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PERMANENT AND TRANSITORY CHANGES IN MONETARY POLICY

A Comment

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Assume that after the rate of growth of the money supply has been equal to 5 percent (on an annual basis) for several quarters, new data are released and the market observes that the growth rate has risen to 8 percent at an annual rate:

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Since the past, current, and expected rates of growth of the money stock are important for interest rates, short-term fluctuations in output, inflationary trends, and exchange rates, people want to base their forecasts of such macroeconomic variables not only on the available observed data but also on rational forecasts of future growth rates of the money supply.

Two polar positions would be:

(a) a forecast that the acceleration from 5 to 8 percent is purely temporary and will be completely reversed in the following quarter:

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(b) the acceleration signals a permanent change to a higher growth rate of the money supply:

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In case (a) the growth rate is a stationary series and any deviations are purely temporary, so that there is no serial correlation in the deviations from the average growth rate that could help us to predict the future rate of growth. In an adaptive-expectations model, the adjustment parameter that indicates how

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much of the current forecast error should be incorporated into a revision of previous forecasts of the future growth rates has a value of 0:

$$\mu_M(t+1) = \mu_M(t) + (m(t) - \mu_M(t)) \times 0 \tag{1}$$

Equation (1) may be compared to equation (25) on page 197 of the Büttler/ Schiltknecht paper, as I have employed the same notational conventions. Polar case (b) represents the opposite situation in which the growth rate is a pure random walk measured without output noise. For this case, the adaptive-expectations formula would be:

$$\mu_M(t+1) = \mu_M(t) + (m(t) - \mu_M(t)) \times 1 \tag{2}$$

Section III of the paper shows why the behavior of commercial banks will depend on whether current changes in the growth rate of the money supply (or the monetary base) are perceived to be transitory or permanent. The authors construct a formal model for the optimal adjustment of the banks' balance sheet, in which different types of earning assets have different returns *and* different transaction costs. If, for example, banks can hold loans, marketable securities, and reserves, with loans producing the highest gross returns and reserves the lowest returns, then corresponding differences in the transaction costs of changing the amounts in each category on the balance sheet imply that a given change in aggregate bank reserves will have a larger effect on the stock of outstanding bank loans if the banks judge this increase in reserves to be permanent than if they judge that it will be temporary. Section III of the Büttler/ Schiltknecht paper provides a precise analysis of the consequences for the behavior of optimizing banks if accelerations in the money supply become more or less permanent. The theoretical analyses in this section make a number of valuable points, one of which I should like to stress again: both the average and the marginal money multipliers are sensitive to the question whether the rate of growth of the money supply is more like a stationary time series or more like a pure random walk (compare p. 200). Analysis of these is – I think – welcome and points to the important costs of increased monetary uncertainty. If the problem of extracting a rational expectation of the future rate of inflation from current data on the money stock becomes harder to solve and if the estimates are surrounded with wider margins of error, then the behavior of economic agents will change. This point has been made extensively in the literature with respect to business investment and also with respect to the portfolio choices of institutional investors; but increased monetary uncertainty is important also for banks that must weigh the higher spread on loans as compared to money-market instruments against the much higher adjustment costs if the portfolio of loans has become too large.

The major merit of this paper in my opinion is its elaborate analysis of the costs that come with greater monetary uncertainty. The authors start from a partial analysis in which they investigate the optimal behavior of an individual bank facing given rates of interest that change temporarily or permanently and then extend their work with macroeconomic arguments.

Section III of the paper shows how much farther an economic analysis can go if one discusses the stochastic behavior of the exogenous variables – in this case the growth rate of the money supply or the monetary base – before proceeding to the specification of the behavioral equations. Büttler and Schiltknecht discuss the stochastic properties of the monetary variables in Section II which provide them with a proper starting point for their analysis of bank behavior in Section III and the effects on macroeconomic target variables in Section IV. Too often, researchers specify the behavioral equations of their model first and squeeze a cursory discussion of the stochastic properties of their exogenous variables between the theoretical and empirical parts of their work. Büttler and Schiltknecht rightly note that many elasticities and other coefficients in an economic model depend on whether the exogenous forces that drive the system are stationary with added random noise or are nonstationary. This, the main point of their paper, is very welcome indeed.

Section II of the paper explores the adaptive-expectations model of equations (1) and (2) above from the point of view of information theory. Büttler and Schiltknecht give definitions of "entropy" and "redundance" as statistical measures of the amount of "disorder" in a time series. Before explaining why I fear that Section II is defective, let me stress that the main contribution of the paper, in Section III, can be read independently of the definitions in Section II. In Section III, replace the expression "a permanent policy" with "random walk type behavior for the growth rate" and replace "a transitory policy" with "a stationary time series for the growth rate with added random noise only," and the analysis of Section III holds.

The argument in Section II is needlesssly complicated because the authors choose to use the words "permanent" and "transitory" to describe policies rather than disturbances. Ordinary parlance would call the case of

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and example of "transitory" disturbance and the scenario

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an occurrence of permanent shock to the growth rate of the money supply. Büttler and Schiltknecht use the terms "transitory policy" and "permanent policy," respectively. They define a transitory policy as a stochastic pattern in time that leads rational forecasters not to attach importance to the current forecast error when they revise their expectations. A permanent policy is a stochastic pattern that leads rational agents to incorporate the current forecast error one-to-one into their expectations for future periods. Their distinction between a transitory versus a permanent policy corresponds to stationarity versus pure random-walk-type behavior. So far so good.

However, after introducing the definitions of "entropy" and "redundance," the authors propose a method of computing the coefficient in the adaptive-expectations model that connects this coefficient to their index of the "redundance." Leaving aside the question of how exactly the value of this coefficient is to be updated as time goes on, the numerical example on p. 174 shows that this idea is incorrect. A simple linear transformation of the data used in this example – subtract the average value of the observed growth rates over the sample period from the actual growth rates – would lead to a different measure of the entropy and the abundance, and thus of the parameter in the adaptive-expectations model, although it does not affect the autocorrelation function of the series and, therefore, should have no effect on the coefficient in the adaptive-expectations model (see, for example, Box and Jenkins, 1970).

Not only is the Büttler/Schiltknecht definition of the redundance of no help in deriving parameters in time series models, it also falls short of being a useful indicator of the amount of disorder in the data. As such, it should obey rules that hold for measures of variability such as the standard deviation or the variance, for example:

$$\text{Variance } (c + ax_t) = a^2 \text{ variance } (x_t),$$

with c and a constants and x_t the time series under consideration.

Since Büttler and Schiltknecht propose to compute the entropy and the redundance by counting the number of positive, zero, and negative observations, their definition is strangely sensitive to simple linear operations on all the data. For this reason alone, I think that their definition must be rejected.

Page 207 of the paper has a diagram of the "redundance" for the growth rates of the money supply in the United States, Germany, and Switzerland. The lower this "redundance," the more market participants assume a surprise in the observed growth rate to be temporary; the closer the redundance to 1, the more an acceleration is taken to be fully permanent.

The authors fail to specify exactly how the indices for the redundance in this diagram have been computed. If the discussion on pp. 174-175 is relevant to this application, then my objection to their idea of using the signs of the observations for computing the redundance carries through to this application. Nevertheless, the graph may be able to convey rough and ready insights about important differences in monetary policy among the three countries analyzed. The redundance for Switzerland reaches a local peak in late 1977 and subsequently declines to a level significantly below the levels for the United States and Germany. Such a low redundance means that positive and negative accelerations of the money supply follow each other in such a way that it is hard to deduce with any confidence the expected future path of the money stock.

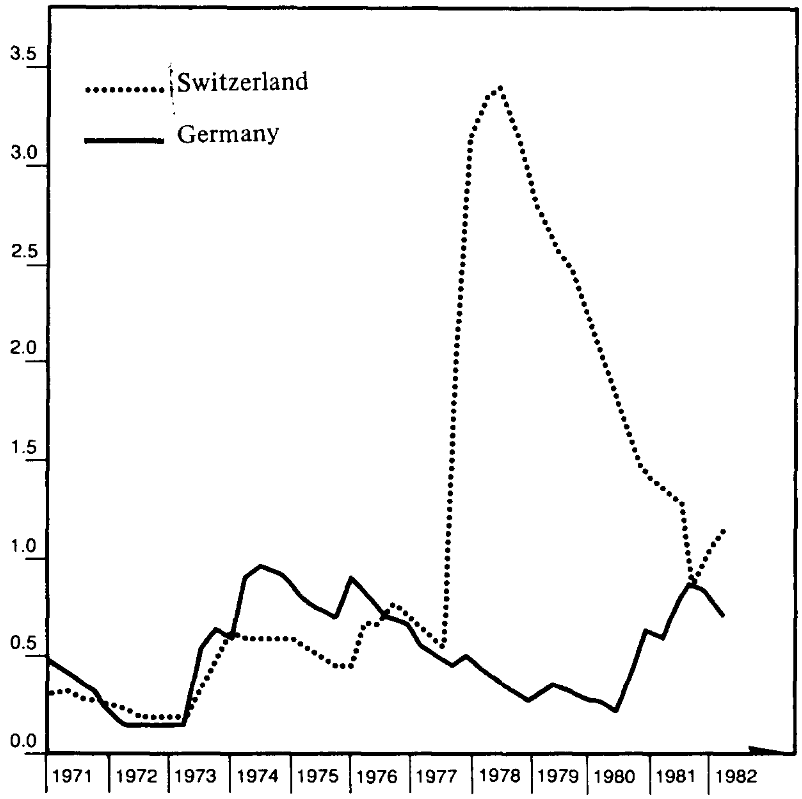
The authors conclude that particularly sharp accelerations or decelerations do not cause important revisions in the expected growth rates and may thus be engineered by the Swiss Central Bank without upsetting inflationary expectations to a large extent. By contrast, the redundance as computed by Büttler and Schiltknecht is much higher for the growth rate of the money supply in the United States. Thus, economic agents, when they form their inflationary expectations, feel confident in attaching importance to recent American trends in money growth. When that is the case, then the authorities cannot accelerate or decelerate the money supply without affecting inflationary expectations and thus interest rates.

My figure tells basically the same story. As part of a larger project about monetary and inflationary uncertainty, Clemens Kool, Paul Veugelers, and I have computed indices for monetary uncertainty for a number of countries, among which are the three countries in the Büttler/Schiltknecht paper. Our indices have been computed in a more conventional way.

First, we have computed ex-ante and on-line rational forecasts of the growth rates of the money supply on a quarterly average basis (see Bomhoff, 1982; Bomhoff and Korteweg, 1983; and Bomhoff, 1983 for further details about the Kalman filter methods employed in this research). We then take the first differences of the expected growth rates and use these numbers as our measure of the period-by-period adjustments in the expected future growth rates. An adaptive estimate of the variance of these underlying accelerations gives us an index of monetary uncertainty. The figures show that up to the second quarter of 1980 the index for the United States was smaller than the indices for Germany and Switzerland. This reflects both the higher quality of the United States data (averages of daily data instead of once-a-month data) and the far smaller swings in the growth rate of the United States money supply. A remarkable increase occurs in the index for monetary uncertainty in the United States during 1980 after which the index stays at historically high levels

FIGURE 1 (A)

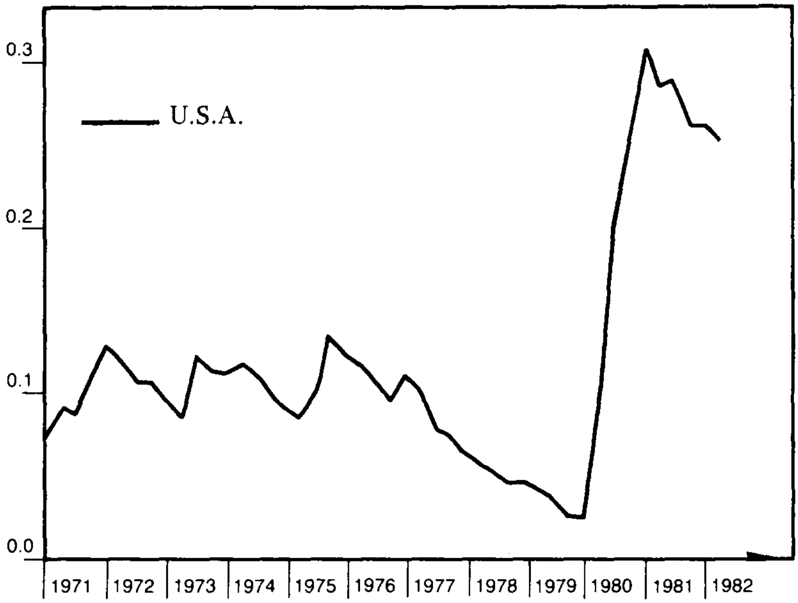
Monetary Uncertainty in Germany and Switzerland



The indices of monetary uncertainty relate to the variability of the quarterly rates of growth of M1 in Germany and Switzerland.

FIGURE 1 (B)

Monetary Uncertainty in the U.S.



This index of monetary uncertainty relates to the variability in the quarterly rates of growth of M1.

until the end of the sample period. Elsewhere we have related the increase in this index to the recent rise in real long-term interest rates in the United States (Bomhoff, 1983).

Important for our present purposes are the following features of the diagrams:

- monetary uncertainty was considerably lower in the United States than in Germany and Switzerland until 1980;
- the index for monetary uncertainty in Switzerland increased during 1978 and remained high throughout the remainder of the 1970s;
- monetary uncertainty in Germany and Switzerland was at roughly the same level during the mid-seventies, but whereas the variability in the Swiss money supply ($M1$) increased significantly after 1977, the degree of monetary uncertainty in Germany stayed in the same range as before.

All three features are also present in the graph on p. 187 of the Büttler/Schiltknecht paper, where greater monetary uncertainty is reflected by a lower value of the redundance.

To what extent do such graphs throw light on the question of why the Swiss money supply would accelerate in 1978 without a corresponding surge in inflationary expectations? Without further analysis I would say – only to a small extent. The redundance as defined by Büttler and Schiltknecht shows only that the gyrations in the growth rate of money supply increased in amplitude, but that by itself does not have implications for the adjustment parameter in the adaptive-expectations model for the expected future growth rate. Our index of monetary uncertainty indicates that the adjustments in the expected growth rate became larger in absolute value, but in principle increases or decreases in the rate of inflation may also become larger over time.

Büttler and Schiltknecht assume implicitly that if the absolute size of the accelerations and decelerations in a time series increases, the rational estimate of the adjustment parameter in the adaptive-expectations model must decrease towards zero, but this is a nonsequitur. The only conclusion that follows from our diagram and from the graph in their paper is that from 1977 onwards it became more hazardous to predict future inflation rates in Switzerland on the basis of monetary trends, either because forecasting the future growth of the money supply became more difficult or because the link between money and prices became less stable or for both reasons simultaneously.

The question remains why people not only found it harder to predict inflation on monetarist lines but also why they decided not to worry much about the events of 1978. Before commenting on this, I shall attempt to cut the problem back to size. There is, I think, a line of investigation that can throw useful light on why the measured data on the Swiss money supply would surge so sharply in 1978 without equivalent effects on the expected future rate of inflation. I attach great significance to the important temporary shifts in the demand for money function in Switzerland, caused predominantly by the fact that some rates of interest on money substitutes are much more sensitive to developments in the domestic and international financial markets than other rates of interest that are relevant to the demand for liquid assets. The demand for money in Switzerland was sensitive to changes in both the thrift-deposit rate and changes in the 3-month time-deposit rate during the period under review (see Johnson, 1982 and Bomhoff, 1983). The time-deposit rate fluctuated more vehemently than the rate on savings deposits, since the latter is not set on a daily basis and should be viewed as an administered rate. Changes in market sentiment, presumably with respect to the foreign value of the currency, are reflected in movements in the time-deposit rate, but they do not have much effect on the savings rate, as long as they are deemed to be of a largely temporary nature.

This difference in behavior between the market rate on time deposits and the administered rate on savings deposits with thrift institutions would help to correct the Swiss money supply data for demand-induced disturbances that were considered temporary rather than permanent. We have corrected the Swiss numbers on the money stock for temporary disturbances by using the difference between changes in the time-deposit rate and changes in the thrift rate as a regressor (see Bomhoff, 1983 for details). This variable is highly significant, both current and lagged one-quarter, in regressions for the change in the ratio between the money supply and nominal GNP in Switzerland, so that correcting for its influence on the money stock produces a much smoother corrected series for Swiss money growth. The annual figures for the period 1975-1979 show that the acceleration in the reported numbers becomes less spectacular after correction of the temporary shifts in the demand for money function:

	1975	1976	1977	1978	1979
raw data	3.8	8.2	2.5	16.5	0.6
corrected data	4.9	7.2	7.2	14.5	4.5

Note: Growth rates have been computed among the quarterly averages of the fourth quarter of each year.

Perhaps the puzzling question why the money supply in Switzerland would accelerate in 1978 without a concomitant acceleration in the price level remains, but at least the size of the question mark can be halved if we go from the raw to the corrected data. The corrected data show an increase of seven percentage points as against an acceleration of fourteen percentage points for the raw published data. A more detailed look at the numbers shows that the first two quarters of 1978 witnessed a 22-percent increase in the official series (annual rate) as against 17 percent in the corrected numbers. Not only was the increase during the first half of 1978 much less after correction, the growth rate during the preceding year also looks more reasonable if we correct the numbers by recognizing that temporarily high values for the interest rate differential led to a decline in the demand for money that was not expected to persist. I would claim that the corrected numbers make more sense also for 1977 in view of the pattern of real output in Switzerland during the same period:

	1975	1976	1977	1978	1979	1980
growth rate of real GNP (estimated)	-4.4	-0.1	1.7	1.0	4.1	2.2

Note: Growth rates have been computed among the quarterly averages of the fourth quarter of each year.

The raw data on the growth rates of the money supply show a sharp decline in 1977 followed by the spectacular advance in 1978 and an equally spectacular deceleration in 1979. Since these changes in the growth rate must have been largely unexpected, one would expect a corresponding short-run pattern in the growth rate of real GNP. But, the numbers show that real output did not behave that way. The fluctuations in economic growth correspond better to the pattern of the corrected data on the growth of the money stock, namely, recovery in 1977, a normal year in 1978, acceleration in 1979, and a return to a normal level for the growth rate in 1980.

The fundamental thesis of Büttler and Schiltknecht is confirmed by research into the demand for money in Switzerland: inflationary expectations increased by less than 14 percentage points between 1977 and 1978 because economic agents assumed that temporary factors were responsible. An analysis of the short-term interest rates in Switzerland during this period shows that the differential between a 3-month savings rate and a 3-month time-deposit rate assumed values that could not be maintained in equilibrium. Changes in this interest differential had important, temporary effects on the demand for money in Switzerland. Correction for these short-run shifts in the demand for money results in a new time series for monetary growth in which the acceleration between 1977 and 1978 is half as large as it is in the raw data.

One can agree with the central thesis of the Büttler/Schiltknecht paper that the Swiss National Bank could afford to let the monetary base and the money supply accelerate without having to fear that each percentage point increase in these growth rates would be translated into a corresponding increase in the expected rate of inflation. The authors explain this by postulating that monetary growth became so uncertain that agents would not dare to extrapolate extravagant current rates of increase into the future. Their hypothesis must be part of the answer, but – as discussed above -- it is insufficient by itself. For, if the growth rate of the money supply jumps around more than before but remains a random walk, then the optimal forecast of the future growth rate is still the last observed growth rate. Careful investigations by Wasserfallen (1981, a, b) do not produce evidence that the time series model for the Swiss money supply ($M1$) or the Swiss monetary base changed during the years under review. The absolute size of the steps that compose the random walk for the growth rate certainly did increase during the seventies, but the evidence is lacking for the necessary additional hypothesis that the growth rate also became less of a random walk.

A more complete answer to the puzzle could incorporate the following elements:

(1) Economic agents realized well before 1978 that the growth rates of the Swiss money supply and monetary base were not pure random walks, so that a one-percentage-point increase in these growth rates would not translate into a one-percentage-point increase in the expected future growth rate. This claim can be substantiated by our research which shows that in 1973 the parameter in the adaptive-expectations model was smaller in Switzerland than in any of the other six countries in our sample, including Germany and the United States, (see Bomhoff, 1983, for details).

(2) Important changes occurred in the demand for Swiss monetary assets that were either accommodated by the monetary authorities, or induced endogenous changes in the money stock for a given path of the monetary base. Many of these shifts in the demand for money may well have been caused by changes in the foreign demand for Swiss monetary assets.

(3) Correction for the effects of such temporary shifts in the demand for money on the published money stock data leaves us with a time series that fluctuates considerably less than the original data.

Our regressions remove about one-third of the quarter-to-quarter variation in the income velocity of Swiss $M1$.

(4) Even after correction for these temporary factors, much variation remained in the time series for the Swiss money growth. However, unforeseen large increases or decreases in the Swiss money supply were regarded predominantly as relevant for the Swiss price level rather than for the Swiss rate of inflation. This statement is based on our Kalman filter analysis of the time series data on the Swiss money supply which shows that throughout the seventies "outlier" shocks to the Swiss money supply were considered to have no permanent implications for its *growth rate* but for its *level* only.

(5) Forecasts of future inflation do not have to be based on data about the growth of the money stock. One alternative is to predict inflation on the basis of past rates of price change. According to our computations, rational agents in Switzerland reduced the weight on expected money growth and increased the importance of past inflation when forming their inflationary expectations during the 1970s.

Taken together, these five points say something about monetary management in a small open economy where the money stock pattern over time resulted from a combination of:

(a) Deliberate Central Bank actions such as those undertaken in a closed economy: what rate of money growth corresponds to long-run inflation and short-run output objectives?

(b) Various forms of currency substitution and other foreign-induced shifts in the demand for Swiss monetary assets.

(c) Endogenous reactions to (a) and (b) by the Swiss banks and the public.

The Büttler/Schiltknecht paper is valuable for explaining why the banks and the public must infer whether current changes in money growth are transitory or permanent. The authors contribute also to the comparative analysis of monetary systems by stressing that during the 1970s a one-percentage-point increase in the growth rate of the Swiss money supply was less ominous for inflationary expectations than a similar increase in the United States. Whereas their original statistical investigation of the proper classification of monetary events takes us into largely uncharted waters and may therefore be rather tentative, the exceptional effort by these two Central Bank officials to develop systematic insights from their Bank's experience deserves to be applauded for the stimulating insights it has to offer.

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