in the conduct of fiscal policy or government pressure on the central bank, interest-rate forecasts extending into post-election periods depend on a weighted average of the inflation rates expected for all possible election results. As a consequence, financial investors trying to avoid this uncertainty trade longer-term assets for shorter-term assets. This, in turn, enlarges monetary aggregates because German money supply is sufficiently elastic. Contrary to the Bundesbank’s rhetorical commitment to a monetaristic policy rule, this is indeed the case: empirically, its behavior is best described as an interest rate policy rule that set the short-term interest rate to minimize deviations from equilibrium values of inflation and real growth. After the election, when the preferences of the new government are apparent, the demand process driving the money stock up is reversed. For an outside observer, however, the demand-induced pattern caused by the uncertainty associated with elections and, possibly, partisan politics might look like a opportunistic political business cycle.

We conclude that our results offer a solution to the apparent contradiction between the Bundesbank's reputation as having been one of the world's most independent and conservative central banks and the traces of straightforward opportunistic business cycles in German monetary aggregates.

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Appendix 1

Following Clarida and Gertler (1997), our structural VAR model is given by

(A1) $$\mathbf{y}_t = \mathbf{C}\mathbf{y}_t + \sum_{i=1,\ldots,3,6,9,12} \mathbf{A}_i \mathbf{y}_{t-i} + \mathbf{e}_t ,$$

(A2) $$\mathbf{y}_t = (\hat{r}_t \; \hat{y}_t \; \hat{p}_t \; \hat{s}_t \; i_t^{usa} \; \hat{m}_t \; i_t \; \hat{w}_t)^T . ,$$

where we include monthly observations on the following variables: commodity prices (r), industrial production (y), the consumer price level (π), retail sales (s), the US Federal Funds Rate (i^{usa}), the real money supply M3 (m), the German short-term interest rate (i), and the real D-Mark/Dollar exchange rate (w).[27] All variables except the interest rates enter the model in the form of annual growth rates, i.e. annual first differences of the original monthly series in logs.[28] We included two cointegration relationships between retail sales/real money stock and production. The observation period is 1951:01 to 1996:05 (545 observations).

Based on the theoretical framework set out in Clarida and Gertler (1997), the matrix **C** captures the contemporaneous interrelationship between the variables and has the form

(A3) $$\mathbf{C} = \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ c(1) & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ c(2) & c(3) & 0 & 0 & 0 & 0 & 0 & 0 \\ c(4) & c(5) & c(6) & 0 & 0 & 0 & 0 & 0 \\ c(7) & c(8) & c(9) & c(10) & 0 & 0 & 0 & 0 \\ 0 & c(11) & 0 & 0 & 0 & 0 & c(12) & 0 \\ c(13) & 0 & 0 & 0 & 0 & c(14) & 0 & c(15) \\ c(16) & c(17) & c(18) & c(19) & c(20) & c(21) & c(22) & 0 \end{pmatrix}$$

The estimation procedure has two steps: first, we estimate the reduced form of the structural VAR:

(A4) $$\mathbf{y}_t = \sum_{i=1,\ldots,3,6,9,12} \underbrace{\mathbf{B}_i}_{(\mathbf{I}-\mathbf{C})^{-1}\mathbf{A}_i} \mathbf{y}_{t-i} + \underbrace{\mathbf{u}_t}_{(\mathbf{I}-\mathbf{C})^{-1}\mathbf{e}_t} ,$$

In the second step, we estimate the matrix C from the reduced form residuals $\mathbf{u}_t$ by IV

[27] The series are available through the Bundesbank directly or through a commercial provider. The Bundesbank codes are : *r* YU0514, *y* UU1133/UU11NA, *p (consumer price index)* UU0062, *s* UU2660, m^n *(nominal, M3)* TU0800 (before 1957:01 supplemented with data from the Monthly Reports of the Bundesbank), *i* SU0101 (1951:1 to 1954:3 approximated by the Bundesbank's discount rate, 1954:3 to 1959:12 computed from the Bundesbank's Monthly Reports), w^n *(nominal)* WU5409. The real money supply and the real exchange rate are computed by dividing the nominal series by π. The federal funds rate (before 1954:7 approximated by the FED's, NY, discount rate), i^{usa} , has been obtained from the FED, NY. Results throughout the paper do not change much if we use M1 or M2 instead of M3.

estimation (for details, see Clarida and Gertler (1997)). By premultiplying the matrices $\mathbf{B}_i$ by ($\mathbf{I}$-$\mathbf{C}$), we obtain the original VAR matrices $\mathbf{A}_i$.

As discussed in Section 2.1, we also introduce controls for the "hard" period of the Bretton Woods system when estimating the model. No matter the specific form of these controls, we find the expected results concerning the contemporaneous effects on the policy variables: (1) The short-term or day-to-day interest rate increases in response to increasing commodity prices, increasing money demand, and a depreciation of the real exchange rate. However, none of the coefficients is significant on conventional levels. This can be interpreted as implying that the Bundesbank reacts on the basis of the information available at the beginning of a given period rather than on contemporaneous information. This result is already incorporated in the model for the bank's reaction function. (2) Money demand depends significantly negatively on innovations in the day-to-day rate. (3) An innovation in the funds rate leads to a significant depreciation of the real exchange rate, while an innovation in the day-to-day rate has the reverse effect.

The contemporaneous characteristics of the estimated extended model are quite similar to the ones obtained by Clarida and Gertler (1997) for the post-1973 subperiod. The same holds for the dynamic patterns of the model. As to the effects of monetary policy, we find that a rise in the day-to-day rate leads to a temporary decrease of production across all subperiods with the negative impact lagged about 6-12 months. A positive shock to the day-to-day rate leads to a temporary decrease in real monetary aggregates after a somewhat longer lag. As in Clarida and Gertler (1997), German consumer prices show signs of the so-called "price puzzle", i.e. inflation reacts positively to a rise in the short-term interest rate, even though the model includes commodity prices as suggested by Sims (1992).[29] Since we cannot determine the lag structure based on this result, we apply the same lag structure for prices and for output.[30] In general, our dynamic results are in line with what other researchers have found in similar approaches (see e.g., Taylor (1993a), Weber (1996), Leeper and Sims (1994)).[31]

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28 Berger and Woitek (1995) show that the use of the annual growth rates of our monthly time series is indeed the proper way to remove the seasonal component in the data.

29 Experiments with other potential inflation predictors were also not successful.

30 We systematically experimented with alternative lag structures, having price effects leading or trailing output but found that results do not depend on the lag structure chosen.

31 All VAR results available on request.

Appendix 2

Table A2.1: The Political Business Cycle in the Growth Rates of German Real M3

	D_3		D_2		D_1		D1		D2		D3	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
M3 real	0.001	0.098	0.001	0.185	0.002	0.037	-0.003	0.020	-0.002	0.029	-0.001	0.063

Notes:

- Data source: see Appendix 1. Sample is 1951:01-1996:05.
- We estimate the model $\frac{i_t^L}{i_t} = c + \sum_{j=1}^{3} b_j \frac{i_{t-j}^L}{i_{t-j}} + aD_{jt}^{pol} + u_t$, where m_t is the real are annual growth rate of M3 (annual first differences of the original series in logs), D_t^{pol} is an election dummy, and u_t is an error term following the usual assumptions. See Berger and Woitek (1997a) for a discussion of this approach.
- The election dummy can take the following forms: D_3/D_2/D_1 is 1 in the 18/12/6 months before an election and 0 otherwise; D3/D2/D1 is 1 in the 18/12/6 months after an election and 0 otherwise. A new model is estimated for every political variable.
- The table shows that there is an increase (decrease) in real M3 significant at conventional levels about 6 months before (about 6–12 months after) federal elections.
- The null-hypothesis of the Q-test ("The residuals are white noise") could not be rejected in any case. R_{adj}^2 is about 0.9 in all cases. Detailed results are available on request.

Table A2.2: The Political Business Cycle in German Long-Term Interest Rates

	D_3		D_2		D_1		D1		D2		D3	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
i^L	0.59	0.00	0.51	0.04	0.55	0.15	0.14	0.68	-0.57	0.01	-0.54	0.01

Notes:

- Data source: see text. (Adjusted) sample is 1951:04-1996:05.
- In order to adjust for the time dependent volatility of the endogeneous variable, we estimated a model similar to equation (8) under the assumption that the ratio follows an ARCH-process.
- D_3/D_2/D_1 is 1 in the 18/12/6 months before an election and 0 otherwise; D3/D2/D1 is 1 in the 18/12/6 months after an election and 0 otherwise. A new model is estimated for every political variable.
- The table shows that there is an increase (decrease) in the long-term interest rate rates significant at conventional levels about 18–12 months before (about 12–18 months after) federal elections.
- The Box-Ljung statistic does not reject the hypothesis of white noise residuals up to a lag of 36 (5 percent significance level). R_{adj}^2 is 0.98. Detailed results are available on request.

Figure 1: Political Business Cycles in Monetary Demand

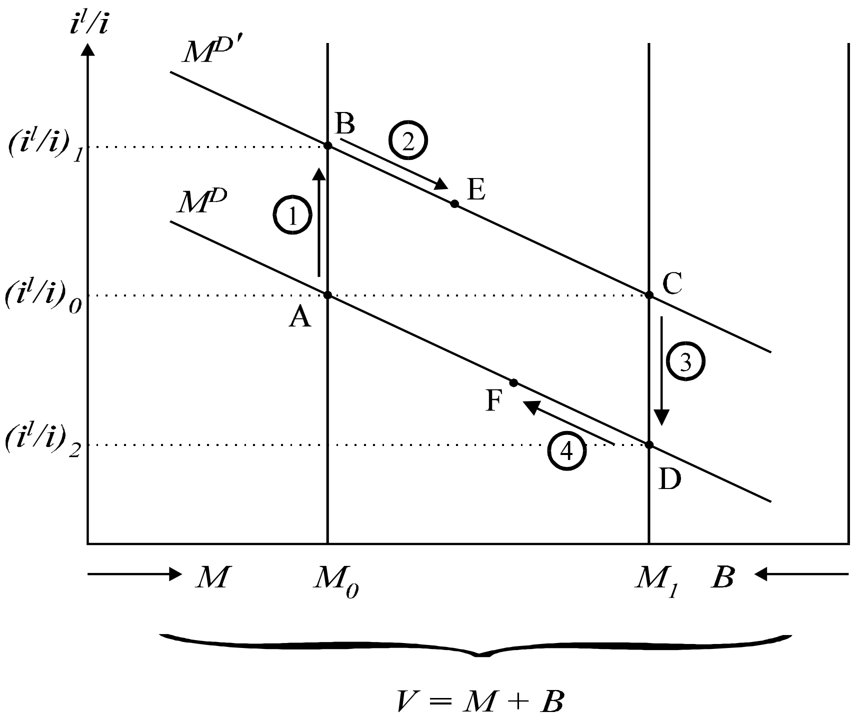
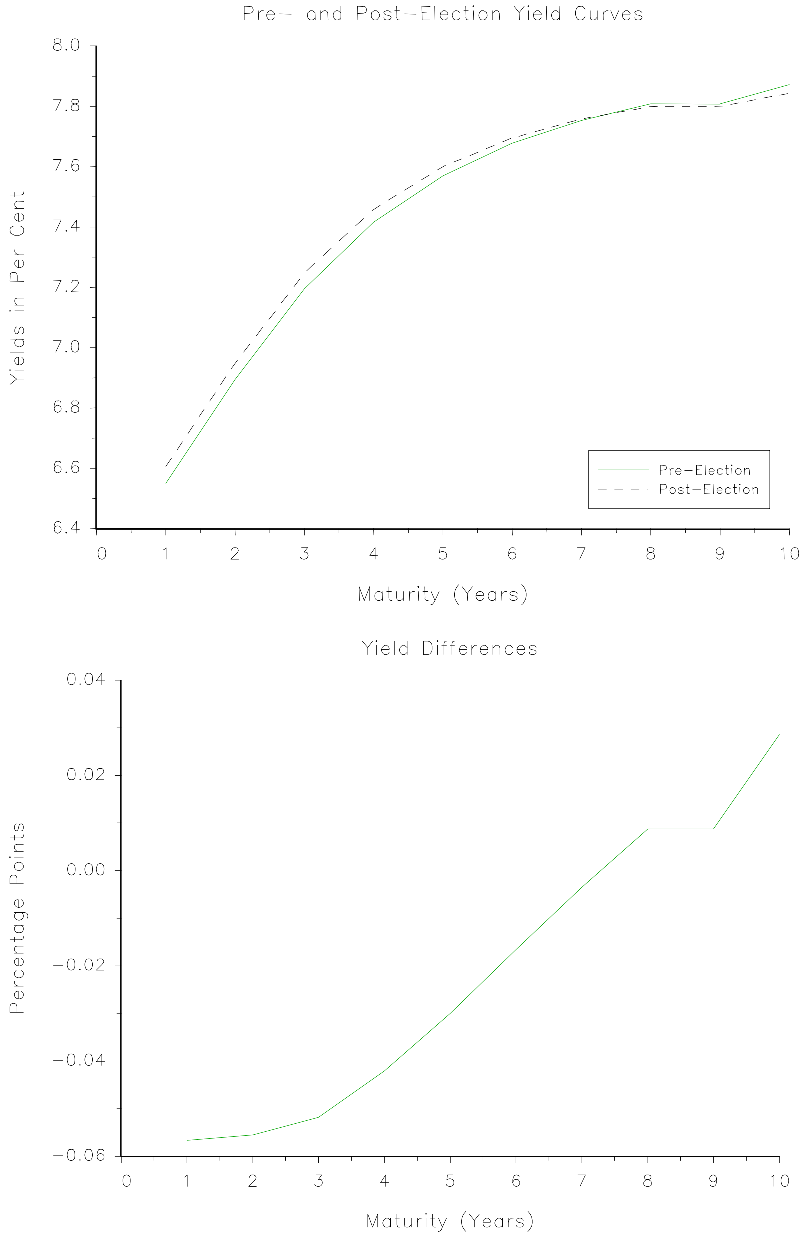


Figure 2: Elections and Yield Curves



Source: see text.

Table 1: Long Run Equilibria

	Sample 1951:01-1996:05	
	steady state	mean
$\hat{y}$	3.42	3.85
$\hat{\pi}$	2.03	2.42
$\hat{m}$	6.44	6.81

Note: see Appendix 1.

Table 2: Monetary Policy

(i) Deviations from Long Run Equilibrium

	D_3		D_2		D_1		D1		D2		D3	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
$\hat{y}_t^6 - y^*$	0.020	0.032	0.020	0.045	0.019	0.049	0.013	0.071	0.018	0.062	0.018	0.061
$\hat{\pi}_t^6 - \pi^*$	0.053	0.001	0.054	0.002	0.052	0.001	0.056	0.002	0.055	0.003	0.056	0.002
$\hat{m}_t^{12} - m^*$	0.027	0.240	0.027	0.155	0.028	0.138	0.026	0.093	0.027	0.099	0.027	0.211
D_t	-0.068	0.558	-0.067	0.685	0.071	0.874	0.225	0.045	0.227	0.512	0.067	0.583

Sample: 1951:01-1996:05

(ii) Deviations from Monetary Target (Mean)

	D_3		D_2		D_1		D1		D2		D3	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
$\hat{y}_t^6 - y^*$	0.054	0.021	0.053	0.009	0.054	0.008	0.049	0.013	0.049	0.014	0.049	0.014
$\hat{\pi}_t^6 - \pi^*$	0.046	0.043	0.044	0.039	0.044	0.037	0.045	0.025	0.045	0.028	0.042	0.035
$\hat{m}_t^{12} - mt$	-0.023	0.736	-0.020	0.360	-0.021	0.766	-0.022	0.594	-0.020	0.359	-0.019	0.760
D_t	-0.093	0.631	-0.099	0.145	-0.102	0.321	0.055	0.481	0.035	0.505	-0.002	0.785

Sample: 1975:01-1996:05

(iii) Deviations from Monetary Target (Upper and Lower Bounds)

	D_3		D_2		D_1		D1		D2		D3	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
$\hat{y}_t^6 - y^*$	0.053	0.031	0.054	0.031	0.054	0.030	0.049	0.024	0.051	0.017	0.050	0.012
$\hat{\pi}_t^6 - \pi^*$	0.053	0.031	0.053	0.030	0.053	0.031	0.052	0.026	0.053	0.026	0.054	0.029
$\hat{m}_t^{12} - mt_u$	0.043	0.345	0.040	0.391	0.041	0.423	0.043	0.521	0.043	0.284	0.045	0.345
$\hat{m}_t^{12} - mt_l$	-0.023	0.202	-0.022	0.234	-0.023	0.313	-0.023	0.323	-0.023	0.344	-0.023	0.310
D_t	-0.081	0.312	-0.100	0.201	-0.092	0.327	0.054	0.232	0.031	0.814	-0.009	0.723

Sample: 1975:01-1996:05

Notes: Estimation is by instrumental variables. The instruments are lagged values of the explanatory variables (lag 2), the political dummy and 5 lagged values of i_t. R^2_{adj} is about 0.9; The Box-Ljung statistic does not reject the hypothesis of white noise residuals up to a lag of 17 (5 percent significance level).

Table 3: The Political Business Cycle in i^L/i

	D_3		D_2		D_1		D1		D2		D3	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
$\frac{i_t^L}{i_t}$	0.486	0.004	0.363	0.007	0.472	0.009	-0.007	0.048	-0.146	0.040	-0.271	0.090

Notes: Sample is 1951:01-1996:05. R^2_{adj} is about 0.7; The Box-Ljung statistic does not reject the hypothesis of white noise residuals up to a lag of 20 (5 percent significance level). In order to adjust for the time dependent volatility of the interest rate ratio, we estimated equation (8) under the assumption that the ratio follows an ARCH-process.

Table 4: Real Money Demand and the Political Business Cycle

	DIII		DII		DI	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
c	0.291	0.000	0.285	0.000	0.279	0.000
$\hat{y}_{t-1}$	0.015	0.080	0.015	0.097	0.014	0.096
$\frac{i_t^L}{i_t}$	-0.013	0.000	-0.014	0.000	-0.014	0.000
$D_t \frac{i_t^L}{i_t}$	0.015	0.001	0.010	0.063	0.015	0.029
$\hat{m}_{t-1}$	1.120	0.000	1.124	0.000	1.125	0.000
$\hat{m}_{t-3}$	-0.170	0.000	-0.173	0.000	-0.174	0.000

Notes: Sample is 1951:01-1996:05. R^2_{adj} is about 0.9; The Box-Ljung statistic does not reject the hypothesis of white noise residuals up to a lag of 11 (5 percent significance level).