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A K-Percent Rule for Monetary Policy
in West Germany

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Abstract

The concept of rules for monetary policy has been more and more criticized in recent years. The Deutsche Bundesbank is also urged to give up monetary targeting. The idea is that the economic performance could be improved if monetary policy became more pragmatic and was more concerned about slow growth and high unemployment. In reality, however, monetary policy in the past decades has been highly unstable and has thus contributed to business cycle fluctuations and inflation. The intended policy oriented at the production potential has not been followed in West Germany. In this paper, a simple model is used to analyze what could have been expected from a rule similar to the one the Bundesbank has intended to pursue since 1974. The simulations for the period 1972-1987 show that strict application of a k -percent rule would have implied less pronounced cyclical fluctuations of domestic demand and a stable price level on average. This result contradicts the view that rules for monetary policy are useless or even counterproductive.

A K-PERCENT RULE FOR MONETARY POLICY IN WEST GERMANY

I. The Recent Debate on Rules for Monetary Policy

The controversy on whether monetary policy should follow rules or react in a discretionary manner has been around for a long time. In recent years, the discussion has become more controversial for several reasons. Some argue that, after monetary policy has fulfilled the task of reducing the high inflation rates which had built up in the seventies, the most pressing problem is now unemployment, particularly in Western Europe. But there is not only this shift in priorities. Many would go even further and say that monetary targeting has altogether failed, and that this has become most obvious in the eighties. These critics, too, point at the stubbornly high unemployment - reflecting supposedly the cost of reducing inflation -, but in particular at the large changes in velocity in the United States and some other countries. The decline in velocity in the United States implied that inflation was cut drastically in spite of relatively strong money growth¹. Had monetary policy followed a fixed rule - of, say, keeping monetary expansion at six percent per year -, the United States would have experienced a recession much more severe than the actual one in 1980/82. Therefore, the argument goes, the US-Fed was right in overshooting pre-announced targets and in following a more pragmatic strategy².

More recently it was pointed out, in particular by Meltzer [1987] and McCallum [1987], that the alternatives are not fixed rules and discretionary policies. In their view, monetary policy can be adjusted to contingencies like "financial turmoils" which occurred in the United States during the period of financial deregulation and innovations in the early eighties and which had probably contributed to the fall in velocity. This reaction can

¹ The rapid expansion of monetary aggregates starting in the summer of 1982 led many observers to forecast a resurgence of inflation at that time.

² Blinder [1987] criticizes the concept of rules because it supposedly implies fixing a rudder in a stormy sea.

be "activist", but the important element in a rule-like monetary policy is precommitment: the monetary authority should make clear that it would compensate such shifts according to a pre-announced policy. In this way the economy can absorb such shocks without additional disturbances and can stay on a fairly stable path with the price level the central bank has committed itself to. This flexible rule is compatible with the rational-expectations view on economic policy: it would not make much of a difference with respect to the evolution of the economy what a rule looks like as long as it is known to economic agents (postulate of neutrality or policy ineffectiveness). If the precommitment aims at a stable price level, such a rule would - as was argued by Kydland/Prescott [1977] and Barro/Gordon [1983] - be superior to discretionary policies in the long run. The central bank would not be tempted to create price surprises which increase employment in the short run¹ but lead to inflation in the medium run without changing employment.

McCallum [1987] introduces a concrete example of a rule for monetary policy: the growth of the monetary base should depend on the trend growth of real GNP, the medium-run velocity growth and the deviations of nominal-GNP growth from a target value; this reference path is given by the long-run development of real output. While the reaction to velocity changes is justified by the "financial turmoil"-argument, the use of the nominal-GNP target needs explaining: McCallum states that since we do not know how a monetary impulse splits up into output and price effects on a period-by-period basis, the best way to assure price level stability in the medium run is to keep nominal GNP close to the trend path of real GNP. He tests the performance of this feedback-rule by applying it to the underlying model of the eco-

¹ This type of analysis is based on a specific utility function which implies a gain from more employment. However, if we accept that any deviation from the full-information equilibrium is suboptimal (people work more than they would if they had better information, which means that they are "fooled"), we would not consider such a utility function. Nevertheless, it seems to apply to real-world considerations, i.e., policymakers seem to behave as if such short-run benefits exist.

nomy. The result of the simulation is that the price level is stable in the medium run, and that the fluctuations of nominal GNP are much smaller than actually observed.

II. An Application to the Case of West Germany

In spite of the widespread practice of central banks to announce targets for money growth, it may be said that monetary policy has not actually followed a well-defined rule. Instead, we could observe substantial over- and sometimes undershooting of the monetary targets; there were obvious shifts in priorities, and we continued to have inflation and sizable cyclical fluctuations¹. This is also true for West Germany: after the Deutsche Bundesbank had started to announce annual targets for the monetary aggregate "Zentralbankgeldmenge" (central bank money)² in 1974, it missed the targets in about half the cases. Furthermore, contrary to the intention, money growth was not more stable than that in the period prior to 1974, cyclical fluctuations in the real economy were nearly as pronounced as before, and until the early eighties, we experienced inflation which was substantial by historical (post-World War II) standards³.

¹ Throughout this paper we hold that business cycles are not exclusively caused by real shocks. The empirical observations suggest that the seven post-war business cycles in West Germany were to a large extent induced by monetary policy. There was no inflationary boom without prior stimulation, and no recession without substantial restriction by the central bank. On this hypothesis, see Scheide [1984, 1987] and Trapp [1976].

² This aggregate is not identical to the monetary base and cannot be precisely controlled by the central bank. However, the relationship between both aggregates is fairly close over time.

³ It seems that many of the factors mentioned by Barro/Gordon [1983] contributing to permanent inflation also apply to West Germany: anticyclical behavior of monetary policy, increase of government debt, and the rise of the natural rate of unemployment. One may add, for this open economy, the revaluation of the currency which, at the time it occurred, obviously led the Bundesbank to increase the money supply faster in order to reduce pressures on the export industry.

Despite the criticism of many advisors inside and outside West Germany, the Deutsche Bundesbank still announces targets for money growth, although in 1988, it changed the target variable and now uses M3. The case for dispensing with the policy was not strong at all: not only did the relationship between money and economic activity continue to hold fairly well, but there were also no changes in the financial sphere that could have led to as drastic movements in velocity as, for example, in the United States [Dudler, 1986].

Since no such changes are expected for the near future, we hold throughout the paper that the case for a feedback-rule may not be as strong for West Germany as it is for the United States¹. We want to test a "modified k-percent rule" which is similar to the strategy the Deutsche Bundesbank has intended to pursue ("potentialorientierte Geldpolitik"). When announcing the target for the coming year, it evaluates the desired rate of change for central bank money according to three components:

- the trend growth of output ("potential" output);
- the trend growth of velocity;
- the unavoidable increase of the price level.

This procedure is equivalent to putting the relation of the quantity theory to work, with the intention to reduce inflation as long as it is considered too high. "Unavoidable rate of inflation" is somewhat vague. It can be interpreted as being the rate that can be achieved without imposing a negative shock on the economy through monetary policy. In reality, therefore, the Bundesbank intended to reduce the inflation rate by about one percentage point per year.

¹ Of course, it is correct not to rely on the absence of such disturbances when devising a rule (see McCallum, 1988, p.4). The purpose of this paper, however, is not to advocate a specific or the presumably best rule but rather to demonstrate that the announced policy would not have been bad at all if it had been followed.

The purpose of this paper is to investigate how such a policy would have worked if it had actually been pursued. In particular, we want to analyze whether cyclical fluctuations would have been smaller. In addition, we assume that the Bundesbank aimed at zero inflation on average during the entire period¹. The rule to be tested differs in two minor respects from the official strategy²:

1. We use domestic demand (GNP minus net exports) instead of GNP as the target variable, and thus also define velocity in terms of domestic demand. The reason is that the link between money and domestic demand is somewhat closer, possibly due to the influence of the relatively large export sector³.
2. While the Bundesbank formulates the target growth for the monetary aggregate for the change between the fourth quarter of year t and year $t+1$, we use annual averages.

Furthermore, we avoid the discussion of transition from positive to zero inflation by assuming that, before the period of simulation, the Bundesbank succeeded in achieving a stable price level.

III. The Workings of the Rule

Targeting nominal domestic demand with the aim of keeping the price level (in this case, the deflator of domestic demand) stable over the medium run, amounts to a rule in which money growth is equal to the medium-term growth rate of output minus the medium-term growth of velocity. Actually, every strategy for mone-

¹ From 1970 to 1987, the price level actually increased by 106 percent (GNP-deflator) or 95 percent (consumer prices), respectively, with substantial fluctuations in the rate of change from one year to the next.

² We also confine ourselves to annual data in order to get as close to the strategy followed by the Bundesbank as possible.

³ Nothing is lost for the investigation because the cyclical fluctuations of GNP are similar in size and can largely be explained by changes in domestic demand (Scheide [1987]).

tary policy - be it Keynesian or monetarist or anything else¹ - needs an appropriate estimate for both trend variables. The simplest way to analyze the behavior of a rule in an ex-post simulation is to estimate the growth rates outside the model. For the simulation, we hold that the trend growth in real output is invariant with respect to the regime of monetary policy. In reality we could observe a downward trend of real output; we assume, for simplicity, that this decrease was linear (which is a rough approximation), i.e., the growth rate of domestic demand declined steadily from 1970 onwards. Concerning the trend of velocity we assume a constant rate of decline from one year to the next.

If we want to analyze how domestic demand is affected by changes in money, we need a basic model for this relationship. In this paper, we use - as a starting point - a very simple form; the economy can be assumed to work according to equation (1):

$$(1) \quad \Delta y_t = a + b\Delta y_{t-1} + c\Delta m_t + u_t$$

where

y_t = log of nominal domestic demand,

m_t = log of central bank money,

u_t = error term with the standard characteristics.

We confine ourselves to the period in which the central bank was able - because of flexible exchange rates - and intended - because of a change toward a more monetarist philosophy - to control this monetary aggregate. Estimating this equation for the period of 1972-1987, using annual data, we get²

¹ There is no dispute among the various schools that if velocity is "known" to fall permanently by, say, ten percent in level, the money supply would have to be adjusted equivalently. The difference lies "only" in the judgement whether such changes occur frequently or "for no reason", i.e., whether the demand for money is sufficiently stable over time.

² \bar{R}^2 is the adjusted correlation coefficient, S.E. is the standard error of the regression. According to the Durbin h statistic, the hypothesis of no autocorrelation of the residuals cannot be rejected. Standard errors of the estimated coefficients are given in parantheses. Since the constant term is not significant one may argue that this equation should not be used for the simulation. However, tests with an equation without the constant lead to practically the same result.

$$(1') \Delta y_t = - 0.0137 + 0.3194\Delta y_{t-1} + 0.7500\Delta m_t + \Delta \bar{u}_t$$

$$(0.0142) \quad (0.1552) \quad (0.1988)$$

$$\bar{R}^2 = 0.64; \quad \text{S.E.} = 0.0155; \quad \text{Durbin } h = 0.33.$$

There is a highly significant influence of money supply growth on nominal income growth in the same period¹.

In the first simulation exercise, the target growth of central bank money (Δm^*) is given by the rule:

$$(2) \Delta m_t^* = \Delta \bar{x}_t - \Delta \bar{v}_t - \Delta \bar{p}_t$$

We assume that trend inflation ($\Delta \bar{p}_t$) is zero. Furthermore, \bar{x}_t and \bar{v}_t are the assumed trend values of real domestic demand and velocity according to the description above, namely

$$(2a) \Delta \bar{x}_t = \Delta \bar{x}_0 - 0.001t$$

$$(2b) \Delta \bar{v}_t = - 0.01$$

with $\Delta \bar{x}_0 = 0.030$ and $t = 0, 1, 2, \dots, 15^2$.

¹ Several alternatives with respect to other lag structures were tested. The equation reported here is not only the simplest, but also the best in terms of statistical criteria.- When estimated for different periods, the coefficients of the equation change. However, they do so in such a way as to leave the elasticity between money growth and growth of domestic demand practically unaffected. This stability confirms the opinion of the Bundesbank that there is a fairly stable relationship between central bank money and nominal income. See Deutsche Bundesbank [1987, p. 91].

² This implies that Δm^* equals 0.040 in 1972 and then declines steadily according to (2a) and (2b). This procedure assures that the value of the simulated nominal domestic demand in 1987 is practically the same as the actual value of real domestic demand.

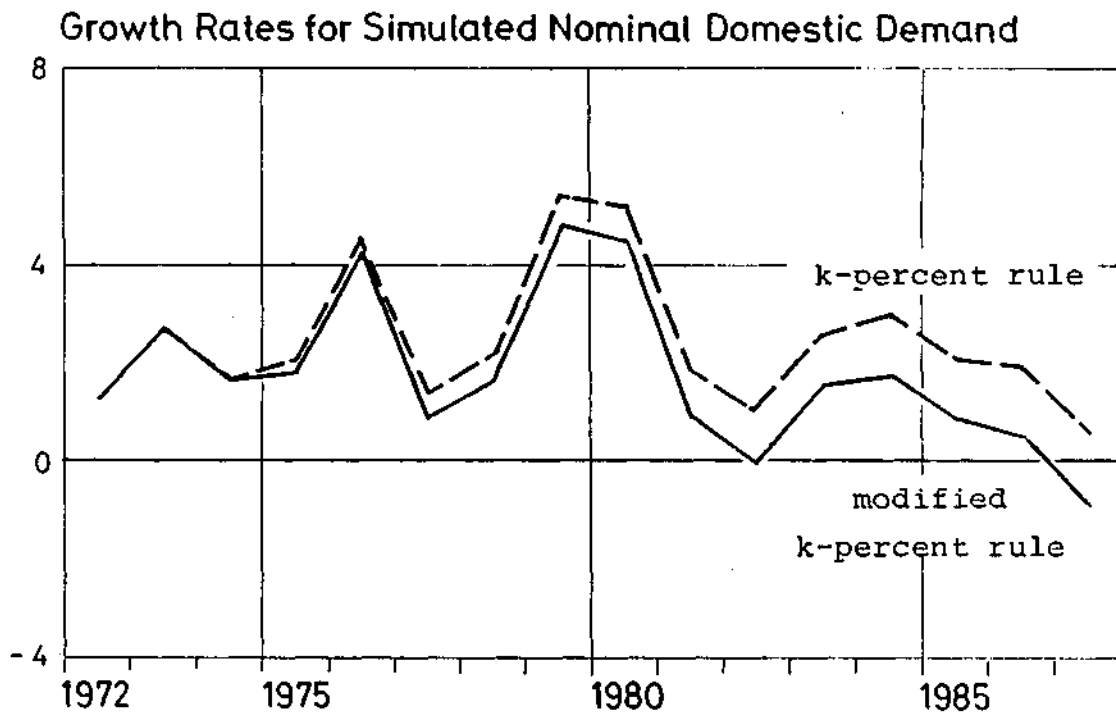
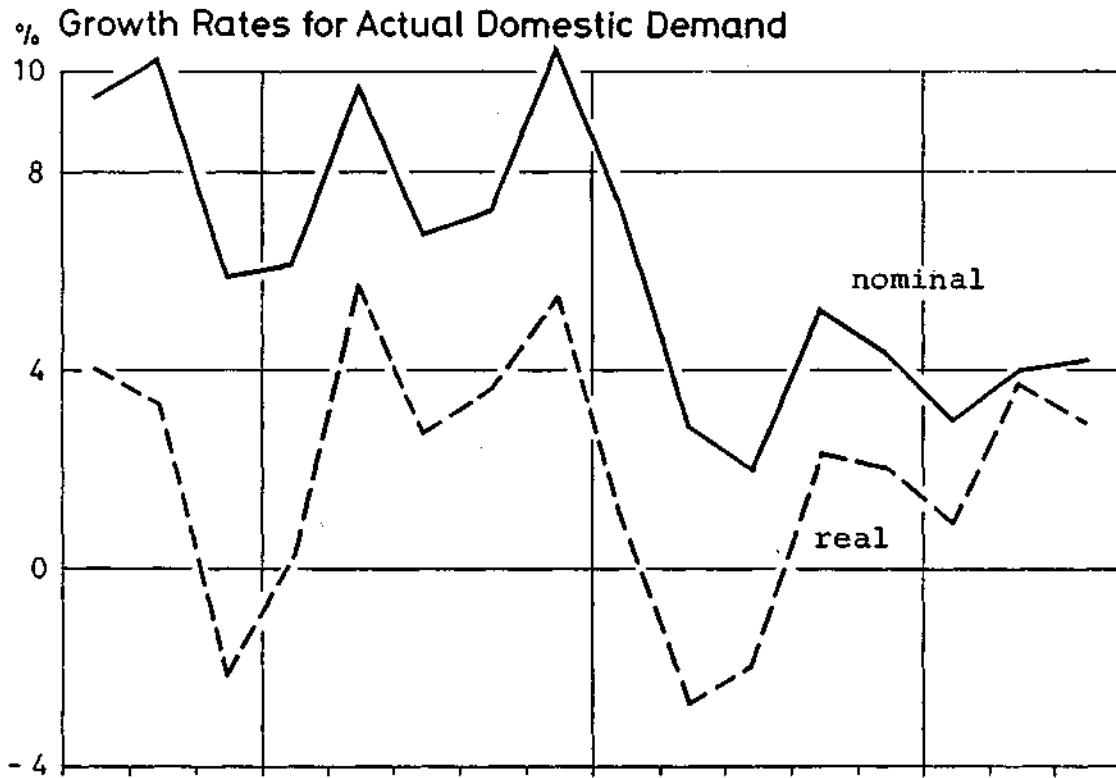
In the simulation¹ we use the values for money growth according to the rule (2). The effects of that policy are estimated with equation (1'). The estimates of the actual disturbances are fed in as they occurred². We get the value for the first year (1972) by taking the trend value of three percent and adding the estimated error term for this period. The effects of the hypothetical monetary policy are now compared with the actual performance. The outcome of the simulation reveals that the growth of domestic demand is - as expected - not stable (Figure 1). However, the fluctuations are reduced compared to the actual behavior, the variance is only one third of the variance of the growth in actual domestic demand. The root-mean-squared error (RMSE) is calculated for the deviations of the simulated series from trend. It is now 1.39, while the RMSE for the actual series - i.e., the deviations of domestic demand from its (inflationary) trend - is 1.90 (Table 1).

This may not look like a substantial improvement. However, if we take some crucial cyclical episodes we may say that the recessions of 1974/75 and 1981/82 would have been less pronounced. To be sure, the downturns can still be observed. But the change in the growth rate of nominal demand in those periods is much smaller: for the first recession, the reduction of the growth rate is only about one percentage point which compares to more than four percentage points of the actual development. For the second recession, the respective changes are less than five compared to more than eight percentage points. In other words: since there would not have been inflationary expansions, there was no need for the Bundesbank to step on the brakes as it actually did during these periods. The downturns may be well explained by other shocks, for example, the recession in other countries and the adverse supply shocks caused by the increases in oil prices.

¹ Following the reasoning in McCallum [1987], we hold here that we can use the reduced-form equation (1') for simulation in spite of the postulated regime change, because the relationship between nominal variables is not nearly as sensitive to the Lucas-critique as that between money and real income.

² An alternative would be to draw these shocks randomly from a sample defined by a zero mean and variance of the shocks according to the estimated equation (1').

Figure 1:



In 1987, there is a small decline in the simulated value of nominal domestic demand. It seems too early to judge whether this is due to a substantial shift in the demand for money that could discredit this particular rule. To be sure, nominal domestic demand would have been lower in 1987 if the Bundesbank had followed its own targets, i.e., if the central bank money had increased by some four instead of (the actual) six and eight percent in 1986 and 1987. However, that does not mean that we would be in a recession now. Firstly, real domestic demand actually increased at a higher rate than that what most observers estimate to be the natural rate of growth¹, so a lower expansion of monetary aggregates would have probably prevented that. And secondly, the deflator of domestic demand would be lower; after all, a rule like this implies that favorable shocks - in this case, the decline in oil prices and in the value of the dollar - will lead to a decline in the price level.

Table 1: Simulation Results for 1972-1987

Nominal Domestic Demand	RMSE
- actual	1.90
- with modified k-percent rule	1.39
- with k-percent rule (four percent money growth)	1.38

IV. Constant Money Growth

In the rule suggested above monetary expansion slowly adjusts to the decline of output capacity (modified k-percent rule). One might argue that the central bank could not know the trend values postulated above. Therefore, another version of the k-percent

¹ This strong increase came at a time when the economy was - according to most estimates - already at its "full capacity".

rule was investigated, which requires no such "knowledge": How would the behavior of economic activity (domestic demand) have changed if monetary growth had been kept constant at four percent per year? Using the same model (1'), we get practically the same result as before (Figure 1). But since the average rate of monetary expansion is higher than in the previous case, there is a small inflationary bias: the average increase of the price level would have been some 0.5 percent per year¹.

V. Conclusions

For the simple model of the economy used in this paper, the simulations suggest that monetary targeting is not useless. In fact, even these extremely simple and strict rules can improve the economic performance by keeping the price level stable in the medium run and reducing fluctuations which have, to some extent, resulted from changes in monetary expansion. Whether the rules tested are the best possible insurance against inflationary booms and severe recessions or whether they can be improved will have to be investigated. For that purpose, it is certainly appropriate to turn to quarterly data and use a more detailed model.

Among the possible variations of the rules in this paper, one can think of using a feedback-mechanism if nominal income deviates from a target path; this would amount to a - possibly activist - nominal-GNP rule (or in our case: nominal-domestic-demand rule). However, there are also limits: not every reduction in the variability of output is automatically increasing welfare. At some point the benefits of stable credit conditions must be higher. If

¹ That is, given our assumption that, on average, the real performance is not affected by the change in monetary policy.- Various alternatives were also tested. The results in terms of variability - measured by the RMSE - are practically the same; they only differ with respect to the average inflation rate.

we follow the underlying postulate of long-run neutrality of money and the natural-rate hypothesis, we must say that the central bank should not respond to changes in real variables in the hope to influence them on a permanent basis. According to the assignment of policies and instruments, monetary policy should concentrate on maintaining price level stability in the medium run, the target for which it has a comparative advantage¹.

The demonstration of the advantages of the rules presented in this paper rests on very simple assumptions which may be disputed. However, the performance of the economy could even be improved by more than can be shown in the simulations. These results would follow from the change in the policy regime, and we may have some idea as to what such a change can imply. Firstly, the path of permanent real income would have been higher if monetary policy had been stable². We may not know much about the costs of inflation and its variability, but there must be some reason why economists recommend price level stability as an important target for economic policy. Secondly, the fluctuations that still exist due to other shocks would have possibly been smaller if a similar, rule-like strategy had been followed by fiscal policy in West Germany; this would have reduced shocks from fiscal measures. Thirdly, if other countries had also followed similar monetary and fiscal policies, external shocks via changes in exports or exchange rates would have been smaller. Fourthly, if we assume that oil prices or other raw material prices are not completely

¹ Some economists would not agree with this assignment. In their view, monetary policy should also feel responsible for alleviating the stagflation problem. See, for example, Wagner [1988].

² This follows from Kormendi, Meguire [1985], whose empirical investigation about determinants of growth suggest that monetary instability has dampened growth in a large number of countries. This result can be interpreted as follows: If over a period of, say, twenty years, inflation is zero with a very small variance, output will be higher on average than if in the same economy inflation fluctuates between zero and twenty percent. The price mechanism does not function as well as under a regime of a stable price level, and inflation uncertainty can lead to higher real rates of interest and thus hinder investment.

exogenous, fewer disturbances could have also been expected from that side. All these considerations suggest that the German economy could be better off today with stable - in the sense of rule-oriented - policies.

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