On the Effects of Disinflationary Policies on Unemployment and Inflation: A Simulation Study With-Keynesian and Monetarist Models for Austria*

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This paper is concerned with an empirical study of very simple Keynesian and Monetarist models of unemployment and inflation, which are estimated with Austrian data. We compare these models with respect to their ability of tracking historical values of the rate of unemployment and the rate of inflation. Some simulation experiments with disinflationary policies during the seventies are performed in order to assess the impact of such policies on unemployment and inflation. In particular, we study the consequences of a constant money supply growth rule within these models and compare the respective benefits and costs of this policy rule with the results of actual stabilization policies in Austria.

1. "Austro-Keynesianism" Amidst the Monetarist Counter Revolution

Since *Milton Friedman's* (1968) presidential address an increasing number of Monetarist propositions have been accepted by mainstream macroeconomic theory and have exerted also considerable influence upon stabilization policies in several countries. Although by no means universally accepted, the Monetarist paradigm (including New Classical Macroeconomics) now can be regarded as at least as influential as the Keynesian one, both with respect to macroeconomic theorizing and to the conduct of monetary and fiscal policies. However, it is remarkable that these developments have left nearly no visible marks on economic theory and policy in Austria. In fact, from an international perspective Austria could be regarded as one of the last bastions of Keynesianism, both with respect to the policies pursued so far and with respect to the views most economists in this country hold. A recent survey among Austrian economists,[1] for example, has shown significant

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[1] *Pommerehne* et al. (1983).

differences for responses to Keynesian propositions on stimulative effects of countercyclical fiscal policy, on the importance of money supply versus interest rates as targets for monetary policy, and on planning of macroeconomic aggregates, as compared with the answers of economists in Germany and Switzerland to the same questions. Have Austrian economists stubbornly failed to acknowledge the Monetarist message, or are there good reasons for their reluctance to Monetarist recipes?

Unfortunately, despite of the increasing influence of Monetarism the theoretical debate about Keynesian versus Monetarist macroeconomic theory has remained largely inconclusive so far.[2] It might therefore be instructive to look at the empirical evidence for particular countries to decide whether accepting elements of Monetarist theories and policy prescriptions could possibly be useful for them. Since unemployment and inflation are the most important phenomena both from the point of view of economic policy and within the theoretical debate, we concentrate on them in this paper. A first glance at the development of the

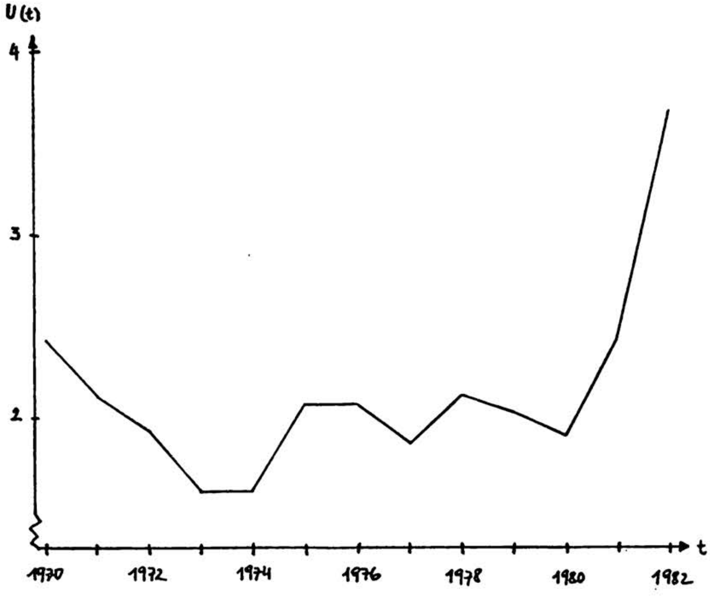
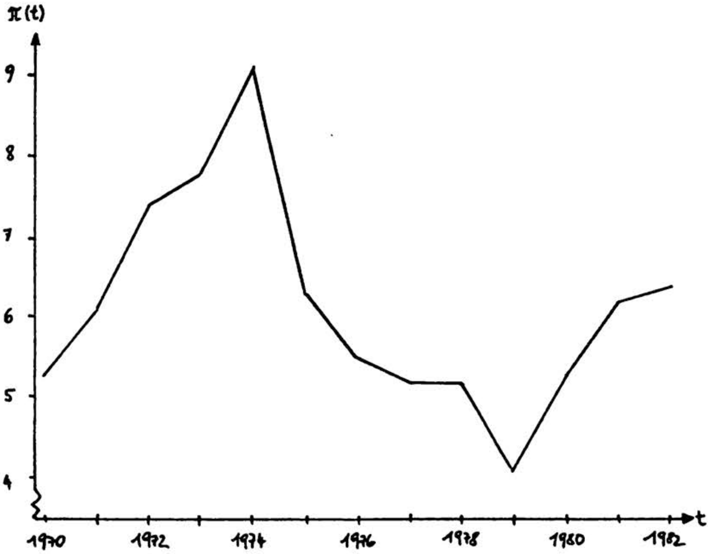


Figure 1: Rate of Unemployment, 1970 - 1982

[2] There is even considerable disagreement about the theoretical foundations of Monetarism itself, e. g. whether it is based generally on a Walrasian general equilibrium framework, *Hahn* (1980), or (at least in some versions) on Marshallian period analysis, *Hoover* (1984).



Source: **WIFO data bank.**

Figure 2: Rate of Inflation (GDP deflator % change), 1970 - 1982

rate of unemployment and the rate of inflation in Austria since 1970 should give a preliminary impression of the records this country has achieved with respect to the two main targets of stabilization policy.

As comparisons using standardized values of the unemployment rate and the GDP deflator inflation rate (measuring domestically originating inflation) show, the Austrian rate of unemployment has always been among the lowest in the OECD area, and also the rate of inflation has been below that of most OECD countries.[3] Austrian economists usually interpret these developments within a Keynesian framework: Domestic inflation is regarded to be caused mainly by unit labor costs and other cost-push developments; unemployment is considered to be caused mainly by labor demand changes and hence, apart from structural shifts, by developments of aggregate demand, particularly of exports and fiscal policy.[4] The "common wisdom" in Austria makes Key-

[3] See the annual OECD Economic Survey: Austria for details on these data. Also the growth of real *GDP* has been above OECD average during the period considered here.

[4] More detailed interpretations can be found in every year's issue no. 3 of the Monatsberichte des Österreichischen Instituts für Wirtschaftsforschung, concerning the overall development of the Austrian economy in the previous year. These sources should be consulted also for qualifications about the data (for instance, there are several breaks in the time series of the rate of unemployment due to slightly different definitions of this variable).

nesian stabilization policies responsible for the relatively favorable performance of the Austrian economy with respect to unemployment and inflation; even the term "Austro-Keynesianism" has been coined for these policies. Although recent interpretations of Austrian economic policy[5] stress the importance of long-run stabilization of private expectations instead of "stop-and-go" policies as essential basis for the success of "Austro-Keynesianism", there seems to be no serious dispute about the importance of demand-management within this conception, which is crucial to Keynesian theory. Monetarist policy prescription, like Friedman's famous constant money supply growth rule, have received virtually no attention in Austria so far.

It is our aim to provide an approach to answering the question whether such a Monetarist policy could have eased the disinflationary process Austria has undergone since the first oil price shock. Of course, it is extremely dangerous to speculate about "what could have happened if ...", since economics is not an experimental science. The answer to that question in any case will be crucially dependent upon the theoretical view one has about the interactions between economic variables, but also on the particular circumstances of the country under consideration. We choose the following methodology here: Our considerations will be based on alternative models, which are estimated with Austrian data by econometric methods and reflect Keynesian and Monetarist views of basic macroeconomic relations, especially between unemployment and inflation. The specification of the models follows international ones as closely as possible in order to link them with contemporary mainstream macroeconomic controversies between the different schools. Furthermore, they shall contain as many common elements as possible to focus on the theoretically interesting differences between them. The models will be compared with respect to their ability to reproduce the developments of the rates of unemployment and of inflation in Austria during the last 25 years. On this basis simulation experiments will be conducted to show for each model the effects of Monetarist disinflationary policy proposals, particularly the constant money growth rule, on the two variables considered.

Of course, the results of simulation studies are heavily dependent on the particular model used; especially they are certainly sensitive to specification and estimation errors. Although by using very small models we will try to minimize specification errors and to preserve the comparability of the models (larger econometric models for Austria are available, but they are all essentially Keynesian), for purposes of interpretation and policy conclusions this necessitates some severe re-

[5] *Tichy* (1983), *Holzmann* and *Winckler* (1983).

strictions which must be borne in mind. In particular, institutional aspects of the Austrian economy are not modelled explicitly,[6] but are reflected only in the data and hence to some extent in the parameter estimates. Thus the specific Austrian voluntary incomes policy, which is closely connected with the unique institution of "social partnership", will not enter our models directly. Still more important is the omission of the openness of the Austrian economy. Since we consider only models of the closed economy, Austria's character as a small open economy is neglected. In particular we exclude all questions concerning the effects of external supply shocks on inflation and unemployment and all aspects of the international transmission of inflation and economic fluctuations. Our procedure can be justified by our interest in the key relations between some domestic variables, but it cannot be denied that for the interpretation of the results of our policy simulations the neglect of foreign influences can raise serious difficulties. For a comprehensive study of Austria's international economic issues, see *Breuss* (1983); also the study of *Wörgötter* (1984) is complementary to ours in this respect.

2. Four Simple Models of Unemployment and Inflation

2.1. General Overview of the Models

Four very simple macroeconometric models are estimated from a common data base (Austrian yearly data, 1954 to 1982) over a common estimation period (1957 to 1982). All data are taken from the data bank of the Austrian Institute of Economic Research (WIFO), with national income data replacing domestic income data where the latter are not available. The following notations will be used for the data variables:

$U(t)$ = rate of unemployment (unemployed persons as % of dependent labor force; $U(t) = \frac{L(t) - N(t)}{L(t)} \cdot 100$)

$p(t)$ = deflator of *GDP* at market prices (1976 = 100)

$\pi(t)$ = rate of inflation (%; $\pi(t) = \ln\left[\frac{p(t)}{p(t-1)}\right] \cdot 100$)

$M1(t)$ = money stock $M1$ (yearly average; Bill. AS)

$M2(t)$ = money stock $M2$ (yearly average; Bill. AS)

$\mu 2(t)$ = growth rate of money $M2$ (%; $\mu 2(t) = \ln\left[\frac{M2(t)}{M2(t-1)}\right] \cdot 100$)

$\pi_m(t)$ = rate of change of deflator of imports of goods and services (%)

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[6] For some evidence on the importance of institutional structures on the success of stabilization policies, see, e. g., *Lipp* (1978).

$pr(t)$ = rate of growth of labor productivity (%; $pr = \left\{ \ln \left[\frac{y(t)}{N(t)} \right] - \ln \left[\frac{y(t-1)}{N(t-1)} \right] \right\} \cdot 100$)

$y(t)$ = real gross domestic product at markets prices (Bill. 1976 AS)

$N(t)$ = employment (1 000 employed persons)

$g(t)$ = real public consumption (Bill. 1976 AS)

$T(t)$ = proportion of total tax revenues (deflated by deflator of public consumption) in real *GDP* at market prices (%)

$R(t)$ = long term bond yield (%)

$R'(t)$ = real rate of interest (%; $R'(t) = R(t) - \pi(t)$)

$L(t)$ = dependent labor force (employed + unemployed; 1 000 persons)

$\pi^*(t)$ = expected rate of inflation (%; defined in section 2.4)

t = time trend ($1956 = 1$)

All calculations are performed with the *STS* program system (*Schleicher* (1980)); for all models, ordinary, two-stages, and three-stages least-squares estimates are calculated.

The models considered are the Monetarist model proposed by *Stein* (1982), two other Monetarist models containing the natural rate of unemployment hypothesis, one being based on the assumption of adaptive inflationary expectations and the other one on that of rational expectations and hence on the New Classical Macroeconomics, and finally a Keynesian model with a long-run Phillips curve trade-off. In contrast to a similar study by *Rea* (1983) for the United States, the models in general don't contain merely equations for the unemployment and the inflation rate, but have different structural properties arising from the interactions of these two variables with other key macroeconomic variables considered to be important in the respective theory. In our view, structural properties are essential for Keynesian versus Monetarist theories, as can be witnessed from the old debate about whether the Classical Dichotomy holds or not. Of course, the empirical specification of each model not only reflects the theoretical background, but also statistical considerations. Compromises between statistical and theoretical criteria cannot always be avoided; when testing our models and exercising simulations with them, particular specifications of general theoretical positions are being considered. Here only brief remarks on the models and the results of the estimations are presented; for more extensive discussions of the theoretical foundations of the models, results of estimations with Austrian data for alternative versions of them, and the choice of the specifications reported here, see *Neck* (1984 a, b).

2.2. Stein's Monetarist Model

First we consider the Monetarist version of a more general macroeconomic model, which has been designed by *Stein* (1982) in order to provide a general framework for an empirical test of Keynesianism, Monetarism, and New Classical Macroeconomics. This model consists of two equations only: The rate of unemployment is explained by its own lagged value and by the lagged growth rate of real balances; the change in the rate of inflation is explained by the lagged growth rate of real balances. There is no functional Phillips curve relation between unemployment and inflation, and the model is a recursive system, because $U(t)$ and $\pi(t)$ do not simultaneously depend on each other. For reasons of statistical significance we choose the growth rate of money $M\,2$ to operationalize the growth rate of real balances. The estimation results for the two equations of Stein's model (called model 1) are given in tables 1 and 2.

In the equation for the first difference of the inflation rate the constant is insignificant and hence suppressed, that is, we estimate an homogenous equation. The fit of this equation is very low, and the same is true for several alternative specifications we have tried; the regression coefficient has the expected sign, but is insignificant. The rate of unemployment, on the other hand, is explained rather well by the respective equation, which implies an equilibrium or "natural"

Table 1

Model 1, Equation for U (t)

Constant and independent variable	Regression coefficient (t-statistic)		
	OLS	2 *SLS*	3 *SLS*
Constant	0.64581 (3.13)	0.64581 (3.33)	0.62783 (3.38)
$U(t-1)$	0.82094 (12.03)	0.82094 (12.79)	0.82289 (13.42)
$\mu\,2(t-1)-\pi(t-1)$	– 0.05819 (3.42)	– 0.05819 (3.64)	– 0.05666 (3.61)
Summary statistic:			
$\bar{R}^2$	0.858		
SE	0.35333	0.33232	0.33247
DW	1.65	1.65	1.63

$\bar{R}^2$ = coefficient of determination adjusted for degrees of freedom (calculated for *OLS* estimation only).
SE = standard error of estimate.
DW = Durbin-Watson coefficient.

Table 2

Model 1, Equation for π (t) — π (t — 1) (determining π (t))

Independent variable	Regression coefficient (t-statistic)		
	OLS	2 *SLS*	3 *SLS*
$\mu 2(t-1) - \pi(t-1)$ ..	0.05409 (1.02)	0.05409 (1.04)	0.05409 (1.04)
Summary statistic:			
$\bar{R}^2$	0.040		
SE	1.47011	1.44156	1.44156
DW	2.63	2.63	2.63

rate of unemployment of 3.6 %; this seems rather high, given Austria data.

2.3. A Keynesian Model

Our Keynesian macroeconomic model (called model 2) corresponds to the traditional IS-LM interpretation of the Keynesian system, which is augmented by a peculiar non-Monetarist mechanism for price formation taking place mainly on the supply side of the economy. Specifically, we follow the approach of wage-price-systems, which has been implemented for Austria by *Wörgötter* (1977) and *Breuss* (1980), among others. Assuming a direct connection between the markets for goods and labor (Okun's law) allows excess demand in both markets to be measured by the same variable, which is approximated by $\frac{1}{U(t)}$. The wage-price-system is solved for the rate of inflation, which then depends on the excess demand variable $\frac{1}{U(t)}$, on productivity growth, and on price changes of factors of production other than labor (especially raw materials); the latter are approximated by the rate of change of the deflator for imports of goods and services. Adding lagged rates of inflation as proxies for inflationary expectations to these variables does not give significant coefficients.

This equation implies a long-run negatively sloped Phillips curve and must be interpreted as a disequilibrium relation. It is very flat, compared with the estimates for the United States, and there exists no finite noninflationary rate of unemployment. Perhaps this may be explained by price and wage rigidities due to both the oligopolistic market structure and the institution of "social partnership" in Austria.

Table 3

Model 2, Equation for π (t)

Constant and independent variable	Regression coefficient (t-statistic)		
	OLS	2 *SLS*	3 *SLS*
Constant	2.68232 (2.48)	2.68232 (2.69)	2.13536 (2.33)
$\frac{1}{U(t)}$	5.79906 (2.29)	5.79906 (2.49)	6.91055 (3.26)
$\pi_m(t)$	0.16895 (2.39)	0.16895 (2.60)	0.14670 (2.73)
$pr(t)$	− 0.27786 (2.16)	− 0.27786 (2.35)	− 0.22278 (2.23)
Summary statistic:			
$\bar{R}^2$	0.652		
SE	1.06471	0.97939	0.98635
DW	1.44	1.44	1.44

For determining the rate of unemployment in a Keynesian system, demand side variables have to be considered. An attempt at estimating directly a reduced form equation for $U(t)$ as explained by Keynesian economic policy variables was not successful, so we connect the rate of unemployment to the demand side of the economy by means of a simple relation between $U(t)$ and real gross domestic product. Although its particular functional form is not easily justified, the relation could be interpreted as an approximation to a production function with potential output growing at a constant rate (estimated to be 3.7 %). The equation exhibits significant first-order serial correlation of the residuals, which themselves, however, are very small.

For the IS curve we estimate directly a reduced form equation for $y(t)$, which is explained by demand side variables. It would be possible to specify more sophisticated models for the product market, but for our purpose the results of the model should be as independent as possible of the particular specification of the demand side of the economy. As explanatory variables we include fiscal policy variables and the real rate of interest, which determines investment. Exogenous variables are assumed to follow a distributed lag pattern, and we use the Koyck transformation for the estimation procedure. Although the coefficients of $g(t)$ and $T(t)$ are not significant when included together (as we do), they become so if applied separately as independent variables with nearly the same magnitude as in the *OLS* regression.

Table 4

Model 2, Equation for ln y (t) (determining U (t))

Constant and independent variable	Regression coefficient (t-statistic)		
	OLS	2 *SLS*	3 *SLS*
Constant	5.88903 (308.11)	5.88903 (327.59)	5.86725 (370.46)
t	0.03715 (67.0)	0.03715 (71.24)	0.03758 (80.87)
ln U (t)	− 0.13684 (10.25)	− 0.13684 (10.90)	− 0.12029 (10.71)
Summary statistic:			
$\overline{R}^2$	0.998		
SE	0.01569	0.01476	0.01525
DW	0.72	0.72	0.58

This is the only equation where three-stages least squares differ markedly from the *OLS* ones, indicating a simultaneity bias. It must be noted that the numerical values of the impact multipliers of all variables seem plausible and roughly accord with those obtained from fully specified demand side models for Austria, but the implied long-term multipliers seem too high, which is partly due to the specification of

Table 5

Model 2, Equation for y (t)

Constant and independent variable	Regression coefficient (t-statistic)		
	OLS	2 *SLS*	3 *SLS*
Constant	88.21762 (1.17)	88.21762 (1.30)	48.75050 (0.88)
y (t − 1)	0.78647 (4.51)	0.78647 (5.02)	0.70660 (5.34)
g (t)	1.11278 (1.01)	1.11278 (1.13)	1.71099 (2.05)
T (t)	− 2.20420 (0.99)	− 2.20420 (1.10)	− 1.17796 (0.73)
R' (t)	− 5.58078 (2.40)	− 5.58078 (2.67)	− 6.34004 (3.72)
Summary statistic:			
$\overline{R}^2$	0.996		
SE	10.80137	9.70738	9.83335
DW	2.32	2.32	2.21

Table 6

Model 2, Equation for ln $\left[\frac{M\,1\,(t)}{p\,(t)} \cdot 100\right]$ (determining R (t))

Constant and independent variable	Regression coefficient (t-statistic)		
	OLS	2 *SLS*	3 *SLS*
Constant	− 0.78176 (3.64)	− 0.78176 (3.87)	− 0.75691 (3.81)
ln $y\,(t)$	0.92166 (20.64)	0.92166 (21.95)	0.91435 (22.52)
$R\,(t)$	− 0.05057 (3.76)	− 0.05057 (4.00)	− 0.04738 (4.00)
Summary statistic:			
$\overline{R}^2$	0.967		
SE	0.04649	0.04372	0.4376
DW	0.75	0.75	0.73

$g\,(t)$ and $R'\,(t)$ as separate independent variables, neglecting possible crowding-out effects of fiscal policy stimuli. Although the interpretation of a reduced form equation as partial equilibrium condition for the product market is not without methodological problems, we use it as representation of a simple Keynesian relation expressing the influence of sufficiently exogenous variables on equilibrium output.

The LM curve is implemented by estimating a conventional Keynesian money demand equation, assuming money supply (operationalized by $M\,1$) to be exogenous. The autocorrelation of this equation is high, but correcting it using the Cochrane-Orcutt procedure gives quite similar coefficient estimates. Again we neglect institutional and foreign influences on the money market, since there is no satisfactory model available for them at the moment.

The complete Keynesian model consists of the equations described in tables 3 - 6 and of identities defining $R'\,(t)$, $\pi\,(t)$ (determining $p\,(t)$), $pr\,(t)$, and $U\,(t)$ (determining $N\,(t)$). The endogenous variables are $R\,(t)$, $R'\,(t)$, $y\,(t)$, $U\,(t)$, $\pi\,(t)$, $p\,(t)$, $pr\,(t)$, and $N\,(t)$, the exogenous variables are $M\,1\,(t)$, $g\,(t)$, $T\,(t)$, $\pi_m\,(t)$, $L\,(t)$, and the time trend t. The model is completely simultaneous reflecting the absence of the Classical Dichotomy as a central element of Keynesian macroeconomic theory: $N\,(t)$, $pr\,(t)$, and $R'\,(t)$ are determined by identities; $R'\,(t)$ together with the exogenous variables determines $y\,(t)$ along the IS curve; aggregate demand $y\,(t)$ determines the unemployment rate; the inflation is explained from the supply side; the price level is determined by an identity and the nominal interest rate from the money market; there are feedbacks of the interest rate to the product market and of real output to the money market and the supply side.

2.4. A New Classical Macroeconomic Model

Following a specification proposed by *Sargent* (1976) we estimate a model of the New Classical Macroeconomics for Austria (model 3), which combines the natural rate of unemployment hypothesis with that of rational inflationary expectations. In this model real variables such as the rate of unemployment, real output, and the rate of interest are exogenous with respect to variables of fiscal and monetary policies; hence the policy ineffectiveness theorem holds for this model, and there is no policy trade-off between unemployment and inflation.

The natural rate of unemployment is defined on a statistical basis by making $U(t)$ dependent upon its own lagged values; in addition, unexpected inflation (inflationary shocks) have an influence on the unemployment rate. Economic agents in period $t-1$ form rational expectations about the inflation rate in period t, given all informations available in period $t-1$; the anticipated inflation rate does not influence the unemployment rate. To implement this concept empirically, an operationalization of the rationally expected rate of inflation is necessary. We follow *Sargent* and use the statistical approach of regressing the inflation rate against all other variables contained in the model. It turns out that only $\pi(t-1)$ and $U(t-1)$ become significant; the corresponding *OLS* regression is:

$$\pi(t) = \underset{(2.64)}{4.64153} + \underset{(2.01)}{0.40699}\, \pi(t-1) - \underset{(1.86)}{0.64533}\, U(t-1)$$

$$\bar{R}^2 = 0.456 \qquad SE = 1.33179 \qquad DW = 2.06$$

What is important here is that the errors of this equation are not serially correlated. The systematic part of the above regression equation is taken as expected rate of inflation $\pi^*(t)$; the unexpected inflation rate is given by $\pi(t) - \pi^*(t)$. Using the latter and lagged values up to the third order as explanatory variables, we get the unemployment rate equation.

Other lag structures for the rate of unemployment are statistically inferior. Unexpected inflation ceteris paribus reduces the unemployment rate slightly in the short run in this model. The natural rate of unemployment implied by this model is approximately 2.5 %.

Table 7

Model 3, Equation for U (t)

Constant and independent variable	Regression coefficient (t-statistic)		
	OLS	2 *SLS*	3 *SLS*
Constant	0.52441 (2.42)	0.52441 (2.69)	0.54597 (2.83)
$U(t-1)$	1.25549 (5.54)	1.25549 (6.17)	1.27075 (6.44)
$U(t-2)$	− 0.71633 (2.56)	− 0.71633 (2.85)	− 0.75587 (3.10)
$U(t-3)$	0.24859 (1.62)	0.24859 (1.81)	0.26468 (1.98)
$\pi(t) - \pi^*(t)$	− 0.09942 (1.68)	− 0.09942 (1.87)	− 0.11301 (2.19)
Summary statistic:			
$\overline{R}^2$	0.840		
SE	0.37481	0.33685	0.33751
DW	1.54	1.54	1.56

A similar procedure is used to model the rate of interest, which in *Sargent*'s theoretical model is determined by a martingale process. In his (and our) empirical implementation it follows an autoregressive process; the important point here is that systematic changes of demand side (especially policy) variables don't influence the rate of interest directly. Statistically, the best lag structure is:

Table 8

Model 3, Equation for R (t)

Constant and independent variable	Regression coefficient (t-statistic)		
	OLS	2 *SLS*	3 *SLS*
Constant	0.60023 (0.68)	0.60023 (0.74)	0.65055 (0.80)
$R(t-1)$	1.39663 (7.74)	1.39663 (8.41)	1.34877 (8.17)
$R(t-2)$	− 0.98444 (3.43)	− 0.98444 (3.73)	− 0.94001 (3.59)
$R(t-2)$	0.52205 (2.65)	0.52205 (2.88)	0.51981 (2.89)
Summary statistic:			
$\overline{R}^2$	0.792		
SE	0.47850	0.44016	0.44098
DW	2.00	2.00	1.92

The complete New Classical model consists of the above equations for $U(t)$ and $R(t)$, identities for $\pi(t)$ and $\pi^*(t)$, the unemployment-output relation from table 4 (3 *SLS* coefficients[7]: for constant: 5.87953 (333.62), for t: 0.03737 (72.54), for $\ln U(t)$: $-$ 0.13020 (10.60), $SE = 0.01484$, $DW = 0.67$), and the portfolio balance condition from table 6 (2 *SLS* coefficients: for constant: $-$ 0.81446 (3.98), for $\ln y(t)$: 0.93185 (21.66), for $R(t)$: $-$ 0.05466 (4.15), $SE = 0.04381$, $DW = 0.78$; 3 *SLS* coefficients: for constant: $-$ 0.73812 (3.66), for $\ln y(t)$: 0.90510 (21.56), for $R(t)$: $-$ 0.04271 (3.39), $SE = 0.04406$, $DW = 0.70$). The latter two equations can be interpreted as elements of consensus between the Keynesian and the New Classical (or generally the Monetarist) view, corresponding to the theoretical debates, which are no longer about the shape of the LM curve as in the early seventies, but instead primarily about the dynamic properties and the existence of a trade-off between unemployment and inflation. The important difference between this model and the Keynesian one is the block recursive structure of the former, reflecting the Classical Dichotomy: The rate of interest is independent of the rest of the system, since it is determined by the equation given in table 8; the same is true of the rate of unemployment, which depends on the rate of inflation only through the innovation term $\pi(t) - \pi^*(t)$. Real output is determined here by the unemployment rate instead of the reverse causation assumed for the Keynesian model. The actual price level and hence the inflation rate are determined here from the LM curve, i.e. essentially by money supply, as it is usually assumed in the Monetarist doctrine. Since real variables are independent of systematic changes in the money supply (and of fiscal policy variables, which do not appear in the model at all), a fixed rule for monetary growth seems to be preferable to a feedback rule of discretionary monetary policy.

2.5. A Monetarist Adaptive Expectations Model

Finally we consider yet another Monetarist model (model 4), which is quite similar to the New Classical model apart from containing a different mechanism for the formation of inflationary expectations, namely adaptive expectations of the form

$$\pi^*(t) - \pi^*(t-1) = \alpha \cdot [\pi(t-1) - \pi^*(t-1)] \ ,$$

where α $(0 \leq \alpha \leq 1)$ is a constant coefficient of adaptation. Similar formulations have been the basis for the original Friedman hypothesis of the short-run negatively sloped, long-run vertical Phillips curve. Combined with the natural rate of unemployment hypothesis, this theory

[7] 2 *SLS* coefficients are only reported where they are different from those in the respective table. Numbers in parentheses are t-statistics.

Table 9

Model 4, Equation for U (t)

Constant and independent variable	Regression coefficient (t-statistic)		
	OLS	2 *SLS*	3 *SLS*
Constant	0.50505 (2.34)	0.50505 (2.61)	0.52113 (2.78)
$U(t-1)$	1.28409 (5.74)	1.28409 (6.38)	1.30428 (6.76)
$U(t-2)$	− 0.67806 (2.43)	− 0.67806 (2.70)	− 0.69723 (2.90)
$U(t-3)$	0.19653 (1.29)	0.19653 (1.43)	0.18832 (1.43)
$\pi(t) - \pi(t-1)$ ..	− 0.08897 (1.77)	− 0.08897 (1.97)	− 0.10482 (2.43)
Summary statistic:			
$\overline{R}^2$	0.843		
SE	0.37224	0.33454	0.33571
DW	1.59	1.59	1.62

states that in the short run ecnomic policy can drive unemployment below the natural rate because of the lagged adaptation of inflationary expectations, whereas in the long run this might only be possible by a permanent acceleration of inflation.

Using lags up to the second order for the natural rate of unemployment hypothesis, we eliminate the unobservable variable $\pi^*(t)$ here by applying the Koyck transformation to the short-run Phillips curve and estimate the resulting reduced form equation for the unemployment rate.

Again the implied short-run Phillips curve is very flat with a slope of about − 0.09. The natural rate of unemployment is again 2.5 % in this model.

Apart from the equation for the rate of unemployment, the adaptive expectations model consists of the same equations as the New Classical model. The simultaneous estimates are as follows: equation for $R(t)$, 3 *SLS* coefficients[7]: for constant: 0.60623 (0.75), for $R(t-1)$: 1.36910 (8.27), for $R(t-2)$: − 0.94588 (3.60), for $R(t-3)$: 0.51067 (2.83), $SE =$ 0.44042, $DW = 1.95$; equation for $\ln y(t)$ (determining $y(t)$), 3 *SLS* coefficients: for constant: 5.87526 (334.98), for t: 0.03747 (73.10), for $\ln U(t)$: − 0.12709 (10.38), $SE = 0.01493$, $DW = 0.64$; equation for $\ln \left[\frac{M1(t)}{p(t)} \cdot 100\right]$ (determining $p(t)$), 2 *SLS* coefficients: for constant: − 0.81435 (3.98), for ln $y(t)$: 0.93182 (21.66), for $R(t)$: $-$ 0.05464 (4.15), SE = 0.04381, DW = 0.78; 3 SLS coefficients: for constant: $-$ 0.73251 (3.63), for ln y (t): 0.90443 (21.59), for $R(t)$: $-$ 0.04289 (3.43), SE = 0.04404, DW = 0.70. Again, $R(t)$ is exogenous with respect to the rest of the model, but this is not true for $U(t)$ in this model: The rate of unemployment can be influenced by money supply M 1 indirectly in the short run through the channel of the price level and the inflation rate. This model therefore takes an intermediate position between the Keynesian and the New Classical model.

2.6. Model Comparison

There are several criteria available according to which we may order and judge econometric models such as those we have presented here, because so far no consensus has been achieved among econometricians and economists about how to choose the "best" model among different ones explaining the same variables.[8] Here our approach is rather moderate: We want to get some idea about which model fits the Austrian data best in the sense of reproducing the historical development of the two variables of interest to us over the estimation period. Apart from model 1, the single equation, especially for the rate of unemployment and the rate of inflation (where these are directly estimated), are not too different with respect to their statistical characteristics. But we are not only interested in the single equations, but also in the performance of the entire models, since their structural differences are theoretically important. Therefore we simulate our four models over their common period of estimation (1957 to 1982), using historical values of the respective exogenous variables as inputs. Because the simultaneity bias does not seem too severe, here and in the following section we use only the *OLS* versions of the models for the simulation exercises. The resulting values for the unemployment rate and the inflation rate are regarded as predictors for these variables. They are compared with the historical values of these variables, their differences being the simulation errors. For them an error analysis is undertaken: We calculate means, standard deviations, root mean square errors, lower and upper bounds of the errors and the percentage errors. Furthermore, we ask whether the predictors are unbiased and efficient estimators of the respective variables; these properties are tested using the method of *Mincer* and *Zarnowitz* (1969). We also calculate first- and second-order autocorrelation coefficients of the errors; high autocorrelation points to specification errors.

[8] See, for example, *Godfrey* (1984) as one among an increasing number of methodological contributions to these questions. An approach based on stochastic simulations that could also be applied to our problem has been developed by *Fair* (1980).

Details about these calculations can be found in *Neck* (1984 b). The results can be summarized as follows: All models exhibit considerable autocorrelation of errors for both variables, which has to be expected, given the limitations of our closed-economic models. Only in the Keynesian model the hypothesis that the predictors of both variables are efficient and unbiased cannot be rejected. In the Stein model the predictor for the unemployment rate is biased, and in the two other Monetarist models the predictor for the inflation rate is both biased and inefficient. The root mean square errors, both in absolute and in percentage terms, are smallest in the Keynesian model for both variables. For the other criteria a unique ordering of the models is not possible, but in general the Keynesian model seems to come out as the "best" one also from them. In general, therefore, it seems that the Keynesian model has a greater ability to reproduce the development of the rate of unemployment and the rate of inflation for Austria than the three Monetarist models considered in this paper. Of course, this model comparison cannot be regarded as a "proof" for Keynesian or against Monetarist macroeconomic theory or their validity for Austria, but perhaps it may contribute to an understanding of why Austrian economists might have good reasons for being reluctant to accept Monetarism as a framework for an analysis of the economy of this country.

3. Simulating Disinflationary Policies in Keynesian and Monetarist Models

3.1. The Scope of Disinflationary Policies

Within the political conception of "Austro-Keynesianism", preventing or reducing unemployment generally has been the most important target during the last fifteen years, and demand-management policies (especially fiscal policy) have been directed towards securing the comparatively low Austrian rate of unemployment. Fighting inflation, on the other hand, has mainly relied on the twin instruments of incomes policy, enacted mainly by the "social partnership" institutions, and the "hand-currency" policy of linking the exchange rate of the Austrian Schilling to the developments of the value of Austria's main trade partners' currencies, particularly the Deutschmark. Monetary policy can be regarded as subsidiary within this concept. However, since the transition to flexible exchange rates in 1973 a more active role of monetary policy would have been possible in principle, such as the orientation towards money supply growth targets combined with floating exchange rates. It would certainly be interesting whether such a policy option, which could be regarded as a Monetarist one, could have eased the process of disinflation undergone by the Austrian economy since the overall peak of the rate of inflation in 1974. In this case, money supply would have to be regarded as an instrument or intermediate target, instead of the accomodating role which is actually fulfilled.

Although a definite answer to this question, if possible at all, could at best be given on the basis of a fully specified and generally agreed upon model of the Austrian economy, including the foreign sector, and of comparisons with experiences of other countries in a similar position having pursued such an alternative strategy (for instance Switzerland), to some extent our simple Keynesian and Monetarist models may also be helpful in assessing the impacts of such a monetary disinflationary policy on unemployment and inflation. For this purpose we assume that from 1973 up to now money supply has been a policy instrument in Austria with the explicit intention of using it to reduce the rate of inflation. Since money supply ($M\,2$ in model 1, $M\,1$ in the other models) is the only exogenous variable common to the four models, we can study the effect of such strategies on the domestic inflation rate and the unemployment rate within each model. Of course, due to the neglect of important feedbacks from the foreign sector of the Austrian economy, such experiments can give only tentative answers, but they may at least contribute to a better understanding of the models we are considering here and of the trade-offs implied by them.

First of all, we want to know whether price stability or significantly lower inflation than has actually occurred could have been possible at all, given the structure of each model. For that purpose we conduct the following experiment in the spirit of the theory of quantitative economic policy with fixed targets: We fix the rate of inflation $\pi(t)$ at a value of 3 % since 1973, which is a rather ambitious aim compared with the historical values of this variable, and ask whether monetary policy could have been able to reach this target within each model, and if so, at which rate of growth of the money supply. Analogous experiments can also be performed with other numerical values of the target variable $\pi(t)$. It turns out that the answer is very different for the Keynesian and the Monetarist models, although they are based nearly on the same data: In the Keynesian model 2 no meaningful results arise, because for some years no finite positive rate of unemployment is compatible with the prescribed rate of inflation of 3 %. This is mainly due the very flat Phillips curve, lacking a finite noninflationary rate of unemployment, but also on the fact that monetary policy has only very weak effects on the inflation rate within this model. The three Monetarist models, on the other hand, allow for achieving the stated goal with reasonable values of money supply growth. For instance, models 3 and 4 both called for a one-time reduction of $M\,1$ by 0.6 % in 1973 (a "cold turkey", if compared with the actual growth of 9.1 %), substantially lower than historical growth rates until 1976, and steady growth rates of about 6 % in the following years (where actual money supply growth was even lower than that). Also costs of such a policy in terms of higher rates of unemployment seem to be moderate, but they are quite different for these two models: In both models, the policy-induced recession in 1973 would create an unemployment rate of about 2.4 % for this year, which is less than one percentage-point above the historical value (and the respective simulated values with actual money supply as input), but afterwards in the New Classical model the rate of unemployment would be only slightly higher than the natural rate estimated for this model (average rate 1974 to 1982: 2.87 %), whereas the adaptive expectations model 4 implies a much more pronounced rise in the rate of unemployment (average rate 1974 to 1982: 3.51 %). This result is in accordance with the predictions of the respective theories: Adaptive expectations imply only slow return of the rate of unemployment to its natural value after a stabilization of inflation, whereas rational expectations in the context of a New Classical framework allow for quick and lasting deflationary policies without prolonged side-effects in the real sector. It is remarkable, however, that these different responses (and the much more striking one in the Keynesian model) can come out from models estimated from the same data base, which shows again the importance of the theoretical background for policy assessment.

3.2. Effects of a Constant Money Growth Rule

Similar differences in the response of unemployment and inflation to monetary policy across the four models can also be shown by simulating the effects of a constant money supply growth rule. Here the same experiment is undertaken with all four models in order to study the trade-offs between the rate of unemployment and the rate of inflation under such a policy within each model. Again starting from 1973, we simulate the effects of a constant growth rate of 4 % for money supply (M 2 for model 1, M 1 for models 2 to 4). The resulting time paths of the inflation rate and the unemployment rate are calculated and compared both with the historical values of these variables and with the simulation results obtained with the historical time path of the respective money growth rate. The latter comparisons indicate what would have happened if the corresponding model were exactly true and the constant money supply growth or actual monetary growth had been implemented as alternative policies; they are intended to show possible advantages or disadvantages of a Monetarist policy prescription within each model. Both simulations in this case start from the values of all variables obtained by the simulation over the estimation period. Differences across models again show the dependence of the effects of the disinflationary policy on the model (and to some extent on the theoretical basis) from which they are calculated. The comparisons with the historical data indicate possible advantages and disadvantages of the constant money growth rule within the particular model over the results actually achieved in Austria by historical policies and the economic "realities" of this country, however they might have been generated. Here the simulations start from the historical values of all variables. The growth rate of 4 % has been chosen as being both sufficiently realistic to be implemented for Austria and disinflationary; actual monetary growth averaged about 6 % from 1973 to 1982, with large fluctuations (high expansion until 1976, moderate growth of M 1 and strongly fluctuating growth rates of M 2 thereafter). The following tables present the results of this simulation experiment and of the comparisons.

As has to be expected, the constant money supply growth rule generally leads to lower inflation rates for most years of the simulation period; apart from model 1, where the inflation rate is considerably biased downwards in the simulations with actual money growth, this holds for both kinds of comparisons. There is also agreement across the models that some price in terms of higher rates of unemployment has to be paid for this reduction of the rate of inflation, at least for some years of the simulation period; again this holds for both kinds of com-

Table 10

Unemployment Rate, Actual Values and Values Simulated with Constant Money Supply Growth

	Actual Values	Model 1	Model 2	Model 3	Model 4
1973	1.560	1.660	1.676	2.083	2.128
1974	1.531	2.232	1.717	2.460	2.538
1975	2.045	2.690	1.973	2.748	2.796
1976	2.016	3.054	2.242	2.957	2.922
1977	1.835	3.343	2.637	3.106	2.935
1978	2.080	3.569	3.220	3.184	2.855
1979	2.004	3.745	3.855	3.213	2.745
1980	1.871	3.881	4.627	3.237	2.663
1981	2.416	3.983	5.681	3.277	2.625
1982	3.668	4.059	7.311	3.317	2.608

Table 11

Unemployment Rate Simulated with Constant Money Supply Growth minus Actual Unemployment Rate

	Model 1	Model 2	Model 3	Model 4
1973	0.101	0.117	0.523	0.569
1974	0.702	0.186	0.929	1.008
1975	0.645	− 0.073	0.703	0.751
1976	1.039	0.226	0.941	0.906
1977	1.508	0.802	1.271	1.100
1978	1.489	1.140	1.105	0.776
1979	1.741	1.851	1.209	0.741
1980	2.010	2.756	1.367	0.792
1981	1.567	3.264	0.860	0.209
1982	0.391	3.642	− 0.352	− 1.060

Table 12

Inflation Rate, Actual Values and Values Simulated with Constant Money Supply Growth

	Actual Values	Model 1	Model 2	Model 3	Model 4
1973	7.741	7.844	7.020	5.951	6.219
1974	9.077	7.636	8.389	3.922	4.050
1975	6.257	7.439	5.866	3.133	2.952
1976	5.473	7.253	5.418	1.865	1.498
1977	5.134	7.077	5.520	1.218	0.656
1978	5.116	6.911	4.661	1.166	0.506
1979	4.062	6.754	4.749	1.244	0.632
1980	5.217	6.605	4.998	1.185	0.710
1981	6.169	6.464	5.035	1.045	0.710
1982	6.377	6.330	3.279	0.954	0.722

Table 13

Inflation Rate Simulated with Constant Money Supply Growth minus Actual Inflation Rate

	Model 1	Model 2	Model 3	Model 4
1973	0.104	– 0.720	– 1.789	– 1.522
1974	– 1.441	– 0.688	– 5.155	– 5.027
1975	1.182	– 0.391	– 3.124	– 3.305
1976	1.780	– 0.055	– 3.608	– 3.975
1977	1.943	0.386	– 3.916	– 4.478
1978	1.795	– 0.455	– 3.950	– 4.610
1979	2.692	0.687	– 2.817	– 3.430
1980	1.387	– 0.219	– 4.032	– 4.507
1981	0.294	– 1.135	– 5.124	– 5.459
1982	– 0.047	– 3.098	– 5.423	– 5.655

Table 14

Simulated Unemployment Rates: With Actual and with Constant Money Supply Growth

	Actual Money Supply Growth				Constant Money Supply Growth			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
1973	2.315	2.130	1.902	2.136	2.315	2.251	2.219	2.443
1974	2.304	1.921	2.349	2.710	2.717	2.139	2.717	2.949
1975	2.633	1.825	2.209	2.565	3.039	2.299	3.011	3.137
1976	2.459	1.601	1.806	2.231	3.294	2.460	3.133	3.097
1977	2.183	1.531	2.114	2.682	3.495	2.751	3.189	2.970
1978	2.414	1.601	2.525	3.038	3.652	3.222	3.236	2.840
1979	2.685	1.814	3.198	3.520	3.773	3.735	3.282	2.738
1980	2.658	2.165	3.456	3.409	3.866	4.374	3.319	2.668
1981	3.256	2.722	3.464	3.106	3.936	5.275	3.346	2.623
1982	3.664	3.644	3.443	2.854	3.987	6.701	3.365	2.596

Table 15

Unemployment Rate Simulated with Constant Money Supply Growth minus Unemployment Rate Simulated with Actual Money Supply Growth

	Model 1	Model 2	Model 3	Model 4
1973	0.000	0.121	0.318	0.307
1974	0.413	0.218	0.368	0.239
1975	0.406	0.474	0.801	0.572
1976	0.834	0.859	1.327	0.866
1977	1.311	1.220	1.075	0.287
1978	1.237	1.622	0.711	– 0.198
1979	1.088	1.921	0.084	– 0.782
1980	1.209	2.209	– 0.137	– 0.741
1981	0.679	2.553	– 0.118	– 0.482
1982	0.322	3.057	– 0.078	– 0.258

Table 16

Simulated Inflation Rates: With Actual and with Constant Money Supply Growth

	Actual Money Supply Growth				Constant Money Supply Growth			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
1973	6.943	5.774	6.523	7.865	6.943	5.803	3.331	4.412
1974	7.168	7.612	4.535	4.874	6.784	7.481	3.340	3.167
1975	7.080	5.480	8.527	8.611	6.634	5.220	2.102	1.585
1976	7.403	5.611	9.531	10.300	6.491	4.992	1.311	0.647
1977	7.851	6.454	4.120	4.463	6.356	5.266	1.012	0.256
1978	7.873	6.040	4.042	3.371	6.229	4.534	0.947	0.198
1979	7.819	6.355	– 1.063	– 2.183	6.108	4.709	0.926	0.292
1980	7.998	6.528	0.131	– 1.251	5.994	5.017	0.839	0.418
1981	7.600	6.385	– 0.184	– 1.390	5.887	5.091	0.841	0.524
1982	7.279	4.447	– 0.184	– 1.172	5.784	3.366	0.798	0.596

Table 17

Inflation Rate Simulated with Constant Money Supply Growth minus Inflation Rate Simulated with Actual Money Supply Growth

	Model 1	Model 2	Model 3	Model 4
1973	0.000	0.029	− 3.196	− 3.453
1974	− 0.384	− 0.136	− 1.195	− 1.707
1975	− 0.446	− 0.259	− 6.426	− 7.026
1976	− 0.912	− 0.619	− 8.219	− 9.653
1977	− 1.494	− 1.188	− 3.107	− 4.207
1978	− 1.644	− 1.506	− 3.095	− 3.172
1979	− 1.711	− 1.646	1.989	2.474
1980	− 2.004	− 1.511	0.358	1.669
1981	− 1.713	− 1.294	1.025	1.914
1982	− 1.494	− 1.081	0.982	1.768

parisons. The magnitude of the effects on inflation rate and unemployment rate and their time pattern is, however, specific to each model. Disregarding the somewhat erratic result for the *Stein* model, the disinflationary effect of the Monetarist policy experiment is weakest in the Keynesian model and very strong in models 3 and 4, particularly in the Monetarist model with adaptive expectations, where it leads to sustained near-stability of the price level after four years. This is due to the direct link between $M\,1\,(t)$ and $p\,(t)$ in these two models, which, however, is one of the main reasons for these models' bad performance in the error analysis for the inflation rate. The side-effects on the unemployment rate of this disinflation, on the other hand, is strongest in the Keynesian model, although it occurs only after several years, reflecting long lags in the transmission mechanism. For models 3 and 4, the costs of the Monetarist policy option in terms of higher unemployment are seen to be minor. Particularly the comparisons of the results of the simulations with actual and constant money supply growth clearly display the dramatic differences between costs and benefits of this disinflationary policy, with the Keynesian model having the strongest trade-off.

Several measures may be calculated to give a quantitative assessment of these different trade-offs and also of the relative costs and benefits of the constant money growth rule. One simple measure of the trade-offs is given by the ratio of the additional unemployment to the reduction in inflation relative to the solution of the simulation with historical values of money supply growth, both measured in percentage-points. That is, the numerator of this ratio is the difference of the simulated unemployment rate obtained with constant money growth minus that obtained with actual money growth; the denominator is the difference of the simulated inflation rate obtained with actual money growth minus that obtained with constant money growth. This ratio can be regarded as a measure for the opportunity costs, with respect to the solution obtained with actual monetary policy within each model, in terms of the unemployment "loss" per inflation "gain". Its magnitude shows the strength of the trade-off for each model:

Table 18

Ratio of Additional Unemployment to Reduction in Inflation Rate

	Model 1	Model 2	Model 3	Model 4
1973	*	**	0.09942	0.08897
1974	1.07586	1.60113	0.30801	0.14011
1975	0.90999	1.82944	0.12470	0.08141
1976	0.91507	1.38871	0.16147	0.08976
1977	0.87775	1.02665	0.34591	0.06828
1978	0.75288	1.07688	0.22975	− 0.06251
1979	0.63605	1.16721	− 0.04230	0.31584
1980	0.60319	1.46183	0.18058	0.44392
1981	0.39660	1.97352	0.11485	0.25197
1982	0.21572	2.82801	0.07892	0.14566

* neither reduction in inflation nor additional unemployment.

** only additional unemployment without reduction in inflation.

These results again confirm how essentially statements about "benefits" and "costs" of disinflationary policies depend upon the model from which they are calculated. Analogous measures can be defined from the comparison with the historical values of $U(t)$ and $\pi(t)$. There the same qualitative picture emerges, but more often negative values occur (especially in the Keynesian model), indicating that in those years historical values of both unemployment and inflation have been lower than those obtained in the Monetarist policy experiment within the respective model. This might be interpreted as an indication of the success of "Austro-Keynesianism" or of particular favorable circumstances not depicted in the models.

Another measure for the gains and losses due to disinflationary policies proposed in the literature is the "sacrifice ratio", defined as "point-years" (cumulative excess) unemployment per percentage-point reduction of the inflation rate.[9] In our framework, this could again be measured in terms of opportunity costs with respect to the simulation with actual money growth. Its maximum value is reached in 1982 for models 1 and 2 and in 1978 for models 3 and 4, with values 5.02, 13.19, 1.49, and 0.65, respectively. Again the "sacrifice" in the Keynesian model by far exceeds the corresponding values in the Monetarist models. Similar results are obtained from analogous calculations with historical values of $U(t)$ and $\pi(t)$.

Alternatively, an evaluation of the Monetarist constant money growth rule could be based on an explicit "social welfare function" in the sense of the theory of quantitative economic policy. We have done some tentative calculations with linear and quadratic welfare functions, but the results are largely arbitrary since they depend essentially on the target paths of $U(t)$ and $\pi(t)$ one postulates and on the relative weights of the deviations of actual from target values for each variable. As an illustration, we report on results for the simplest measure of this kind, namely the "misery index", which is just the sum of inflation rate and unemployment rate (corresponding to a linear "social welfare function" with equal weights for both variables). In the following table this index is again measured in terms of differences of simulated values with constant and actual money growth, to be interpreted as opportunity costs as before.

If one accepts the "misery index" as "social welfare function", then the above figures measure each year's net loss due to the constant money supply growth policy as compared with actual policy results for each model if the model is considered to be "true". Results with historical values of $U(t)$ and $\pi(t)$ are more "pessimistic" (higher positive values) for models 1 and 2 and more "optimistic" for models 3 and 4. Keynesians, therefore, will be less inclined to adapt the Monetarist deflationary option than will be Monetarists believing in models 1, 3, or 4.

4. Concluding Remarks

The simulation experiments conducted with our simple models for the Austrian economy have shown that substantially different results can arise from models with different theoretical structures, even when they are estimated from approximately the same data base. In any

[9] *Okun* (1978), cf. *Friedman* (1984), 385.

Table 19

"Misery index" (Sum of Differences of Simulated Variables with Constant and Actual Money Growth)

	Model 1	Model 2	Model 3	Model 4
1973	0.0	0.15013	− 2.87814	− 3.14546
1974	0.02913	0.08197	− 0.82673	− 1.46745
1975	− 0.04013	0.21512	− 5.62454	− 6.45380
1976	− 0.07744	0.24054	− 6.89213	− 8.78665
1977	− 0.18266	0.03166	− 2.03256	− 3.91995
1978	− 0.40615	0.11576	− 2.38389	− 3.37059
1979	− 0.62261	0.27519	2.07264	1.69292
1980	− 0.79520	0.69794	0.62077	0.92824
1981	− 1.03370	1.25945	0.90738	1.43205
1982	− 1.17196	1.97608	0.90452	1.51060

case, it seems that a Monetarist constant money supply growth rule cannot be regarded as unambiguously advantageous for the purpose of disinflating the Austrian economy. Results from simulations are, of course, only tentative, but also an inspection of recent attempts to implement the constant money growth rule in the United States raises doubts as to the applicability and usefulness of such a policy.[10] Even some adherents of Monetarist theories have modified their policy prescriptions to a recommendation of adapting the monetary base to a target path of nominal output[11] which comes already close to a mildly discretionary view of monetary policy. On the other hand, the scope for monetary disinflationary policies might even be greater than our simulation experiments suggest, if they are supported by credibility effects changing the eonomic structure as a result of the announcement of such a policy. Such effects could be argued to occur particularly as a consequence of a change from fixed to flexible exchange rates, which would be necessary to implement the policy option studied in our simulations. Apart from the open question of whether such structural changes in fact always work in a direction favorable for the success of that policy, recent studies of reactions of expectations to changes in the policy regime show only weak structural changes as a result of the adoption of money stock instead of interest rates and exchange rates as intermediate targets for monetary policies in the United States, par-

[10] *Friedman* (1984).
[11] *McCallum* (1984).

ticularly in the labor market;[12] also credibility effects seem to occur only slowly, at best.[13] Hence the *Lucas* critique may not be a too severe limitation for our policy simulation experiments. However, we don't deny that still other models, particularly those for the open economy, should be used in addition to ours to give a more definite picture of the possibilities and limitations of Monetarist disinflationary policies for the Austrian economy. Studying the effects of these policies in models of this kind, preferably again based on different theoretical foundations, therefore remains a task for further research.

Summary

Simple Keynesian and Monetarist econometric models for the Austrian economy are estimated and checked for their ability of explaining the rate of unemployment and the rate of inflation in Austria. In this comparison the Keynesian model comes out better than the three Monetarist models considered here. A simulation analysis shows the effects of disinflationary monetary policies, in particular the Friedman rule of constant money supply growth, on unemployment and inflation within the estimated models. The results widely differ across the models; this points to the importance of the underlying model structures for the assessment of alternative proposals for economic policy.

Zusammenfassung

Einfache keynesianische und monetaristische Modelle für die österreichische Wirtschaft werden ökonometrisch und in bezug auf ihre Fähigkeit geprüft, die Entwicklung von Arbeitslosenrate und Inflationsrate in Österreich zu erklären. Das keynesianische Modell schneidet bei diesem Vergleich besser ab als die drei betrachteten monetaristischen Modelle. Eine Simulationsanalyse zeigt die Auswirkungen inflationssenkender geldpolitischer Maßnahmen, insbesondere der Friedman-Regel eines konstanten Geldmengenwachstums, auf Arbeitslosigkeit und Inflation in den geschätzten Modellen. Die je nach dem Modell sehr unterschiedlichen Ergebnisse verweisen auf die Bedeutung der zugrundeliegenden Modellstrukturen bei der Einschätzung alternativer wirtschaftspolitischer Vorschläge.

References

Blanchard, O. (1984), The Lucas Critique and the Volcker Deflation. American Economic Review, Papers and Proceedings 74, 211 - 215.

Breuss, F. (1980), Gibt es eine stabile Phillips-Kurve in Österreich? Monatsberichte des Österreichischen Instituts für Wirtschaftsforschung 53, 210 bis 222.

— (1983), Österreichs Außenwirtschaft 1945 - 1982. Vienna.

Cagan, P. and W. *Fellner* (1983), Tentative Lessons from the Recent Disinflationary Effort, Brookings Papers on Economic Activity (2), 603 - 608.

[12] *Blanchard* (1984).

[13] *Perry* (1983), *Cagan* and *Fellner* (1983), *Friedman* (1984).

Fair, R. C. (1980), Estimating the Expected Predictive Accuracy of Econometric Models. International Economic Review 21, 355 - 378.

Friedman, B. (1984), Lessons from the 1979 - 82 Monetary Policy Experiment. American Economic Review, Papers and Proceedings 74, 382 - 387.

Friedman, M. (1968), The Role of Monetary Policy. American Economic Review 58, 1 - 17.

Godfrey, L. G. (1984), On the Uses of Misspecification Checks and Tests of Non-Nested Hypotheses in Empirical Econometrics. Conference Papers-Supplement to the Economic Journal 94, 69 - 81.

Hahn, F. H. (1980), Monetarism and Economic Theory. Economica 47, 1 - 17.

Holzmann, R. and G. *Winckler* (1983), Austrian Economic Policy. Some Theoretical and Critical Remarks on "Austro-Keynesianism", Empirica (2), 183 - 203.

Hoover, K. D. (1984), Two Types of Monetarism. Journal of Economic Literature 22, 58 - 76.

Lipp, E. M. (1978), Zur Bedeutung institutioneller Bedingungen für die Stabilitätspolitik — dargestellt am Beispiel Großbritanniens. Zeitschrift für Wirtschafts- und Sozialwissenschaften 98, 347 -373.

McCallum, B. T. (1984), Monetarist Rules in the Light of Recent Experience. American Economic Review, Papers and Proceedings 74, 388 - 391.

Mincer, J. and V. *Zarnowitz* (1969), The Evaluation of Economic Forecasts, in: J. Mincer (ed.), Economic Forecasts and Expectations. Analyses of Forecasting Behavior and Performance. New York et al. 3 - 46.

Neck, R. (1984 a), Arbeitslosigkeit und Inflation in Österreich. Ein Test keynesianischer und monetaristischer Erklärungen. Quartalshefte der Girozentrale 19/1, 91 - 110.

— (1984 b), Keynesian and Monetarist Models of Unemployment and Inflation. A Simulation Study for Austria. Empirica 11, 23 - 45.

Okun, A. M. (1978), Efficient Disinflationary Policies. American Economic Review, Papers and Proceedings 68, 348 - 352.

Perry, G. L. (1983), What Have We Learned about Disinflation? Brookings Papers on Economic Activity (2), 587 - 602.

Pommerehne, W. W., F. *Schneider* and B. S. *Frey* (1983), Quot Homines, Tot Sententiae? A Survey Among Austrian Economists, Empirica (2), 93 - 127.

Rea, J. D. (1983), The Explanatory Power of Alternative Theories of Inflation and Unemployment, 1895 - 1979, Review of Economics and Statistics 65, 183 - 193.

Sargent, T. J. (1976), A Classical Macroeconometric Model for the United States, Journal of Political Economy 84, 207 - 237.

Schleicher, S. (1980), STS-System: User's Manual. Forschungsbericht, Nationalökonomische Institute, Universität Graz.

Stein, J. S. (1982), Monetarist, Keynesian and New Classic Economics. Oxford.

Tichy, G. (1983), Hauptkonflikte der Makropolitik in Österreich: Austrokeynesianismus als Versuch eines wirtschaftspolitischen Brückenschlages zwischen den makrotheoretischen Extremen, in: G. Bombach, B. Gahlen, A. E. Ott (eds.), Makroökonomik heute: Gemeinsamkeiten und Gegensätze. Schriftenreihe des Wirtschaftswissenschaftlichen Seminars Ottobeuren 12, Tübingen, 35 - 58.

Wörgötter A. (1977), Lohn- und Preissysteme für Österreich, Empirica (1), 127 - 140.

— (1984), Incomes Policies in Open Economics. The Possibility of J-Curve Effects. Paper presented at the Second Colloquium of the European Economic Associations at Frankfurt.