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## Central banks: No reason to ignore money

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# Central Banks: No Reason to Ignore Money

by Joachim Scheide

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- The need for a stable monetary policy arises from several facts about business cycles. For example, practically all recessions in industrial countries were preceded by restrictive measures of central banks. The main cause for the instability, however, was the expansionary policy that led to a boom and too high inflation. There is no question that high inflation in the long run is caused by high money growth; the empirical evidence in favor of the quantity theory of money is overwhelming.
- Inflation reduces economic growth considerably if it exceeds a certain level. At rates below 10 percent, the negative effects appear to be small. But recent studies show that there is a tremendous welfare gain even if inflation is reduced from a low rate of two percent to zero. This follows from the existence of distorting taxes and from a high demand for non-interest bearing cash at low rates of interest. The conclusion is that zero inflation can be achieved and that it produces a sizable free lunch for a society.
- While there is a consensus that monetary policy should follow a rule because discretionary policies have a bias towards higher inflation, it is not clear what the best strategy should be. It is often stated that monetary targeting cannot be used in the case of an unstable money demand function. This is not necessarily true because this instability can often be taken account of. Actually, rules exist according to which money growth adjusts to changes in the trend rate of the velocity of money. An instability of the money demand function does not invalidate the policy of monetary targeting or the main predictions of the quantity theory of money.
- The instability of money demand has led many central banks to pursue inflation targeting instead. But this policy, too, is fundamentally affected if the demand for money is not stable: The strategy requires a forecast for inflation which critically hinges on the conditions on the money market. In the case of an instability, it is difficult or even impossible to predict inflation accurately. This means that inflation targeting may not be better than monetary targeting.
- According to the Taylor rule, which is often propagated, the central bank reacts to the output gap as well as to the difference between actual inflation and the inflation target. If the central bank wants to set the short-term interest rate accordingly, an estimate for the real equilibrium interest rate is needed. Given the large variations in the trend of real short-term interest rates in the past, it is quite possible that a central bank uses a "wrong" estimate when following the rule. A small underestimation may already produce considerably higher inflation. Such an error is equivalent to the error concerning the estimate of trend velocity in the strategy of monetary targeting, so both strategies may lead to deviations from the target inflation rate. In other words: The Taylor rule is not necessarily superior.
- The future European Central Bank will choose between monetary targeting and inflation targeting. The start of the European Monetary Union may lead to an instability of the demand for money because of the regime shift. Therefore, the strategy of monetary targeting may lose some of its appeal. However, it does not follow that it is better to pursue a policy of inflation targeting. Any strategy will have difficulties when the fundamental link between money, prices, income and interest rates is disturbed.
- The rules for monetary policy have desirable features: inflation is to be kept under control, and fluctuations of output are to be reduced. But obviously, there is no single rule which is always and everywhere better than the alternatives. To conclude: It is not justified to disregard monetary targeting — a tendency which seems to prevail among central bankers and economists alike. After all, the quantity theory of money holds well enough to stress the importance of monetary aggregates as an anchor for the price level.

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*Money may be a veil,  
but it matters a great deal!*

## I. Monetary Policy and the Business Cycle

There is a widespread consensus that monetary policy matters for economic activity, at least to some degree, as opposed to the postulate of the real business cycle theory. For example: Prior to practically all recessions in OECD countries over the past three decades, short-term interest rates were raised considerably, money growth slowed down markedly, or — to take another indicator of monetary policy — the yield spread shrank or even became negative. In this sense, therefore, business cycles are to some extent avoidable if central banks had a better strategy at hand or did not resort to a discretionary policy. The possible benefit of a more stable development of output may be large if one considers the often huge fluctuations of unemployment over time. However, since most economic theories would consider monetary policy neutral in the longer run and thus not affecting the natural level of income and consumption, the “costs of business cycles” may not be too large altogether. In fact, Lucas (1987) comes up with a (actually maximum) welfare gain for each US consumer of just \$8.50. He derives the costs of business cycles from plausible assumptions on the utility function of consumers and their attitude towards risk. One would have to argue that more is involved in cyclical fluctuations than just the consumer’s inability to smooth consumption (almost) perfectly if a case is to be made for a more stable monetary policy.

Another stylized fact of business cycles is the fluctuation of inflation. Again, practically all recessions in the OECD countries were preceded by an acceleration of inflation.<sup>1</sup> This applies also to all recessions in the United States, Great Britain and Germany — to mention three important examples — since World War II. Obviously, too high inflation led central banks to the above-mentioned reaction of tightening monetary policy. The typical sequence of events during business cycles is also compatible with

Hayek’s notion that “unemployment must follow inflation”. Now, what then was the cause of inflation in the first place?

There is a consensus that monetary policy is to a large extent responsible for the acceleration of inflation.<sup>2</sup> One of the best possible ways to show the strength of the quantity theory of money is the link between money growth and inflation over a long time span. Using data for 110 countries for the 1960–1990 period, McCandless and Weber (1995) present a very persuasive correlation. The coefficient amounts to some 0.95, independent of the monetary aggregate chosen (M0, M1 and M2 were used) and the sample of countries (it applies to the group of industrial countries as well that were not among the high inflation economies). Lucas (1996) reproduced this figure in his Nobel Lecture praising David Hume for predicting such a relationship by purely theoretical reasoning — Hume had no data on money or the price level to support his theory.<sup>3</sup>

Although the quantity theory seems to be “always and everywhere controversial” (Laidler 1991), the long-run neutrality of money is certainly a tenet in all serious models on business cycles. In addition, the quantity theory cannot only be used for long-run predictions but is also applied to short-run price movements in, for example, P-star models (Krämer and Scheide 1994). Here, the difference between the equilibrium price level, determined by money, and the actual price level drives the process of inflation.

Another key issue related to a monetary strategy therefore is — besides the impact on the cycle — the importance of inflation. But how relevant is this? Does it matter much for economic welfare of a country whether inflation averages 2 percent, 10 percent or 100 percent? Is inflation not completely neutral with regard to welfare if it is correctly anticipated and fully reflected in, for example, nominal interest rates?

## II. The Benefits of Price Level Stability

### 1. Inflation Reduces Economic Growth

While many would agree that inflation does not raise economic growth, there is some doubt among the economics profession whether reducing inflation is worthwhile. Many are critical when it comes to the negative effects on output during the transition when inflation is reduced. Huge “Okun gaps” are compared to small “Herberger triangles” suggesting that disinflation does not pay but is very costly. This argument of tremendous so-called sacrifice ratios needs some clarification.

An economic boom which brings about high output and low unemployment is by no means a desirable goal in itself. Economic theory does not state anything that would justify the target of a maximum of output or a maximum of employment. Typically, economic agents are fooled into working by surprise inflation. Therefore, any output level above the natural rate means a welfare loss.<sup>4</sup> Had they not been surprised by inflation but known their true real wage, people simply would not work but rather enjoy leisure which is worth more to them given their preferences and given market outcomes. So, reducing output by a “restrictive” monetary policy<sup>5</sup> to the natural level improves welfare — at least according to all theories that are based on neo-classical principles. Often, however, the restriction is stronger and produces another welfare loss, namely a level of output below the natural rate. While this may be typical for many episodes when inflation was reduced to a more desirable level, one has to keep in mind that the starting point of all these reactions of monetary policy has practically always been the preceding acceleration of inflation. One may therefore refer equally well to the costs of inflation when talking about the corrections that follow. In any case, the concept of sacrifice ratios is often exaggerated. What should be blamed for a recession is the policy that has led to the inflation in the first place.

Because of the close link between money and prices and the observation that inflation can practically reach any level, it seems a correct statement to say that a central bank — or better: a society — can choose the inflation rate that it wants to have. Most central banks of industrial countries have for some time followed a policy of low inflation. In fact, a recurring statement at G-7 meetings and similar occasions is that stability of the price level is a precondition for economic growth. What really are the benefits? One of the most telling empirical investigation in this regard is Barro’s (1995) article about the relationship between inflation and growth.<sup>6</sup> The results show quite dramatic negative consequences for very high rates of inflation. This may be explained by the tremendous distortions in the economy that are connected with rapid price increases but also by the fact that high inflation may be a symptom of several other things that go wrong in an economy and thus are detrimental to growth. For inflation rates below 10 percent, however, the effects seem to be minor. No strong case can be made that rates of 5 percent are much worse than, say, 3 percent. Nevertheless, an economy which experiences inflation of 10 percent will grow by some 0.2 percent less a year than an economy with price level stability. This adds up to a sizable free lunch if, for example, the present value of the additional real income is calculated.<sup>7</sup>

### 2. Zero Inflation — A Sizable Free Lunch

While such calculations show “real” benefits, other estimates refer to welfare gains of low inflation not always captured in higher GDP levels. Usually, inflation leads to shoeleather costs, i.e. people have to go to the bank more often because of the higher opportunity cost of holding non-interest bearing cash.<sup>8</sup> Milton Friedman’s approach of balancing the marginal cost and marginal benefit of money implies that it is optimal to have a deflation rate equivalent

to the rate of productivity growth in an economy. The welfare gain of a policy which would produce this outcome critically hinges on the type of money demand function, in particular the relationship between money and the interest rate. Postulating a log-log relationship, Lucas (1994) argues that there is a high interest elasticity of real balances at very low rates of interest. As people do not get saturated with real balances, the annual welfare gain of Friedman's rule is substantial, namely one percent of GDP compared to the situation of zero inflation. While the empirical basis for this may not be overwhelming — periods of very low interest rates are rare —, other authors come to a rather similar magnitude of either deflation or zero inflation (Wolman 1997; Dotsey and Ireland 1996).

For several reasons, however, policymakers do not find deflation desirable. It may also be difficult to change the attitude of the population.<sup>9</sup> But recent studies come up with a rather remarkable result: Substantial welfare gains can be expected even if inflation is reduced from a low level of two percent (currently prevailing in most industrial countries) to zero: Feldstein (1996) as well as Tödter and Ziebarth (1997) argue that such gains follow from the existence of distorting taxes. Capital gains are taxed in various ways. Even if the real rate of interest is the same under the two different levels of inflation, the net real interest rate is not. This is detrimental to saving and capital accumulation in the economy. Thus, people who save now in order to consume later experience a gain of welfare if — given the tax system — inflation is brought down to zero as in those examples. Feldstein's estimate for the United States amounts to about one percent, Tödter and Ziebarth's estimate for Germany to about 1.4 percent of GDP.<sup>10</sup> It must be stressed that this is a permanent gain, it comes every year, whereas the costs postulated in the concept of the sacrifice ratio are only transitory. Therefore — even if one accepts the estimates of the sacrifice ratio in spite of all the inconsistencies — the benefits of zero inflation by far surpass those "costs of bringing inflation down".<sup>11</sup>

To summarize: monetary policy intensifies or even causes business cycles and produces in-

flation. Thus, the welfare gain to be expected from a monetary strategy which leads to stable outcomes would be a sizable free lunch for a society, and a stable monetary policy can be seen as an insurance against the negative effects of economic fluctuations and inflation.

### 3. Arguments in Favor of Rules for Monetary Policy

Before I turn to the topic of a good strategy of monetary policy, one question certainly arises after the previous discussions: If higher money growth does not raise output in the long run and if inflation is costly, why is it that central banks allow inflation to arise or, to put it bluntly, produce inflation? The answer probably lies in the difference in the timing of effects. Since in the short run output gains seem to be beneficial (what they are not!), central banks may try to exploit the Phillips curve by surprise inflation. One major result of the rational expectations "revolution" is the description of the policy dilemma that a central bank faces: Although it promises zero or low inflation, it is tempted to raise money growth in order to reduce unemployment or to prevent it from rising.<sup>12</sup> In this typical game, the result is the Nash equilibrium with the suboptimal outcome of higher inflation. A discretionary policy, therefore, does not lead to satisfactory outcomes (even if central banks dislike inflation). This is the fundamental argument in favor of rules for monetary policy.<sup>13</sup> Alan Blinder, however, stresses that when he was a member of the Federal Reserve Board, he was never tempted in the way described above. But what then are alternative explanations for the existence of suboptimal inflation rates? Looking at the correlation between money growth and inflation one can certainly say that only a small part — if at all! — of the inflation can be "explained" by negative supply shocks, aggressive wage policy or whatever.

If the target of low or even zero inflation is accepted, how can it be achieved? What is the best strategy for a central bank under possibly uncertain structural relationships? In the following sections, the pros and cons of three widely

discussed alternatives are analyzed: monetary targeting, inflation targeting and the Taylor rule. Given the widespread criticism of the policy of monetary targeting, it is analyzed whether the arguments against this strategy are valid and

whether the alternatives can be expected to perform better under certain circumstances. In Section VI, the possible strategy of the future European Central Bank is discussed.

### III. Is Monetary Targeting Obsolete?

Given the empirical regularities, monetary targeting is the straightforward application of the quantity theory. If the target inflation is  $\pi^*$  — the rate that is to be achieved not on a quarter-to-quarter basis but rather on average for the medium term — then the growth rate of money ( $m$ ) has to follow

$$[1] \quad \Delta m^* = \pi^* - \Delta \bar{v} + \Delta \bar{y}.$$

Here, the trend values (with a bar) of the change in output  $y$  and in velocity  $v$  have to be estimated. Various methods are used in the literature.<sup>14</sup> The target for money growth can then simply be derived. This is the procedure that the Deutsche Bundesbank has followed since the middle of the 1970s. The rule for monetary policy looks trivial, but this is what the quantity theory is.<sup>15</sup> The equation can be used to determine long-run and even short-run inflation — possibly modified as in, for example, the P-star model (Krämer und Scheide 1994) — or to make forecasts. The “charme” is that money growth and inflation practically change 1:1 in the long run, the direction of causation is clear, and any rate of inflation can be chosen as a target.<sup>16</sup> This relationship works well if the trend growth of output can be estimated well enough — usually this is not seen as a major problem — and if the trend of velocity is fairly stable.

#### 1. The Stability of Money Demand — A Necessary Condition?

The latter “if” is a big one. Estimating the trend may be difficult if money demand becomes unstable. This instability is exactly the reason why

so many central banks have given up monetary targeting.<sup>17</sup> It is often claimed that the stability of the demand for money is a necessary condition; if it is not stable, monetary targeting does not make sense, and the central bank has to do something else.

Would this instability by itself imply that the fundamental relationships of the quantity theory do not apply anymore? The evidence presented by McCandless and Weber (1995) is overwhelming. Nevertheless, it would be a great surprise if the money demand functions for each of the 110 countries had been stable over the entire 30 years. There certainly were structural breaks en masse, but the basic message of the theory holds anyway. Usually, arguments such as the Lucas critique or Goodhart’s Law are referred to in order to question the validity of certain propositions. But: While the Lucas critique refers to short-run phenomena such as the translation of a change of money into real and price effects and while according to Goodhart’s Law the use of a policy instrument may distort its function as an indicator and thus lead to different outcomes than before, neither Lucas nor Goodhart question the validity of the long-run relationship as stated in the quantity theory of money!

The question whether and how much the instability of money matters can be put in the following way. Consider the typical function

$$[2] \quad m_t - p_t = c_0 + c_1 y_t + c_2 i_t + \varepsilon_t,$$

where real money balances ( $m - p$ ) depend on real income  $y$  and the nominal interest rate  $i$ . Assume that all variables (including real money) are integrated of order one. Unit root econometrics would imply that the residual  $\varepsilon_t$  is station-

ary only if the other series are cointegrated. If they are not, the residual is only stationary in first differences and the function cannot be used. But there are many reasons to expect exactly this characteristic (McCallum 1993). The residual captures, *inter alia*, changes in transaction technology or other innovations. These occur normally at irregular intervals, and they are typically permanent in character. As they are not reversed, they lead to the non-stationarity of  $\varepsilon_t$ .

Two conclusions follow: First, the money demand function may be amended by using dummies for the periods in which these shocks took place. Second, and more importantly, the main implications of the functions will remain intact if the variance of the residual is small relative to the change in money. In that case, the typical policy conclusions will hold, namely that in the long run, a one percent change in the rate of monetary expansion leads to a change in the inflation rate of approximately one percentage point. In other words, the implications of monetary neutrality continue to hold — or for that matter: the predictions “monetarists” would normally make — although money may not be super-neutral. In fact: the observations for the 110 countries concerning money growth and inflation are not on the 45°-line but very close; this means that there is strong support for the quantity theory in spite of the fact that money demand functions are not always and everywhere stable.

## 2. An Alternative Rule for Money

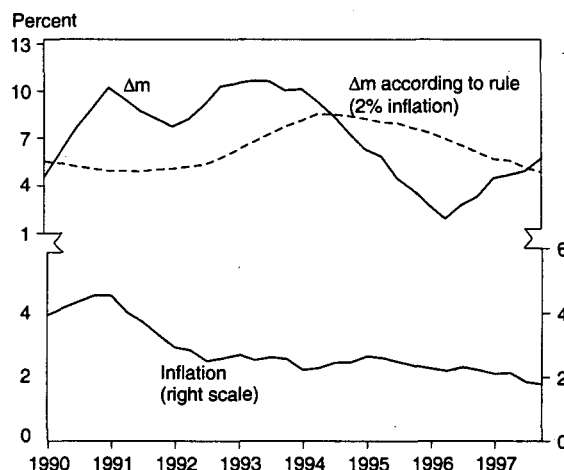
While the quantity theory holds in the long run, central banks must have something at hand for the short run. Their day-to-day actions, even if they are not discretionary but follow something like a rule, must take account of uncertainties. The instability of velocity which obviously occurred at the beginning of the 1980s in the United States led a few authors to develop a rule for the money stock, in this case of the monetary base. Meltzer (1987) and McCallum (1987) proposed a rule of the following type<sup>18</sup> in order to achieve the desired inflation rate  $\pi^*$ :

$$[3] \quad \Delta m_t^* = \pi^* - \frac{1}{16}(v_{t-1} - v_{t-17}) + \frac{1}{16}(y_{t-1} - y_{t-17}).$$

As the trend of velocity is not known, one needs an estimate. The average of four years — admittedly taken *ad hoc*<sup>19</sup> — is used as an approximation. Applying the same type of estimate for trend output, one can calculate what excess money is: if  $\Delta m > \Delta m^*$ , then  $\pi > \pi^*$  in the long run. The performance of this rule was estimated by McCallum (1987) for the United States. It could have produced zero inflation on average and was thus by far superior to the policy actually pursued.<sup>20</sup> Equation [3] can also be used to explain the recent development of inflation in the United States. Assuming a target for inflation of 2 percent, one can calculate the rate of money growth which would deliver this rate. In Figure 1, actual money growth during recent years has been lower than the rate compatible with 2 percent (or even higher) inflation. Thus, it would have been correct not to forecast an acceleration of inflation — as many did on the basis of the unemployment rate or some idea of the NAIRU — but rather a decline which actually occurred until recently.<sup>21</sup>

All this means that even in case of an instability of money demand, targeting money growth still makes sense.<sup>22</sup> It would be wrong to disregard monetary aggregates altogether either for evaluating policy or for making forecasts.

Figure 1 – Monetary Policy and the McCallum Rule in the United States



Source: OECD (1998), own calculations.

### 3. Is It Better to Target Interest Rates?

The type of shocks hitting the economy matters for the choice of the policy instrument. Poole (1970) shows in a model with fixed prices that if money demand shocks are relatively frequent — as recently in industrial countries —, the interest rate is superior to the money stock. However, in a more general model this would lead to an indeterminacy of inflation. If interest rates are used, there is no anchor for the final target of the price level.

In general, the problem is that no simple relationship exists between the money market rate and inflation that could be exploited for policy recommendations. It may usually be correct to say that interest rates should be raised if inflation is too high relative to some target.<sup>23</sup> Such considerations are indeed behind the day-to-day actions of central banks. But if interest rates are to be raised: by how much and for how long? In the strategy of monetary targeting, the policy

advice is straightforward: If inflation is to be lowered by one percentage point, reduce money growth by just that amount. Nothing quite as simple can be said with respect to the interest rate. In fact, in the long run there is a positive relationship between the interest rate and inflation, not a negative one which is usually assumed when typical policy recommendations are made.

This sign switch in the correlation between the rate of interest and the rate of inflation makes it impossible to evaluate an interest rate policy which would deliver the desired inflation rate. Or, as Lucas (1996: 666) put it: "Central banks and even some monetary economists talk knowledgeably of using high interest rates to control inflation, but I know of no evidence from even one economy linking these variables in a useful way ...". Certainly, there is no evidence of the quality as for the money-inflation correlation as shown by McCandless and Weber (1995).

## IV. Is Inflation Targeting Superior?

Because of the instabilities of money demand, many central banks have given up using money as an intermediate target and switched to the strategy of directly targeting the inflation rate (e.g. Great Britain, Canada, New Zealand, Sweden). These countries were also successful in bringing inflation down. However, this "evidence" is not necessarily a reason to believe that this strategy is superior because inflation has come down in practically all industrial countries. One could equally say that the strategy of monetary targeting has continued to be successful: The Deutsche Bundesbank pursued this policy — money demand has been sufficiently stable in Germany — and reduced inflation; other countries in Europe, the so-called DM-bloc, followed this by means of an exchange rate target and thus also achieved low inflation.

The key point, however, is twofold: First, if money demand is not stable, is it necessary to give up monetary targeting? The negative answer to this question was explained in the previous section. Second, if money demand is unstable, is the strategy of inflation targeting superior? This question can be analyzed by using a simple macroeconomic model<sup>24</sup> (Box). There is nothing peculiar about this model, it is fairly standard, so the conclusions are not confined to a particular ideology. The results are interesting as far as the price equation is concerned. The strategy of inflation targeting is based on an inflation forecast. This, however, depends among other things also on the money demand function: All coefficients show up in the price equation. If money demand is unstable and/or the coefficients are not known, it is impossible — or, at least, very difficult — to make an inflation forecast.

Box — A Simple Macroeconomic Model for a Closed Economy

[A]	$y_t = b_0 + b_1(i_t - E_t p_{t+1} + p_t) + v_t$	IS curve
[B]	$m_t - p_t = c_0 + c_1 y_t + c_2 i_t + w_t$	Money demand
[C]	$y_t - \bar{y}_t = \alpha(p_t - E_{t-1} p_t) + u_t$	Aggregate supply

Equation [A] is an IS curve with output  $y$  depending on the real interest rate, which is the difference between the current nominal rate  $i$  and expected inflation ( $E$  is the expectation operator). The LM curve [B] has the usual form with real balances depending on output and the interest rate  $i$ . Equation [C] is a type of the Lucas supply function: output deviates from its natural level  $\bar{y}$  in the case of a shock or if the current price level  $p$  deviates from its expected value.

Solving for two of the endogenous variables  $y$  and  $p$  gives the following expressions (the third one is  $r$ ):

$$[D] \quad y_t = -\alpha E_{t-1} p_t + u_t - \frac{\alpha(b_1(-c_0 + m_t + w_t) - c_2(-b_0 + b_1 E_t p_{t+1} - v_t) - (-b_1 c_1 - c_2)(\alpha E_{t-1} p_t - u_t - \bar{y}_t))}{-b_1 + \alpha(-b_1 c_1 - c_2 + b_1 c_2)} + \bar{y}_t$$

$$[E] \quad p_t = -\frac{b_1(-c_0 + m_t - w_t) - c_2(-b_0 + b_1 E_t p_{t+1} - v_t) - (-b_1 c_1 - c_2)(\alpha E_{t-1} p_t - u_t - \bar{y}_t)}{-b_1 + \alpha(-b_1 c_1 - c_2) + b_1 c_2}$$

As expected, the interdependence of the various equations shows up in a rather complicated way, or in other words: everything depends on everything.

In other words: If the demand for money is unstable, every strategy of monetary policy has problems, and it is by no means the case that — as it is often stated — monetary targeting must be given up and inflation targeting is the solution to the problem.<sup>25</sup>

In practice, central bankers try to reduce the difficulties by “looking at everything”, i.e. by using other variables that may have an impact on inflation. However, the problem arises that policy actions can often not be distinguished from a discretionary policy. According to King (1996), there is also a good deal of judgment involved when it comes to the inflation forecast which is derived from, as in the case of Great

Britain, the econometric model of the Bank of England.

To be sure, the differences between monetary targeting and inflation targeting are not fundamental. In fact, the Deutsche Bundesbank also has a target for the inflation rate, and proponents of the alternative strategy have over and over again stated that with a stable money demand function, the two strategies amount to the same. But it is also true that both strategies face difficulties in the case of an instability of the money demand function, and it is not correct to say that inflation targeting becomes automatically superior.

## V. The Taylor Rule: A Good Compromise?

### 1. The Reasoning Behind the Rule

Also because of the problems of money demand instability, John Taylor proposed a rule that uses the short-term interest rate as an instrument (Taylor 1996). The basic idea is that monetary policy can reduce output fluctuations in the short run, at least to some extent; but in the long run, it can only affect inflation and should

focus on the target inflation rate (Taylor 1997). The central bank cannot, however, achieve a complete stabilization of both output and inflation. There is obviously a trade-off. For example, if a negative supply shock hits the economy, an expansionary monetary policy can reduce the output gap but only at the price of more inflation; if, in contrast, the central bank wanted to prevent inflation from rising, output

would be reduced further. In other words: More output stabilization comes at the cost of more inflation instability and vice versa, with the opportunity costs increasing. Thus, there is a curve of “production possibilities” with the usual convex shape (Taylor 1996). The curve may shift outward, i.e. in the more favorable direction if there is more knowledge about the short-run dynamics in the economy, more credibility of the central bank and so on.

One version of the Taylor rule is

$$[4] \quad i = \pi + r + \alpha(\pi - \pi^*) - \beta(\bar{y} - y)$$

with  $\alpha > 0, \beta > 0$ .

The money market rate  $i$  is set depending on the level of actual inflation  $\pi$  and the difference between actual and target inflation  $\pi^*$ . Furthermore, the interest rate should decrease with the output gap  $(\bar{y} - y)$ . The rule implies that the interest rate behaves in a similar fashion as “suggested” by the money demand function. For example, if output increases,  $i$  must increase also if  $m$  remains constant; if inflation goes up,  $i$  also has to rise because real balances are lower. In other words: The interest rate in the Taylor rule is used as an instrument, and the central bank “behaves” as if the money stock is fixed.

The rule appears to be quite attractive since manipulating the interest rate is close to the actual policy behavior of central banks. Also, the rule implies the neutrality of monetary policy: if inflation rises above the target rate, restrictive measures are taken. And in the long run, real variables are not affected, the output gap is zero on average.

## 2. What Can Go Wrong with the Rule?

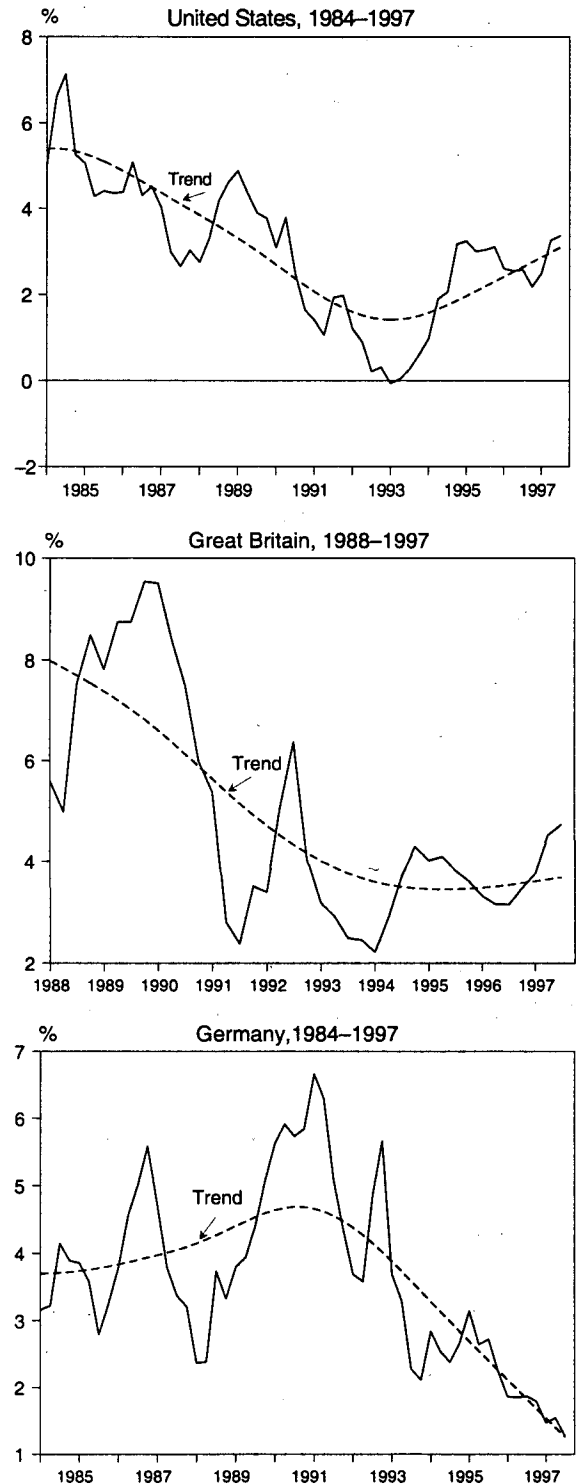
An important element is the real equilibrium interest rate  $r$ . In the steady state, the Fisher condition holds:

$$[5] \quad i = \bar{r} + \pi.$$

Estimating the real short-term rate that reflects the equilibrium is quite a difficult matter.

In the absence of a complex macroeconomic model one would have to use some average of past values. But even this poses severe problems.

Figure 2 – Real Money Market Rate in Various Countries



Source: OECD (1998), own calculations.

While it is obvious that one has to choose a time span longer than the duration of a business cycle, the “correct” length is by no means clear. The real rate has quite different values for the three major countries, the United States, Great Britain and Germany (Figure 2), i.e. the trend lines<sup>26</sup> show remarkable variations over time. Therefore, it is easily possible that the central bank in pursuing the Taylor rule uses a “wrong” estimate of the real rate. What would be the consequences for inflation?

As an example, let us assume that the estimated rate  $r$  is lower than the “true” equilibrium rate  $\bar{r}$ , i.e.  $r < \bar{r}$ . Assume further that there is no error concerning the output gap, so that term is deleted for simplicity.<sup>27</sup> The inflation rate can be derived by combining equations [4] and [5]:

$$\pi + \bar{r} = \pi + \alpha(\pi - \pi^*) + r.$$

Solving for  $\pi$  results in

$$[6] \quad \pi = \pi^* + (\bar{r} - r)/\alpha.$$

This means that permanent inflation would be higher than the target rate, with the size of the error depending on the reaction coefficient  $\alpha$ . Commonly, the concrete proposals for the rule [4] imply a value for  $\alpha$  (as well as for  $\beta$ ) of 0.5 (Taylor 1996). Thus, an error of one percentage point concerning the real interest rate — which is quite possible given the range of values in Figure 2 — would imply that long-run inflation would be higher than the target rate by 2 percentage points, i.e. there is a “multiplier effect”. If compared to the strategy of monetary targeting, it is the same as if the growth rate of money would be 2 percentage points higher than justified by the “true” relations; for example, if the growth rate of velocity is 2 percentage points higher than estimated by the central bank, the error concerning long-run inflation would be the same.

At this point it is fair to say that the Taylor rule implies a correction mechanism. The money market rate would be raised in the case of this error because actual inflation would tend to be higher than the target  $\pi^*$ . But this would only be so after a long time — due to the time lag

between monetary policy and inflation. Anyway, this example demonstrates that

1. inflation will not be stabilized as desired if a wrong estimate of the true real interest rate is used. Output fluctuations would increase because the initial policy of too much expansion (a too low interest rate) must be followed by a restrictive policy;
2. the target inflation will not be achieved as desired, or only after a possibly long process during which the central bank corrects earlier “mistakes”.

This, however, should not be interpreted in such a way as to reject the rule altogether. It certainly has desirable features, and it is to be preferred over a discretionary policy also because it is explicitly focused on achieving a particular inflation rate. But, as the example shows, substantial errors are possible here as well. This means that this rule which was intended to replace monetary targeting is not necessarily superior. In both cases, inflation may turn out to be higher than targeted. But both strategies also have correction mechanisms. The central bank following monetary targeting would also adjust its course if inflation is higher than envisaged, money growth would be corrected here just as the interest rate would be corrected with a policy of the Taylor rule.

### 3. The Taylor Rule and Actual Monetary Policy

Empirical evidence suggests that most central banks behave in a similar manner as the rule predicts. In a sense, then, it can also be interpreted as a reaction function: Central banks obviously lower interest rates in recessions and raise them when inflation increases.<sup>28</sup> It is not surprising, therefore, that the ups and downs of interest rates in reality are close to the rule often suggested:

$$[7] \quad i = \pi + r + 0.5(\pi - \pi^*) - 0.5(\bar{y} - y).$$

Again, the policy of three important central banks is considered. For the United States,

Great Britain and Germany the inputs are estimated as follows: The output gap is determined using a Hodrick-Prescott filter for detrending real GDP. The equilibrium real interest rate is defined here as the average over the period 1984–1996.<sup>29</sup> The inflation target  $\pi^*$  has not been constant over time in all the countries; therefore, it only makes sense to look at the more recent years.<sup>30</sup> The target levels are 2 percent for the United States and for Germany, and 2.5 percent for Great Britain. Given these assumptions, interest rates were close to their target value in the United States and in Germany; in the latter case, the difference has increased somewhat recently (Figure 3), suggesting an expansionary policy. The reference for Great Britain shows that the Bank of England kept the interest rates “too low for too long”, a fact which would explain the inflationary pressure in this economy and the central bank’s reaction

Figure 3 – Taylor Rule for Various Countries

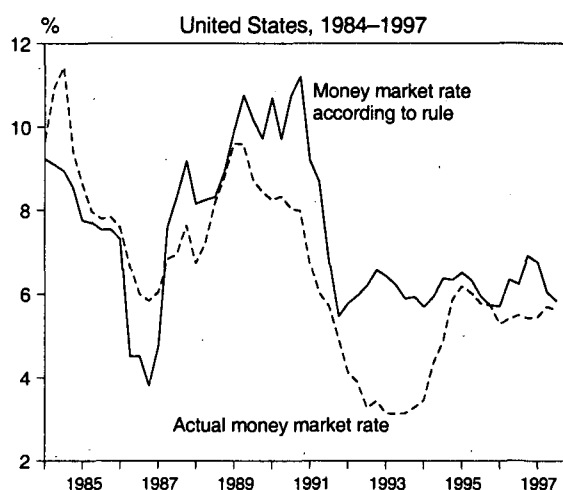
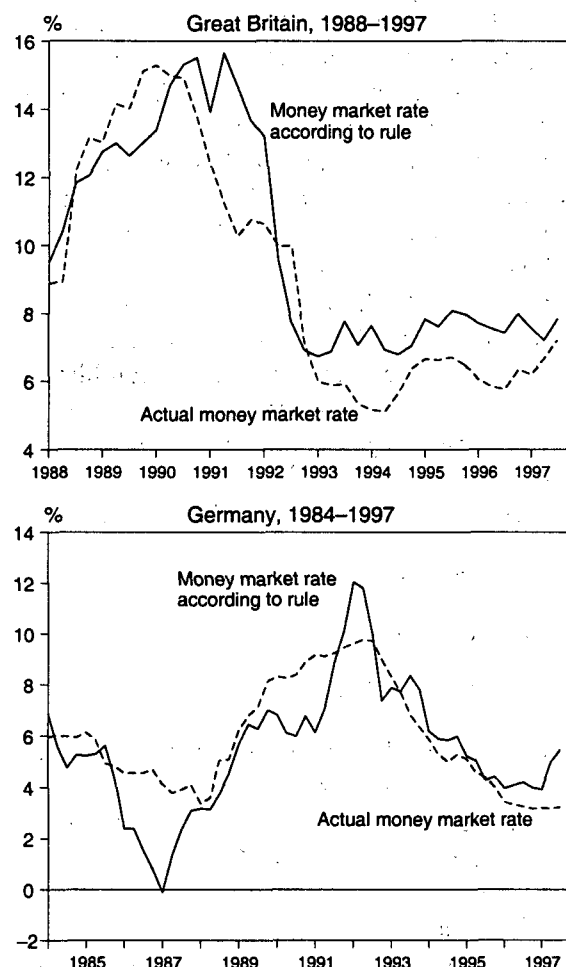


Figure 3 continued



Source: OECD (1998), own calculations.

of raising rates over the past year. By the way, it should be mentioned that also the figures on money growth suggest a very stimulative policy; this indicator, too, provided reliable information on the course of inflation.

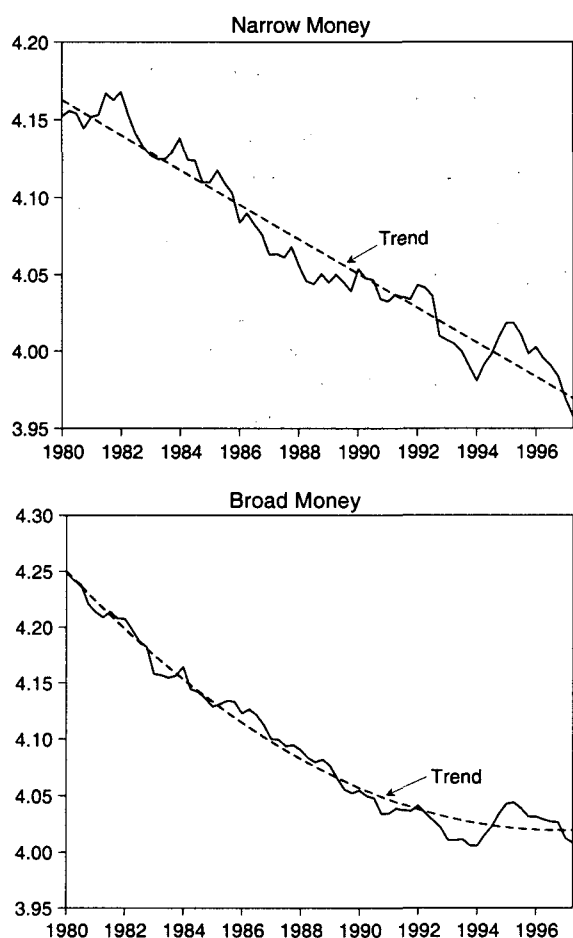
## VI. Strategies for the European Central Bank

According to the decision of the European Monetary Institute, two options are available for the European Central Bank (ECB) as far as the strategy for monetary policy is concerned: monetary targeting and inflation targeting.

If the stability of money demand is taken as a criterion, there seems to be evidence in favor of

monetary targeting. Many empirical studies support the view that the demand for money is fairly stable for a large currency area in Europe.<sup>31</sup> Accordingly, the velocity of money<sup>32</sup> shows a trend which is almost deterministic (Figure 4). This suggests that the trend growth of velocity, which is a central variable for the targeted money

Figure 4 – EU15: Velocity of Money, 1980–1997



Source: OECD (1998), own calculations.

growth in this strategy, could have been estimated without major problems.

While this would lend support to monetary targeting as the strategy for the ECB, the start of EMU itself may lead to an instability of money demand. The regime shift can pose the typical problem of the Lucas critique: There will be only one currency in Europe, and this may well change the demand for money by firms and households (Rother 1996). Also, the possible role as a reserve currency may change the demand for the euro. It is true, therefore, that monetary targeting might lose some of its appeal or justification. Nevertheless, for reasons discussed in Section III, this would not automatically make inflation targeting the superior strategy. Any strategy will have difficulties

when the fundamental link between money, prices, income and the interest rate — as implied in the typical demand for money function — is not stable. Thus, the start of the monetary union will pose a big problem for the ECB no matter what.

It therefore seems advisable for the European Central Bank not to disregard money altogether. The ECB may gain some reputation by following a strategy close to that of the Deutsche Bundesbank. It may be difficult to introduce a new strategy on the European level. Also, one has to keep in mind that the strategy of inflation targeting was introduced in most countries under special circumstances: High inflation prevailed, and the central banks were not independent or became independent only later. The credibility also did not come automatically; real long-term interest rates in those economies were higher than, for example, in Germany for an extended period of time.

Apart from these fundamental issues concerning the strategy, there are at least two practical problems for the starting period of EMU. The first has to do with the proper definitions of monetary aggregates. So far, the harmonization has not fully taken place. Long time series which would be necessary to evaluate the strategy of monetary targeting obviously do not exist. The second problem has to do with the strategy of inflation targeting. While the Bank of England, for example, uses a model to predict inflation and thus has an empirically tested basis for policy decisions, this condition is not yet given for the ECB. Major central banks — among them is also the Deutsche Bundesbank — did not publish forecasts of inflation, and it is unclear whether the ECB will have a model at hand which will generally be accepted as the basis for monetary policy. So even if inflation targeting were chosen as the ECB's strategy, one of the basics just would not exist. In addition to all possible instabilities of the fundamental relationships, these practical issues make the start of EMU even more difficult.

## **VII. Conclusions: Money Still Matters**

The practice of monetary policy is certainly not a trivial task. There seems to be a consensus that rules are superior to discretionary policies. All the rules discussed in this paper try to achieve the same goals: to keep inflation low (maybe even at zero) and — either by an active policy or as a side-effect — to reduce fluctuations of output. In this sense, they all have desirable features. But at the same time, it appears that there is not a single strategy that is always and everywhere superior to all the others. The

discussion of the pros and cons showed that it is not justified to disregard money, to give up monetary targeting altogether and switch to one of the alternatives — a tendency which seems to prevail among central banks and economists alike. Apparently, many relationships have become unstable also because of the changes on financial markets. In the long run, however, the quantity theory of money seems to hold well enough to stress the importance of monetary aggregates as an anchor for the price level.

## Endnotes

- 1 Exceptions are Denmark in 1993/94 and New Zealand in 1994
- 2 It is true, of course, that often — but certainly not always — real shocks hit the economy and thus produced a surge in the price level.
- 3 Hume postulated some non-neutrality of money in the short run as money is not distributed evenly in the “common-wealth”.
- 4 The definition of the natural rate of output or of unemployment was introduced by Friedman (1968).
- 5 Output would sooner or later decline to its natural level even without a restrictive policy, i.e. when agents realize their mistake and react accordingly.
- 6 In a different study, Pindyck and Solimano (1993) show that inflation is the major factor of uncertainty affecting investment and thus economic growth.
- 7 As an example: If an economy with zero inflation grows at 2.5 percent per year, real GDP in 30 years will be almost 7 percent higher than if inflation was 10 percent. For Germany, this would imply an additional income of DM 3,150 per person after 30 years. As free lunches go, this is a sizable amount worth having.
- 8 Lucas (1994: 21 p.) also refers to the costs of having a financial industry. These arise because of a suboptimal rate of inflation. “In a monetary economy, it is in everyone’s private interest to try to get someone else to hold non-interest bearing cash and reserves. But someone has to hold it all, so all of these efforts must simply cancel out. All of us spend several hours per year in this effort, and we employ thousands of talented and highly-trained people full-time in the financial industry to help us. These person-hours — many billions of dollars worth — are simply thrown away, wasted on a task that should not have to be performed at all.”
- 9 For example: If the rate of deflation equals the rate of productivity growth, unions and employers may have to negotiate about a reduction of nominal wages if unemployment (overall or for particular groups) is to be reduced.
- 10 Other effects are investigated as well but are of minor importance quantitatively.
- 11 Referring to welfare gains, Tobin (1977: 467) once stated that “it takes a heap of Harberger triangles to fill an Okun gap”. Given their new estimates, Tödter and Ziebarth (1997: 47) correctly add that “... but it needs only one single Feldstein trapezoid to do it”.
- 12 One possible reason is related to political business cycles: Before elections, a central bank — if not fully independent — may want to (or have to) support the government in office by pursuing a stimulative policy.
- 13 The pioneering work is Kydland and Prescott (1977) and Barro and Gordon (1983).
- 14 Estimating of normal output growth is not trivial; various methods are used in the literature (production functions or simply trends, such as the Hodrick-Prescott filter). The trend of velocity may also be estimated either by purely statistical methods or by running money demand functions.
- 15 The strategy of the Deutsche Bundesbank also follows directly from Friedman’s  $k$ -percent rule for money growth. Cf. Scheide (1989) for a discussion and an empirical test.
- 16 It is fair to add, however, that the transition from a high rate of inflation to a low target inflation may take time.
- 17 For Germany, however, several studies show that money demand is sufficiently stable.
- 18 In addition, McCallum added a term which implies a reaction of the monetary base to deviations of nominal GDP from its target level. For the purpose of demonstration, this term is deleted here.
- 19 The time span is long enough to average over purely cyclical influences. One could improve the trend estimate by using sophisticated detrending methods but this might run counter to the requirement of simple rules.
- 20 This can be said because the policy would not have altered — certainly not lowered — the path of real output.
- 21 Whether the turnaround since the middle of 1996 in base money growth means more inflation in the future is an open question. It would require excess money growth for some time; it has recently crossed the “critical” line which is compatible with 2 percent inflation.
- 22 For the purpose of estimating the  $P$ -star model, Scheide and Solveen (1998) “solve” the problem of instability of the demand for  $M2$  in the United States by introducing a dummy variable for the early 1990s.
- 23 It may sound paradox to say that interest rates must be raised at one point in time to have low interest rates in the future.
- 24 This is a simplified version of the model used by McCallum (1994). There, government expenditures are also included; furthermore, it is an open economy model, i.e. it contains, among other variables, also the exchange rate.
- 25 See also von Hagen and Neumann (1996) for a discussion.
- 26 The trend is approximated by using a Hodrick-Prescott filter.

- 27 The output gap is not a crucial difference to other strategies. For example, with monetary targeting one needs an estimate of the natural rate of output  $\bar{y}$ , too.
- 28 For an extensive analysis of reaction functions in general cf. Solveen (1998).
- 29 The values are 3.0 percent for the United States, 3.8 percent for Germany and 4.8 percent for Great Britain. One may wonder why the average is so high for Great Britain. Probably the uncertainty concerning the exchange rate policy played a role. For Germany, the rate is also high compared to the United States; one reason may be the effect of German unification. This only demonstrates that it is very difficult to estimate the equilibrium real rate. It appears that there are quite substantial differences of real rates (both long-term and short-term) between countries for reasons not fully understood.
- 30 For example, the target for the Fed in the United States was probably higher than 2 percent during the 1980s.
- 31 Cf. Browne et al. (1997) for a survey.
- 32 The aggregates used here are the OECD figures for the European Union (EU 15) for M1 and for "broad money".

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