Volume Title: The Responsiveness of Demand Policies to Balance of Payments: Postwar Patterns

Volume Author/Editor: Michael Michaely

Volume Publisher: NBER

Volume ISBN: 0-870-14221-6

Volume URL: http://www.nber.org/books/mich71-1

Publication Date: 1971

Chapter Title: Appendix: A Few Experiments with Formal Correlation Analysis

Chapter Author: Michael Michaely

Chapter URL: http://www.nber.org/chapters/c3446

Chapter pages in book: (p. 281 - 287)

APPENDIX: A FEW EXPERIMENTS WITH FORMAL CORRELATION ANALYSIS

As I have pointed out in the discussion of the study's approach, much of the method amounts, in essence, to a correlation analysis; but due to the small number of observations (the "subperiods"), it is a mostly intuitive inference, rather than formal. I have also argued, in that discussion, that a formal analysis based on a large number of observations, in which each quarter is taken as a unit of measurement of the variables concerned, is not likely to be very helpful. Nevertheless, I have carried out a number of experimental correlation analyses, which are described here.

First, Table A-1 presents the outcome of the simplest experiment, in which the size of each dependent variable in a given quarter is assumed to be a function of the sizes of the independent variables in the same quarter. The dependent variables are, in turn, three monetary variables: the discount rate; the rate of change of money supply; and the rate of change of credit supply. The independent variables are the four targets assumed in this study as conceivably guiding monetary policy: the balance-of-payments position, measured by the change in external reserves and designated by B; the price level, measured by the change in the cost-of-living index and designated by P; the employment position, measured by the unemployment ratio and designated by U; and, finally, the growth target, measured by the change in the industrial-production index and designated by G. The table records only correlation coefficients which are significant at the .95 level. When a coefficient appears with the right sign (that is, the sign expected from the assumption that the instrument in question responds to the need of the target in question), the coefficient is *italicized*.

The results of Table A-1 are quite meager. Little dependence of the monetary instruments on the major economic targets is revealed. The highest R^2 recorded (.538) is in Germany, with credit supply as the dependent variable. But in this case, as also with the variable of money supply in Germany, the result may be discounted altogether. Credit

TABLE A-1

COEFFICIENTS OF CORRELATION OF MONETARY INSTRUMENTS WITH TARGET VARIABLES

Country and Dependent Variables	*Multiple Correlation*		*Partial Correlations with Independent Variables*			
	r	*Adjusted R^2*	*B*	*P*	*U*	*G*
Belgium:						
Discount rate	.601	.320	—	—	*−.573*	—
Money supply	.440	.142	*.302*	—	—	*−.252*
Credit supply	.440	.106	*.310*	—	—	—
France:						
Discount rate	.581	.286	—	*.407*	—	—
Money supply	—	—	*.351*	—	—	—
Credit supply	—	—	—	*−.344*	—	—
Germany:						
Discount rate	.583	.297	.351	*.250*	.486	—
Money supply	.428	.131	—	—	*.394*	—
Credit supply	.750	.538	—	—	*526*	.504
Italy:						
Money supply	.559	.257	*.323*	—	−.410	.378
Credit supply	—	—	—	—	—	.400
Japan:						
Discount rate	—	—	—	−.284	—	—
Money supply	—	—	—	—	—	—
Credit supply	—	—	—	—	—	—
Netherlands:						
Discount rate	.446	.147	—	—	*−.408*	—
Money supply	.517	.220	*.496*	—	—	—
Credit supply	.396	.102	−.336	—	—	—
Sweden:						
Discount rate	—	—	—	—	—	—
Money supply	.442	.140	*.317*	—	—	.382
Credit supply	—	—	—	—	—	—
U.K.:						
Discount rate	—	—	*−.279*	—	—	—
Money supply	—	—	—	—	—	.330
Credit supply	—	—	—	—	—	—
U.S.:						
Discount rate	—	—	—	—	—	—
Money supply	—	—	—	—	—	.310
Credit supply	—	—	—	—	—	—

supply and money supply appear, in Germany, to be dependent on the employment situation; but this is patently due to general trends of falling unemployment and falling rates of expansion of money and credit in this country. Outside Germany, the highest correlations (R^2) are within the range of about .3, which is very low indeed.

It should be pointed out that despite the meagerness of the results, they largely conform with those arrived at in the main body of analysis of this study. Thus, with the exception of one instance (Sweden), all the cases of dependence of one monetary instrument or another on the balance-of-payments position (Belgium, France, Italy, Netherlands, and the U.K.) have been demonstrated before. But the opposite is not true: many instances of such demonstrated dependence are *not* revealed by the correlation analysis. A glaring example of this is the case of Japan.

Table A-2 presents the results of a similar analysis, except that it introduces a time lag: the size of the dependent variable (monetary instrument) in each quarter is assumed to be a function of the size of the independent variables (the targets) during the preceding two quarters. The outcome as a whole is again quite disappointing. Table A-2 shows a clear improvement over the performance of Table A-1 in two countries: France, and the U.K. In both instances, the outcome agrees with the findings arrived at by the main body of analysis of this study. In other cases, however, there are mostly fewer and less meaningful findings when the time lag is introduced than without it.

Particularly baffling is the outcome concerning the discount rate. Table A-1 shows a significant (but quite small) correlation of this instrument in the right direction in only one instance: in the U.K., it appears to depend on the target of the balance of payments. In Table A-2, some improvement is apparent: a dependence of the discount rate on the balance-of-payments position is seen also in France, where the discount rate appears to depend also on the unemployment situation. Dependence of the discount rate on the price level appears in Germany and the Netherlands, and in the latter also on the unemployment position. All these positive findings still amount to quite little. Table A-3 presents the result of an attempt to improve this performance by observation of selected points only. There is a general tendency, in almost all countries, not to vary the discount rate very often but, at most, about once or twice a year on the average. Thus, long periods may be found in which the target variables move, but the discount rate remains stable. It might be expected that if these periods are abstracted from,

TABLE A-2

COEFFICIENTS OF CORRELATION OF INSTRUMENTS WITH VARIABLES, WITH TIME LAG

Country and Dependent Variables	*Multiple Correlation*		*Partial Correlations with Independent Variables*			
	r	*Adjusted R^2*	*B*	*P*	*U*	*G*
Belgium:						
Discount rate	.583	.292	—	—	*−.549*	—
Money supply	.413	.115	—	—	−.276	—
Credit supply	—	—	—	—	—	—
France:						
Discount rate	.758	.542	*−.422*	.483	*−.377*	—
Money supply	.460	.151	*.317*	—	—	—
Credit supply	—	—	—	—	—	—
Germany:						
Discount rate	.552	.259	—	*.409*	.399	—
Money supply	.487	.186	—	.374	*.326*	—
Credit supply	.652	.386	—	—	*.546*	—
Italy:						
Money supply	—	—	—	—	−.302	—
Credit supply	.543	.235	—	—	—	.536
Japan:						
Discount rate	.513	.210	—	−.363	—	—
Money supply	—	—	—	—	—	—
Credit supply	—	—	—	—	—	—
Netherlands:						
Discount rate	.678	.424	—	*.315*	*−.552*	−.270
Money supply	.353	.066	—	—	—	—
Credit supply	.451	.150	—	—	—	.408
Sweden:						
Discount rate	—	—	—	—	—	*.271*
Money supply	—	—	—	—	—	—
Credit supply	—	—	—	—	—	—
U.K.:						
Discount rate	.480	.179	*−.412*	−.379	—	—
Money supply	—	—	—	—	—	.319
Credit supply	.577	.289	*−.407*	—	*.327*	—
U.S.:						
Discount rate	—	—	—	—	—	—
Money supply	—	—	—	—	—	—
Credit supply	—	—	—	—	—	—

TABLE A-3

COEFFICIENTS OF CORRELATION OF DISCOUNT-RATE CHANGES WITH TARGET VARIABLES

Country	*Multiple Correlation*		*Partial Correlations with Independent Variables*			
	r	*Adjusted* R^2	*B*	*P*	*U*	*G*
Belgium	—	—	—	—	*−.503*	—
France	.858	.605	—	—	*−.642*	—
Germany	—	—	—	—	—	—
Japan	—	—	—	—	—	—
Netherlands	.797	.531	—	*.688*	—	—
Sweden	.860	.624	.843	—	—	*.710*
U.K.	—	—	—	—	—	—
U.S.	—	—	—	—	—	—

and only periods of changes in the discount rate are left, the real motivations of these changes stand a better chance of being revealed. Thus, Table A-3 presents coefficients of correlation of the discount rate with the target variables when only quarters in which discount-rate changes took place are considered, and each such change is assumed to be a function of the target variables during the preceding two quarters. The results of this procedure are again disappointing: if anything, the performance is even worse than in Tables A-1 and A-2. The discount rate appears to depend on any of the target variables in only four instances. In Belgium, a dependence of the rate on the unemployment position is shown; but the multiple-correlation coefficient, which would show the dependence of the rate on all targets combined, is insignificant. In France, a dependence of the rate on the unemployment position appears, as it has also appeared in Table A-2; but the level of unemployment in France has been so low, throughout the period, that such a dependence would be hardly credible. In the Netherlands the rate seems to be correlated with the price-level target—a finding which would agree with that of the study's text. Finally, in Sweden the rate appears to be correlated, even strongly so, with the rate of change of industrial production—a somewhat surprising finding not only in view of the main body of the study's analysis, but also when compared with Tables A-1 and A-2.

Lastly, Table A-4 presents the outcome of an attempt to tackle the problem on hand in a somewhat different manner. The balance-of-payments target is taken here as the *dependent* variable, and the three monetary instruments as the independent variables. The multiple correlation coefficient would then show the association of the target with all the three instruments combined; whereas the partial correlations would show the association with each separate monetary instrument. The results, again, are not encouraging. Once more, Japan is the most obvious case: no significant correlation of the balance of payments with monetary policy appears at all in this country. But other associations as well, though significant, seem to be quite weak. Among the separate instruments, associations of the balance-of-payments target appear for money supply in Belgium, France, Italy, and the Netherlands; and for credit supply in Belgium. These findings agree with those of the study's text; but they represent only a small fraction of the latter. Again, particularly disappointing is the performance of the discount rate, as it is represented here.

All the experiments demonstrated in this appendix appear, thus, to have been unsuccessful. If conclusions had to be drawn from their findings, they would have been grossly misleading in many instances. It is, of course, conceivable that an improved performance of this method

TABLE A-4

COEFFICIENTS OF CORRELATION OF MONETARY POLICY WITH BALANCE-OF-PAYMENTS POSITION

Country	*Multiple Correlation*		*Partial Correlations with Independent Variables*		
	r	*Adjusted* R^2	*Discount Rate*	*Money Supply*	*Credit Supply*
Belgium	.430	.146	—	*.297*	*.264*
France	.374	.091	—	*.287*	—
Germany	—	—	.303	—	—
Italy	.442	.164	—	*.393*	−.341
Japan	—	—	—	—	—
Netherlands	.588	.315	—	*.483*	−.390
Sweden	—	—	—	—	—
U.K.	.273	.046	—	—	—
U.S.	—	—	—	—	—

could be achieved in a variety of other ways, such as by the elimination of extreme observations; the introduction of a variety of time lags, not necessarily uniform for all targets, and possibly of some model of distributed lags; the removal of trend factors; and the like. The amount of experimentation required for these improvements would undoubtedly have been very large—and its outcome of doubtful validity.