MONETARY TARGETING IN WEST GERMANY, HOLLAND, AND SWITZERLAND

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Links between fluctuations in domestic money supplies and subsequent fluctuations in rates of real output have been less visible in Western Europe than in the United States. This paper discusses some of the causes and investigates the stability of the demand for money in West Germany, the Netherlands and Switzerland. In all three countries, temporary changes in short-term interest rates temporarily affect the demand for money. These temporary changes in the demand for money are reflected in temporary blips in the monetary statistics, as agents substitute among various monetary assets.

The hypothesis that aggregate demand responds only to longer-lasting changes in interest rates is tested by a two-step procedure. First, the official data on European money supplies are corrected for temporary disturbances caused by temporary changes in domestic interest rates. Second, changes in real activity are regressed on a measure of monetary stimulus, which takes into account the correction for temporary disturbances. This two-step procedure avoids some of the bias present in ordinary estimates of the demand-for-money function. The results show that the links between changes in money and subsequent changes in output are somewhat more tenuous in West Germany, the Netherlands, and Switzerland than in the U.S. but significant effects do exist. These effects are more easily documented when corrected time series for the European money supplies are used.

I. INTRODUCTION

Central bank watching is much more prominent in the United States than in Western Europe. The American financial press comments on the weekly M1 numbers, and newsletters publish average forecasts of other newsletters regarding upcoming weekly numbers. Attention paid to monetary statistics in Western Europe is in no way comparable to the keen excitement they generate in the U.S. The lower visibility of monetary statistics in Europe could result from any combination of the following factors: (a) the relevant data are published with more delay in Europe; (b) the data are of

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poorer quality in Europe in that they contain more noise which is irrelevant for computing current and expected underlying rates of monetary growth; (c) the European data contribute less to forecasts of important macroeconomic variables, such as inflation, real output, interest rates, and exchange rates.

This paper presents information on the timeliness, quality, and relevance of monetary statistics in West Germany, Holland, and Switzerland. Section II comments on the raw money-stock data in these three countries. Section III explains why the raw data appear to be less relevant for macroeconomic forecasting than are the M1 numbers in the U.S. Fortunately, a simple method is available to correct the officially published data for temporary shifts that obscure the relationship between money growth and real output, and between sustained money growth and inflation. Section IV describes how the official data may be corrected for these irrelevant temporary disturbances. Evidence on the links between (corrected) money and real output in the three European countries is presented in section V. This evidence shows that unanticipated changes in the rate of money growth exert a statistically significant influence on the growth rate of real output in all three countries, albeit with smaller and not such well determined coefficients as compared to the U.S. Also included in this section are some references to the literature dealing with the links between money growth and inflation in Western Europe. Finally, the paper is concluded in section VI with a brief summary of the main points.

II. QUALITY OF THE DATA

One reason monetary statistics generate less excitement in Western Europe than in the U.S. is the greater publication lag. To collect and process raw data from banks takes approximately a month and a half in West Germany and Switzerland, and approximately two months in Holland. Such delays make the monetary statistics much less relevant for forecasting short-term movements in domestic interest rates. More important signals regarding current interest-rate trends originate in the foreign exchange markets—particularly in Holland and West Germany, which maintain fixed rates with their European Monetary System partners. European monetary statistics are interesting primarily for their macroeconomic implications for future trends in inflation and for shorter-term movements in the rate of real output.

Not only do European central banks require more time to collect monetary statistics from their banks, but the data eventually published are of poorer quality than those in the U.S. Monetary statistics in Europe usually are collected once a month, and in many countries, the numbers pertain to the last day of the month. Consequently, irrelevant noise in the data, severity of seasonal patterns, and the degree to which seasonal factors change over time substantially affect the statistics. In the U.S., however, averages of weekly or daily estimates are taken for many monetary series.

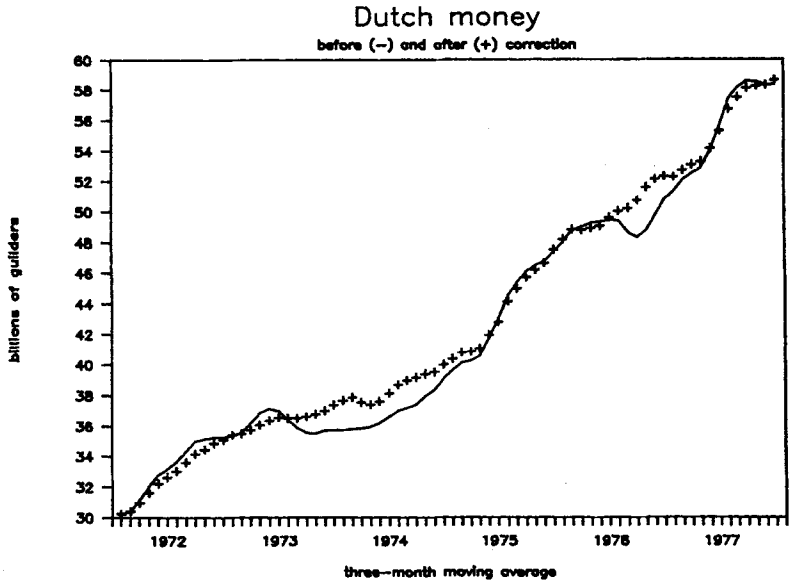
Lower quality of European data is an important reason why links between changes in monetary aggregates and contemporaneous or subsequent changes in real output and inflation are more difficult to substantiate for low-inflation European countries than for the U.S. Brunner and Meltzer's (1978) volume provides interesting evidence in this respect. Specifications similar to those of Barro's (1977) paper, which dealt with the U.S., are applied to European data. The results offer support for a simple monetarist framework, but the statistical significance of the equations is lower on average, as compared to the St. Louis model or Barro's empirical work.

III. TEMPORARY DISTORTIONS IN THE MONETARY AGGREGATES

If the only problems with statistics on money growth in West Germany, Holland, and Switzerland were irrelevant noise and seasonal factors, then analyses of the effects of money on real output and prices would be similar to—though perhaps less rewarding than—monetarist analyses for the U.S. The differences go deeper, however. In the U.S., the income velocity of money may be subject to occasional significant shifts due to the introduction of new close substitutes for money. In West Germany, Holland, and Switzerland, the income velocity of the narrow money supply (M1) at times is very sensitive to short-term substitution between demand deposits (included in M1) and savings and time deposits (not included in M1). The relevant margin of substitution here is from demand deposits and savings deposits (which carry a zero or a rather inflexible positive interest rate) to and from time deposits (which offer a market-determined, flexible interest rate). Section IV discusses how increases or decreases in the differential between the interest rate on time deposits and the interest rate on savings deposits induce short-term substitution effects. Before explaining how we should correct the M1 statistics for these temporary distortions, some indication of the magnitude of this effect is in order.

Figure 1 shows the end-of-month numbers for the Dutch money supply (M1) before and after correction for temporary shifts in and out of time deposits. The original data give a distorted image of the underlying growth rate of the money stock. The corrected data make more sense if one expects short-term accelerations and decelerations in money stock growth to appear in real output movements and longer-term trends to appear in the inflation rate. For example, when the rapid growth in the official measure of the money stock during 1975 was abruptly terminated in 1976 (with even an absolute decline in the money supply between the second and third quarters of 1976), there was no discernible effect on industrial production in 1976. Similarly, an abrupt change in the growth rate of the published money series occurred in the third quarter of 1977, when the average annual growth rate decelerated from more than 20 percent to a little more than 3 percent, according to the Federal Reserve Bank of St. Louis. However, the index for industrial production already had declined before this

FIGURE 1



break in the growth rate of the money supply, and it remained stable throughout the winter of 1977–1978. Real GNP in Holland increased each quarter between 1977-IV and 1978-IV. There also are opposite examples of periods during which industrial production and real GNP in Holland exhibited sharp movements without prior acceleration or deceleration in the money supply. Of course, economic activity can change for many reasons. Monetary theory has never proclaimed that sharp changes in the money supply are a necessary condition for changes in output. The monetarist claim is confined to the observation that sharp movements in the money supply often are sufficient to cause subsequent swings in real activity.

The loose, and at times even contradictory, relationship between fluctuations in money and fluctuations in real output in these European economies suggests that important short-term fluctuations may occur in their income velocity of money. Research into the determinants of the demand for money would be the obvious way in which to illuminate this issue. In this paper, however, I propose a slightly different method to achieve the same result. This method for correcting the raw data on European money supplies takes into account short-term fluctuations in velocity which are of no interest in the analysis of monetary effects on output and inflation. Statistical arguments for correcting the money supply data rather than estimating demand-for-money relationships are presented in the next section.

A strong practical argument for correcting the money-supply numbers is that market participants and monetary authorities wish to interpret the evolution of money supplies. Correcting the raw published data on the money stock provides the most natural way of reinterpreting the current data to assess whether monetary policy has been too restrictive or too expansionary. Recall that in the U.S., effects on the demand for money resulting from rapidly introducing close substitutes for M1 in the early 1980s also were translated into a series of corrections to the money stock data to obtain a convenient framework for analyzing monetary policy.

IV. CORRECTING FOR TEMPORARY CHANGES IN VELOCITY

In the U.S., both short-term and long-term interest rates are assumed to behave not too differently from pure random walks (see Nelson and Plosser 1982 on the statistical methodology of testing whether a given time series is a realization of a random walk process). Sound theoretical reasons exist for assuming that changes in forward rates are approximately serially uncorrelated. This implies that long interest rates also will behave similarly to random walks under several hypotheses regarding the term structure. If interest rates behave as pure random walks, then all observed changes would be considered permanent, and it would make no sense to speak about temporary deviations from a "normal" level. In European countries, short-term interest rate differentials with neighboring countries do not always behave as pure random walks. In the Dutch case, the three-month interest rate differential vis-a-vis West Germany exhibits spectacular short-term movements when the guilder/D-mark exchange rate is under pressure. Changes in perceptions about the likelihood of an imminent devaluation of the guilder affect this interest rate differential (measured as the forward premium in the foreign exchange market). If West German short-term Euro-rates and domestic rates are not similarly affected, the result is that market-determined short-term interest rates in Holland behave similarly to the forward premium. They experience sharp upward moves of a temporary character that are reversed when the guilder has indeed been devalued or when the fears of a forthcoming exchange rate adjustment have subsided. Switzerland has not participated in the European Monetary System. However, the Swiss authorities do consider exchange rate movements, particularly changes in the Swiss franc/D-mark rate, when executing their monetary policy.

If significant changes in short-term interest rates are considered to be of a predominantly temporary nature, then the demand for money will change. However, it is reasonable to assume that the rate of real output and the national price level will not be appreciably affected by such temporary disturbances in the money market. Equilibrium in the money market thus requires that the measured stock of money changes temporarily as holders substitute time deposits for demand deposits in the case of a sudden temporary increase in short-term interest rates. This short-term deviation of the

money stock from its long-term path causes a corresponding and opposite short-term temporary change in the income velocity of money.

Table 1 shows how one may estimate the magnitude of such shifts in velocity. The dependent variable is defined as the first difference of the nominal money supply divided by a smoothed estimate of the rate of nominal national income for the same quarter. Therefore, this variable can be regarded as an index for the reciprocal of velocity after correction for purely temporary noise in the income series.

The substitution of a smoothed estimate of nominal income for its actual quarterly values serves to eliminate one of the major sources of simultaneous-equations bias in ordinary estimates of the demand for money. If actual values for national income, Y, are used, any common shocks to both income and interest rates cause simultaneous-equations bias in the estimated coefficients. The two-step procedure executed here avoids at least some of the simultaneous-equations bias. I estimate the effects of changes in interest rate differentials on a smoothed estimate of velocity, correct the money-supply data accordingly, and then regress changes in real output on a measure of monetary stimulus. The money supply and the current price level are assumed to be predetermined with respect to the current rate of real output (see section V below).

The first step consists of a regression of the first difference of the inverted smoothed estimate of the income velocity of money on a constant, plus the current and last quarter's value of the change in differential between two three-month domestic interest rates—a market-determined rate, i_t, which is assumed to adjust freely to changing conditions in the financial markets, and an administered rate, i_s, on three-month savings deposits. i_t also may be regarded as an estimate of the sum of a relevant foreign interest rate plus the expected rate of depreciation of the domestic currency (see Vaubel 1980, which discusses much the same phenomena and includes an analysis in terms of distinguishable demand functions for domestic and foreign holders of domestic money). I assume that the normal value for the differential between these two interest rates $(i_t - i_s)$ is constant and that any changes are due predominantly to temporary factors. If i_t rose far above i_s, time deposits would increase temporarily at the expense of savings and demand deposits, and the narrowly defined money stock would decrease. Once the interest rate differential returned to a normal value, substitution effects in the opposite direction would nullify the initial disturbance in the demand for money. To account for this occurrence, the effects on the money stock resulting from changes in the interest rate differential are removed if one assumes that the normal value for the interest rate differential is constant or changes little over time. Fase (1977) was the first to use this interest rate differential to improve monetary statistics in the Netherlands (see also Bomhoff 1980). Fase focused on the effects of changes in the interest rate differential for time deposits and savings deposits, whereas this paper focuses on the effects for the narrowly defined money

TABLE 1

Temporary Changes in the Income Velocity of Money Resulting from Temporary Changes in Interest Rate Differentials

(Period of Analysis: 1965-III to 1982-II)

West Germany:	$\Delta(M/Y^e)$	=	.008	−	$.052\,\Delta(i_t-i_s)$	−	$.131\,\Delta(i_t-i_s)_{-1}$
			(.030)		(.040)		(.041)
	$R^2 = .19$		$\sigma_u = .25$		$DW = 1.6$		
Holland:	$\Delta(M/Y^e)$	= −	.052	−	$.146\,\Delta(i_t-i_s)$	−	$.091\,\Delta(i_t-i_s)_{-1}$
			(.049)		(.031)		(.031)
	$R^2 = .33$		$\sigma_u = .40$		$DW = 2.0$		
Switzerland:	$\Delta(M/Y^e)$	= −	.072	−	$.437\,\Delta(i_t-i_s)$	−	$.525\,\Delta(i_t-i_s)_{-1}$
			(.12)		(.14)		(.16)
	$R^2 = .33$		$\sigma_u = .97$		$DW = 2.1$		

M = nominal money supply.
Y_e = smoothed estimate of nominal income.
i_t = market-determined interest rate, which also may be regarded as an estimate of the sum of a relevant foreign interest rate plus the expected rate of depreciation of the domestic currency.
i_s = an administered interest rate on three-month savings deposits.
The dependent variable M/Y^e (which is the reciprocal of income velocity) has been multiplied by 100. All interest rates are percentages (e.g., 5, not 0.05).
R^2 = coefficient of determination after correction for degrees of freedom.
σ_u = standard error of estimate.
DW = Durbin-Watson coefficient for first-order serial correlation.

supply. Separate investigation of currency and demand deposits (not reported here) shows that higher interest rates on three-month time deposits have statistically insignificant negative effects on holdings of currency, but that they have very significant negative effects on demand deposits.

Temporary changes in the interest rate spread supposedly result from changing expectations about devaluation in the foreign exchange market that affect market-determined interest rates but leave administered interest rates unaffected (unless the changing expectations last a long time). Therefore, an obvious alternative to correlating money demand and changes in the interest rate differential is to investigate directly the effects of changes in the forward premium on the demand for money. In the Dutch and Swiss cases, forward premiums are indeed significantly related to the demand for money. In the case of West Germany, the interest rate differential is much more useful as an explanatory variable than is the dollar/D-mark forward premium.

Multiplying both sides of the above suggested specification by the expected level of nominal Gross Domestic Product gives equations that provide a partial explanation for the quarterly changes in the money stock. The observed quarterly change in the money stock minus that part of the observed change explained by the current or one-quarter-lagged change in

the interest rate differential yields the corrected change in M1.

Figure 1 shows that the corrections for the Netherlands are far from trivial.[1] Growth rates over six-month or annual periods are often substantially different after correction. For example, the temporary dip in 1976 has disappeared along with the absolute decline during the third quarter of 1973. The graph of the corrected series not only is smoother, but it also is much more relevant for the analysis of economic growth in the Netherlands.

The growth rate of the money supply accelerates somewhat in the second half of 1974. Recovery in industrial production starts during the second half of 1975, and is slightly more vigorous than in West Germany (but not significantly so). If the trend growth rate of the Dutch money supply had indeed been perceived to accelerate as sharply as the original series in figure 1, then the difference between the growth rates of industrial production in Holland and West Germany should have been larger. Also, inflationary expectations would have gone up sharply in Holland, and the guilder would have lost more ground vis-a-vis the D-mark.

Dutch monetary policy turned more restrictive during the winter of 1976–1977 to reduce the inflation differential with West Germany and to protect the value of the guilder. This change in monetary policy is not at all visible in the original series, in which the trend changes in the third quarter of 1977. The figures on industrial production confirm that monetary policy became tighter in early 1977. Between 1977–I and 1978–IV, industrial production rose by 1.4 percent in Holland, but by 3.8 percent in West Germany. The corrected data also are more in line with the pattern of Dutch inflation over time. The short period of time covered in figure 1 makes it impossible to illustrate this with reference to the graphs. However, a statistical analysis performed elsewhere (Bomhoff 1980) provides evidence that the corrected data on monetary growth in Holland are more closely related to subsequent Dutch inflation rates than are the rough numbers.

It is of interest to illustrate the same point for the case of Switzerland, where the behavior of M1 during the second half of the 1970s has been much discussed. Annual growth rates of Swiss M1 before and after correction are shown in table 2.

The Swiss monetary authorities allowed sharp accelerations in the monetary base and the money supply in 1978. However, monetary policy in the mid 1970s had been carried out in accordance with a strong dislike of the (imported) inflation during the terminal years of the fixed exchange rate period. The Swiss Nationalbank's purpose was to avoid further strengthening of the Swiss franc in foreign exchange markets at a time of increasing disenchantment with the U.S. dollar. To achieve this, the bank made the

1. The "+ + +" line in figure 1 is based on a similar regression performed with monthly data.

TABLE 2
Annual Growth Rates of Swiss M1
(1975 to 1979)

	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 between the quarterly averages of the fourth quarters of each year.

franc less scarce. This created two puzzles for observers of the Swiss economy: (1) How could growth in the money supply accelerate so much without great consequences for the inflation rate? (2) If real balances became much more plentiful, why did Switzerland not achieve spectacular rates of economic growth in 1978–1979?

Comparison of the raw and corrected figures sheds some light on both questions. First, the extent of the acceleration between 1977 and 1978 is halved if we go from the raw data to the corrected 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) compared to a 17 percent increase in the corrected numbers. Also, the growth rate during the preceding year looks more reasonable if the numbers are corrected by taking into account that temporarily high values for the interest rate differential led to a decline in the demand for money which was not expected to persist. It could be argued that the corrected numbers also make more sense for 1977 in view of the pattern of real output in Switzerland during the same period, as indicated in table 3.

Raw data on the growth rate of the money supply show a sharp decline in 1977, followed by a spectacular advance in 1978 and an equally spectacular deceleration in 1979. Since these changes in the growth rate must have been unexpected, one would expect to find a corresponding short-run pattern in the growth rate of real GNP. However, the numbers show that real output did not behave that way. Rather, the fluctuations in economic growth correspond more closely to the pattern of the corrected data on

TABLE 3
Estimated Growth Rates in Real Output in Switzerland
(1975 to 1980)

	1975	1976	1977	1978	1979	1980
Growth rate of real GNP	−4.4	−0.1	1.7	1.0	4.1	2.2

Note: Growth rates have been computed between the quarterly averages of the fourth quarters of each year.

growth of the money stock (i.e., recovery in 1977, a normal year in 1978, acceleration in 1979, and a return to a normal level for the growth rate in 1980). Formal analysis confirms that correction for temporary disturbances makes the resulting numbers on European money supplies smoother and thus easier to interpret for business-cycle analysis.

V. DOMESTIC MONETARY INFLUENCES ON THE EUROPEAN BUSINESS CYCLE

The regression equations in table 4 show to what extent a stimulative or restrictive monetary policy temporarily can influence the pace of economic growth. At the same time, the table conveys some information about the relative usefulness of original versus corrected data on the money stock in predicting the business cycle. The aim of the regressions has not been to achieve the richest possible specification for each of the four countries, but to provide some simple evidence regarding the potency of monetary actions in influencing the real sector. Identical regressions were run for the three European countries and the U.S. The quarter-to-quarter growth rate of real gross domestic product was regressed on a constant term, a linear time trend, the previous quarter's rate of economic growth, and the amount by

TABLE 4
Monetary Effects on Real Output
(Period of Analysis: 1967-I to 1982-II)

United States:	$\hat{y} = 3.19$	$- 0.11T$	$+ .591(\hat{M/P})^e$	$- .014\hat{y}_{-1}$		
	(1.2)	(.026)	(.13)	(.13)		
	$R^2 = .30$	$\sigma_u = 3.65$		$h = 0.25$		
West Germany:	$\hat{y} = 4.85$	$- .063T$	$+ .288(\hat{M/P})^e$	$- .080\hat{y}_{-1}$		
	(1.5)	(.031)	(.077)	(.11)		
	$R^2 = .24(.11)$	$\sigma_u = 4.26$		$h = -0.66$		
Netherlands:	$\hat{y} = 9.71$	$- 0.153T$	$+ .294(\hat{M/P})^e$	$- .432\hat{y}_{-1}$		
	(2.5)	(.056)	(.12)	(.11)		
	$R^2 = .26(.19)$	$\sigma_u = 7.41$		$h = -1.16$		
Switzerland:	$\hat{y} = 2.65$	$- .035T$	$+ .164(\hat{M/P})^e$	$+ .272\hat{y}_{-1}$		
	(1.4)	(.031)	(.067)	(.12)		
	$R^2 = .22(.15)$	$\sigma_u = 4.23$		$h = -0.86$		

$\hat{y}$ = growth rate of real output.
$(\hat{M/P})^e$ = logarithmic growth rate of smoothed real balances (see text).
T = linear time trend that increases by 1 each quarter. It picks up long-term changes in the income velocity of money.
R^2 = coefficient of determination after correction for degrees of freedom (and, in parentheses, before correction for temporary disturbances).
σ_u = standard error of estimate.
h = Durbin's h-statistic for first-order serial correlation in the presence of the lagged dependent variable.
$\hat{}$ = represents a growth rate.

Estimated standard errors are in parentheses below each coefficient.

which real balances increase or decrease. As noted above, I assume that money and prices are predetermined with respect to real output in the same quarter. If the nominal money supply increases faster than the aggregate price level, so that real money balances become more plentiful, agents start to bid up the prices of financial and real assets. Combined with more direct effects of higher wealth on spending, this boosts production. Conversely, if the growth rate of the money supply falls below the inflation rate, actual money balances drop below the desired level, causing consumers and business firms to cut back on their planned expenditures.

The definition of this term $(M/P)^e$ is as follows: A Multi-State Kalman Filter was used to discover the "underlying" or "basic" levels of the series for the logarithms of money and prices. The filter eliminates purely temporary distortions from the data. Subsequently, a moving average was computed for both the money supply, M, and the aggregate price level, P, in which the current and previous two values are combined. Obviously, the weights are the same for M and P in each country, but they differ between the various countries and were chosen to optimize the fit of the equation. In all cases, the weights decrease linearly, implying that only one free parameter describes the lag structure. The coefficients in table 4 refer to the first difference of this weighted average of current and lagged underlying levels of log (M) minus log (P).

Shown are the regressions based on the corrected money stocks. The numbers in brackets directly after the coefficients of determination for these regressions show the coefficients of determination for the identical specification when run with the uncorrected money data. For comparison, the same specification also was applied to the U.S. Correcting the money numbers produces a higher value for the coefficient of determination and a more significant value for the coefficient of the weighted change in real balances.

The model estimated aims for simplicity and a uniform specification across countries. Many potential explanatory variables that were omitted surely influence the size and statistical significance of the few determinants of economic growth that were included. The regressions do illustrate, however, that no desparate data mining is required to show that money matters. The simplest possible specification for testing whether changes in real balances can help predict real growth—when the information hidden in past rates of growth is taken into account—shows that money matters significantly (.05 level) in all four countries and has the correct sign everywhere.

The relationship between sustained money growth and subsequent inflation can be illustrated with combined time-series and cross-section data, but requires either very low frequency data (for example, annual data or one or two observations for each business cycle) or specifications adapted to the peculiarities of each country. The Brunner and Meltzer (1978) volume contains papers on West Germany and Holland (see also

Bomhoff 1982). Wasserfallen (1981) and Buttler and Schiltknecht (1983) provide evidence for the Swiss economy.

The most important difference between Western European countries and the U.S. regarding the relationship between money growth and subsequent inflation is the international effects on domestic inflation. Commodity price indices measured in dollars are not exogenous with respect to U.S. money growth. Also, changes in the real effective exchange rate of the dollar have consequences for the pressure of demand in the U.S. economy, but much less so than in the more open economies of Europe. Furthermore, U.S. monetary policy is not constrained by supranational agreements to maintain a fixed nominal exchange rate vis-a-vis one or more foreign currencies.

In the case of the smaller, more open economies of Western Europe, it is not inappropriate to consider changes in commodity prices as exogenous with respect to domestic monetary policy, and changes in international competitiveness have significant consequences for the pressure of demand in the domestic economy. Also, many European countries participate in exchange rate arrangements, so that the growth of their domestic monetary base is constrained by the implementation of an exchange rate target. As a consequence of these differences between the U.S. and Western Europe, reduced forms for domestic inflation differ primarily with respect to the treatment of foreign influences on the domestic rate of price change. The studies cited above, as well as work by Den Butter and Fase (1981) on the demand for money in the European Economic Community, show that money growth is important in explaining subsequent inflation and that stable demand for money equations can be identified.

VI. CONCLUSIONS

A greater emphasis on monetary aggregates and the public's interest in the degree to which monetary authorities hit pre-announced targets for the growth rates of selected monetary aggregates have fostered a better understanding of the proper role of monetary policy. Also, awareness has grown that central banks are capable of regulating the growth rates of the monetary base and the money stock, but that they are unable to regulate real interest rates.

Thus, the public debate on economic policy suffers less from money illusion than before. Real problems, such as a very high natural rate of unemployment and insufficient flexibility in the labor and housing markets, are discussed more in terms of their real causes. Inflating nominal demand is less popular as a panacea for real ills than it was in earlier years. Discussion of Friedmanite rules has at least produced more clarity about what monetary policy can and cannot achieve.

Whether monetary targeting also has increased the credibility of monetary authorities remains an unsettled issue. The Swiss experience in the late 1970s (Buttler and Schiltknecht 1983, Bomhoff 1983) suggests that the pub-

lic is more impressed by evidence that monetary authorities are prepared to suffer a large temporary increase in unemployment to combat inflation than by evidence that authorities manage to hit pre-announced targets for the growth rate of the money supply. The Swiss Nationalbank, for example, could afford to miss its 1978 target by an enormous margin without destroying much of its "credibility capital." Long-term interest rates in Switzerland did not increase much until the second oil crisis of 1979-1980, and they actually fell during most of 1978 when the Swiss money supply was surging.

In this paper, I have presented some evidence that the path of the money supply matters for the aggregate economies of West Germany, Holland, and Switzerland for the same reasons that it matters in the U.S. That is, abrupt changes in the growth rate of money which last more than a few months may have important temporary influences on real output, and the maintained rate of expansion of the money supply is the major determinant of the domestic inflation rate. The links between money and the price and volume components of national income are less apparent in Europe, however, because the quality of monetary data is poorer and the variability of the income velocity of money is higher. One reason for temporary shifts in velocity is the frequent, temporary shifts between demand deposits and time deposits caused by short-term temporary changes in interest rates. The demand for money reacts to such temporary blips in interest rates, but aggregate demand responds only to longer-lasting changes in interest rates. This paper documented the importance of purging the original monetary statistics of their consequences. Correcting the official numbers on the narrow money supply results in a series which more closely relates it with patterns in the growth rate of real output. Central bank watching will never become as popular in Europe as in the U.S. because Europe's monetary statistics have smaller predictive content at the time they are released. There is no doubt, however, that low and stable rates of money growth can be advocated for the open economies of Western Europe for exactly the same reasons they have been advocated in the U.S.

DATA APPENDIX

Official sources of the current monetary statistics are as follows: West Germany—Monatsberichte der Deutschen Bundesbank, obtainable free from the Deutsche Bundesbank, Frankfurt am Main, Wilhelm-Epstein-Strasse 14, Postfach 2633, 6000 Frankfurt am Main 1; the Netherlands—"Oorzaken van de veranderingen in de liquiditeitenmassa," a monthly sheet obtainable free from De Nederlandsche Bank N.V. afd. Secretarie, Postbus 98, 1000 AB Amsterdam; Switzerland—Schweizerische Nationalbank, Monatsberichte, available by subscription (Swiss francs 42 per year) from Orell Fussli Graphische Betriebe A.G. 8036 Zurich 3. The publication lag is approximately one-and-a-half months for West Germany and Switzerland and approximately two months for Holland. Until recently, the Dutch monetary statistics were published with a lag of some three to four months, but this situation has been remedied somewhat. The Dutch Central Bank publishes its figures on the narrow and broad money stock with and without seasonal adjustment. The West German and Swiss National Banks

tend to provide estimates of growth rates after seasonal adjustment in the texts of their monthly reports, but publish their statistical tables without seasonal adjustment.

The International Monetary Fund (IMF) publishes many monetary statistics for each country in its monthly publication *International Financial Statistics*, together with its own seasonal adjustment for the narrow money supply, M1. The IMF publication also contains a comparative table that shows growth rates for the money supply over a 12-month period in different countries. Such growth rates over a 12-month period also are reported in the *Economist*. This British weekly gives growth rates over a three-month period as well, but these are based on data that have not been adjusted for seasonal variation in all countries.

An attractive source for quarterly averages is the Federal Reserve Bank of St. Louis. Its quarterly publication presents graphs for M1 in the three countries under review. Moreover, quarterly averages are presented for central bank money (West Germany), M2 (Netherlands), and the monetary base (Switzerland).

Since 1982, the IMF has published a section on "Monetary Developments in Major Industrial Countries" in its annual *World Economic Outlook*. West Germany is a major industrial country; Holland and Switzerland are not. The OECD publishes a regular section on fiscal and monetary policy in its semi-annual *Economic Outlook*. This section provides information on targets and outcomes in the larger OECD countries. The country notes on Switzerland provide information on the target for Swiss central bank money.

Finally, the Bank for International Settlements gives a table on "Monetary and Credit Aggregates: Objectives and Rates of Expansion," as well as graphs and explanatory notes, in its annual report.

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