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A NOTE ON INTEREST RATE POLICY DURING THE GREAT DEPRESSION*

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ABSTRACT

This paper presents some analyses of interest rate determination in six industrialized countries during the Great Depression. The main finding of the paper is that the huge real interest rate shocks experienced during that time were mainly due to policy actions by central banks.

CONTENTS

1 INTRODUCTION

This note presents some analyses of interest rate policy in Europe and the United States during the Great Depression from 1929 to 1938. The main purpose of the paper is 1) to emphasize the discretionary nature of interest rates during that time, 2) to present evidence on the real interest rate shocks and 3) to discuss the consequences of interest rate policy for the Great Depression.

The literature has thus far paid rather little attention to the role of interest rates in the Great Depression, see e.g. Berstein (1987), Kindleberger (1987) and Saint-Etienne (1984). This is somewhat surprising because monetary factors have been analyzed quite extensively and, moreover, the effects of deflation have generally been emphasized. Still, it is more or less unclear which forces affected the determination of interest rates during that period; in other words, to what extent interest rates were determined by discretionary policy actions and/or by such factors as inflation, liquidity and supply shocks. It is also unclear what kind of effects interest rates, and particularly real interest rates, had on economic activity.

Even though we are not able to give affirmative answers to all of these questions, we try to present some information which suggests that interest rate policy might have been of crucial importance in deepening the depression and delaying the recovery.

2 SOME STYLIZED FACTS

This study makes use of monthly data from six countries: Belgium, France, the Netherlands, Switzerland, the United Kingdom and the United States. The data cover the period 1926M1 - 1938M12. Three interest rate series are scrutinized: the private discount rate, rs,

the central bank discount rate, rd, and the government bond yield, rb.[1)] The price level is measured by the wholesale price index; the rest of the data are described in footnote 4 below.

We can get some idea of the basic trends in the data by taking a look at Figure 1, which contains the graphs of rs for these six countries. Though there are some slight differences between countries, the basic trends are very similar: the timing of changes is about the same and the degree of contemporaneous correlation is rather high (see the cross-correlation coefficients presented in Table A1) while the other variables, which are used in this study, seem to be only weakly related over countries. Not surprisingly, Belgium and France differ most from other countries, particularly from the United States. Market rates were about 4 per cent until 1930, then fell to a about 1 per cent and stayed at that level until the end of the sample period. In 1931 interest rates experienced a short, but in some cases sharp, rise, which in many countries resulted in a record high (ex post) real interest rate. Real rates were otherwise largely determined by extraordinarily strong deflation. Prices started to fall in 1929 and this fall continued until the mid-1930's. The following figures give some idea of the magnitude of this fall:

Table 1. The values of the wholesale price index (Sep. 1929 = 100)

Country	lowest level of the price index	corresponding period	price level in Dec. 1938
Belgium	55	Nov. 1934	72
France	52	Sep. 1935	112
Netherlands	50	Apr. 1934	62
Switzerland	61	Mar. 1935	75
U.K.	80	Mar. 1933	94
U.S.A.	61	Mar. 1933	79

Given this pattern of price movements, real (ex post) interest rates became very volatile, and, what is perhaps more important, they

became extremely high in the period running approximately from October 1929 to December 1932. This can be discerned from discerned from the following sample averages:[2)]

Table 2. Sample averages of ex post real interest rates (rs-p)

Country	Feb. 1926-Sept. 1929	Oct. 1929-Dec. 1932	Jan. 1933-Dec. 1938
Belgium	-6.59	17.74	-0.60
France	5.40	13.20	-5.10
Netherlands	5.72	20.95	-1.16
Switzerland	5.01	15.05	-0.73
U.K.	7.46	12.00	-2.05
U.S.A.	5.95	14.77	-3.17

Given these figures the following questions clearly merit note: Why did nominal interest rates not fall rapidly in 1929 and 1930 and why, instead, did they increase in 1931? And why did nominal rates not respond to the relatively rapid inflation after 1935. As for the first question, we must, of course, remember that nominal rates cannot decrease without limit. Thus, in general, they cannot become negative - provided that there are money balances which earn a zero interest rate (in nominal terms). But in this case, and particularly for the period 1929 - 1932, there was really no question of negative or zero interest rates. This can be seen from Figure 1. Moreover, it can be noted that the central bank discount rates and government bond yields were even more clearly above zero in the period 1926 - 1938, as the following sample averages in terms of the interest rate differential between the long-term government bond yield, rb, and the (short-term) private discount rate, rs, indicate: Belgium 1.401, France 2.70, the Netherlands 1.39, Switzerland 2.04, the United Kingdom 1.52 and the United States 1.38.[3)] Alternatively, one can focus on the following minimum rates for rs, rd and rb:[4)]

Table 3. Minimum values of interest rates in 1926 - 1938

Country	min rs	min rd	min rb
Belgium	1.00	2.00	3.25
France	0.91	2.00	3.48
Netherlands	0.13	2.00	2.65
Switzerland	0.99	1.50	3.08
U.K.	0.36	2.00	2.68
U.S.A.	0.13	1.00	2.27

Given these figures one can ask, in particular, why the central bank discount rates were not set to zero during the strongest deflation period. What, in fact, happened was that the central bank discount rates typically exceeded the private discount rates during that period. On the other hand, it seems obvious that the private market rates were mainly determined by the central bank discount rates.

3 AN ECONOMETRIC ANALYSIS OF INTEREST RATE DETERMINATION

The above conclusion can be reached merely by examining the graphs of rs, rd and rb. Perhaps more affirmative proof can be obtained by using the following simple model as a frame of reference:

$$(1)\quad rs_t\{rb_t\} = b_0 + b_1 rd_t + b_2 p_t + b_3 m_t + b_4 q_t + u_t,$$

where p = actual rate of inflation, m = rate of change in money stock, q = rate of change in industrial production and u = stochastic error term.[5)]

This equation was estimated from monthly data covering the period March 1926 - December 1938. Because the OLS residuals were highly autocorrelated in the case of level form data the equation was also estimated by differencing the data. The estimation results are presented in Table 4.[6)]

The tabulated results clearly show that in the sample period the determination of the private discount rate and the government bond

Table 4. OLS estimation results of equation 1

	level form				first difference form			
Country	rd	SEE	DW	F	rd	SEE	DW	F
Belgium	.88 (7.39)	.52	.29	1.30	.54 (28.55)	.24	1.61	.26
France	.84 (18.72)	.74	.45	.44	.54 (11.17)	.40	2.04	8.63
Netherlands	1.52 (32.02)	.59	1.11	2.10	.63 (6.02)	.51	2.54	3.97
Switzerland	1.06 (32.64)	.30	.32	5.27	.53 (5.42)	.12	1.39	.24
U.K.	1.26 (59.01)	.37	.61	.32	.74 (12.35)	.23	1.96	1.15
U.S.A.	1.20 (36.39)	.54	.33	4.91	.73 (10.54)	.22	1.76	4.15
Belgium	.45 (22.58)	.33	.56	5.48	.02 (0.38)	.20	1.86	.28
France	.64 (12.38)	.86	.41	2.91	.03 (0.98)	.26	1.79	.79
Netherlands	.28 (10.16)	.35	.19	6.94	.04 (3.03)	.07	1.98	3.17
Switzerland	.51 (14.80)	.32	.37	3.73	.26 (2.02)	.16	2.04	2.12
U.K.	.40 (23.65)	.29	.51	10.41	-.01 (0.32)	.10	2.26	1.52
U.S.A.	.29 (15.50)	.31	.13	1.67	.14 (4.78)	.09	1.51	1.63

The dependent variable is the private discount rate, rs, for the first six equations and the government bond yield, rb, for the following six equations. rd refers to the coefficient estimate of rd, SEE to the standard error of estimate, DW to the Durbin-Watson statistic and F to the F test statistic for the hypothesis that the coefficients b_2, b_3 and b_4 are identically equal to zero. 154 observations were used for each country.

yield is dominated by the central bank's discount rate policy. Other variables seem to be of marginal importance. The only clear exception (in the case of first difference form and the private discount rate) is France. However, in her case the high value of the F-statistic is due to the "highly significant" negative coefficient of the inflation rate variable, which obviously does not make sense.[7)]

A similar result arises when these variables are scrutinized in the frequency domain. Thus, coherency between rs and rd is typically different from zero (at least for low frequencies) while the corresponding measure with respect to rs and p obtains very low values which fail to exceed the standard significance levels. This can be seen from Figure 2 which contains unweighted averages of coherencies computed for individual countries.[8)]

Thus, one may conclude that central banks have mainly been responsible for the nonadjustment of nominal interest rates during the prewar period. As a result, the economies experienced a period of very volatile real rates. It can be argued that, particularly during the first depression years, the failure to lower nominal rates contributed to the slowdown of economic activity (which showed up in the wave of bankrupties, for instance). But can something more precise be said about the magnitude of this real interest rate effect? This is a very difficult question because there are relatively few empirical models available for assessing the magnitude of the effect. One possibility is, of course, to use some parameter values which have been estimated from the postwar period as crude approximations (see, for instance, Chouraqui et al (1988) and Virén (1986)). Thus, we can take some sort of "average value" for the elasticity of GDP with respect to the real interest rate, which is about -.5. Even this figure indicates that lowering nominal interest rates by just 2 percentage points in 1930 - 1932 might have increased GDP by 1 per cent per annum. That is not very much but it might have helped to break the vicious circle of deflation and a slowdown in production and investment.

Clearly, the real rates were so high, particularly in 1929 - 1932, that either the nominal rates should have been made negative (e.g.

by levying some sort of nominal balance tax) or the deflation rate should have lowered (e.g. by some regulatory measures). Unfortunately, very little was done - or even tried - in this respect. Perhaps this just reflects the fact that the importance of monetary factors, and the real interest rate effects in particular, was not recognized at that time.

FOOTNOTES

1) To be a little bit more precise, for the UK and the USA rs = interest rate on banker's acceptaces (3 months). For the USA rd = Federal Reserve Bank discount rate in New York. All interest rates are expressed as annual percentages and as a rule they represent averages of daily or weekly rates. The data are derived from the following sources: rs and rd from Banking and Monetary Statistics, the Federal Reserve System, Washington D.C., 1943, and rb from the Statistical Yearbook of the League of Nations, Geneva 1927 to 1939.

2) The Belgian value for the first period clearly deviates from the general pattern. The explanation is the very rapid inflation which took place in 1926. Except for this year, the Belgian experience is similar to other sample countries. (For more details of the Belgian pre-Depression episode, see Aldcroft (1987)).

3) The positive interest rate margins reflect the well-known liquidity preference phenomenon which was dominant for the whole prewar period. It is, however, difficult to assess what is the explanation for this phenomenon. Accordingly, it is difficult to model the interest rate margin using the prewar data. If, for instance, an "expectations hypothesis" -based model $\Delta rb = \alpha + \beta(rb(-1) - rs(-1)) + \varepsilon$ is fitted to data, β can be estimated only very unprecisely (t-ratios are systematically below 1; a set of results is available upon request from the author). All in all, the behavior of the term structure in the depression period represents some sort of puzzle which would require further analysis.

4) It is true that there existed some negative bond yields in the United States during the Great Depression period. These perverse observations can be explained by the "exchange privilege" premium, which, in turn, resulted from the Treasury's floating procedure; see Cecchetti (1987) for details.

5) Because of deficient data m is proxied here by notes and coin in circulation. The industrial production (index) series were not available for the Netherlands and Switzerland. Thus, the unemployment rate was used for these countries. The data derive mainly from the Statistical Yearbook of the League of Nations (from 1927 - 1939). In addition, the following data sources were used: Bulletin Mensuel de l'Office Permanet, Institut International de Statistique, the Hague, 1927 - 1932, Industrial and Financial Statistics, Bank of England, London, 1927 - 1939, Federal Reserve Bulletin, Federal Reserve Board, Washington D.C., 1930 - 1939, Reports Presented by the President and Commissaries to the General Meeeting of Shareholders, the

Netherlands Bank, Amsterdam, 1926 - 1939, Rapport fait par le Gouverneur, au non du Conseil de Regence sur les operations de l'exercice, Banque Nationale de Belgique, Brussels, 1926 - 1938, Compte rendu au nom de Conseil General de la Banque, Nanque de France, Paris, 1926 - 1938, and Geschäftsbericht, Schweizerische Nationalbank, Berne, 1926 - 1938. The data used in estimation were seasonally adjusted. Further details are given in an unpublished data appendix which (together with a printout of the data) is available upon request from the author.

6) In this connection we pay very little attention to possible endogeneity problems, which are obviously relevant in estimating equation (1). This is partly because the use of monthly data may diminish the importance of this problem and partly because the computed Hausman-Wu test statistics for p (see Hausman (1978)) did not indicate any simultaneity bias (the corresponding marginal significance levels were all above 10 per cent).

7) The computed Jarque-Bera test statistics (not displayed) suggested that the OLS residuals are not normal. This observation made us check whether the results are crucially affected by some outlier observations. Thus, as one check a robust regression estimation experiment was carried out using the Huber M-estimator (for details, see Huber (1981)). The following results - comparable to those in Table 4 - were obtained:

	rd	SEE	DW	F	scaling factor
Belgium	.34 (10.40)	.24	1.55	0.07	.08
France	.58 (18.67)	.41	2.11	6.58	.18
Netherlands	.72 (13.96)	.52	2.51	2.50	.18
Switzerland	.40 (10.46)	.12	1.28	0.20	.03
United Kingdom	.60 (16.84)	.23	1.74	0.91	.14
United States	.58 (27.35)	.23	1.76	2.23	.04

The dependent variable is rs and the model is expressed in first differences.

The results are very much in accordance with those in Table 1 and they do not lend support to the idea that some clear outliers dominate the data. This conclusion also seems to be in accordance with some informal data checking exercises.

Another, partly related, problem is the existence of residual heteroskedasticity which biases the estimated standard errors.

Thus, if one computed White's heteroskedasticity adjusted t-ratios, for instance, in the case of the Huber M-estimator the following results emerge for b_1: Bel. 2.06, Fra. 5.93, Net. 4.15, Swi. 2.91, UK 4.23, USA 3.58. Clearly, these adjusted t-ratios are much lower than the corresponding unadjusted even though they still exceed the standard significance levels. As far as the other coefficients are concerned only in the case of France the adjusted t-ratio of b_3 exceeds the 5 per cent level of significance.

8) The coherencies have been computed using the Tukey-Hanning window. The lag length is 40 and the number of observations 154. The variables are expressed in first differences. If one tests the hypothesis of zero coherency, the approximate cutoff value at the 5 per cent level of significance is .71. In the case of coherency between rs and rd this value is exeeded by the following percentage of coherency points: Belgium 6, France 55, the Netherlands 46, Switzerland 9, the United Kingdom 45 and the United States 35. For details of the corresponding test procedure see Koopmans (1974) and Groves and Hannan (1968).

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FIGURE 1

PRIVATE DISCOUNT RATES

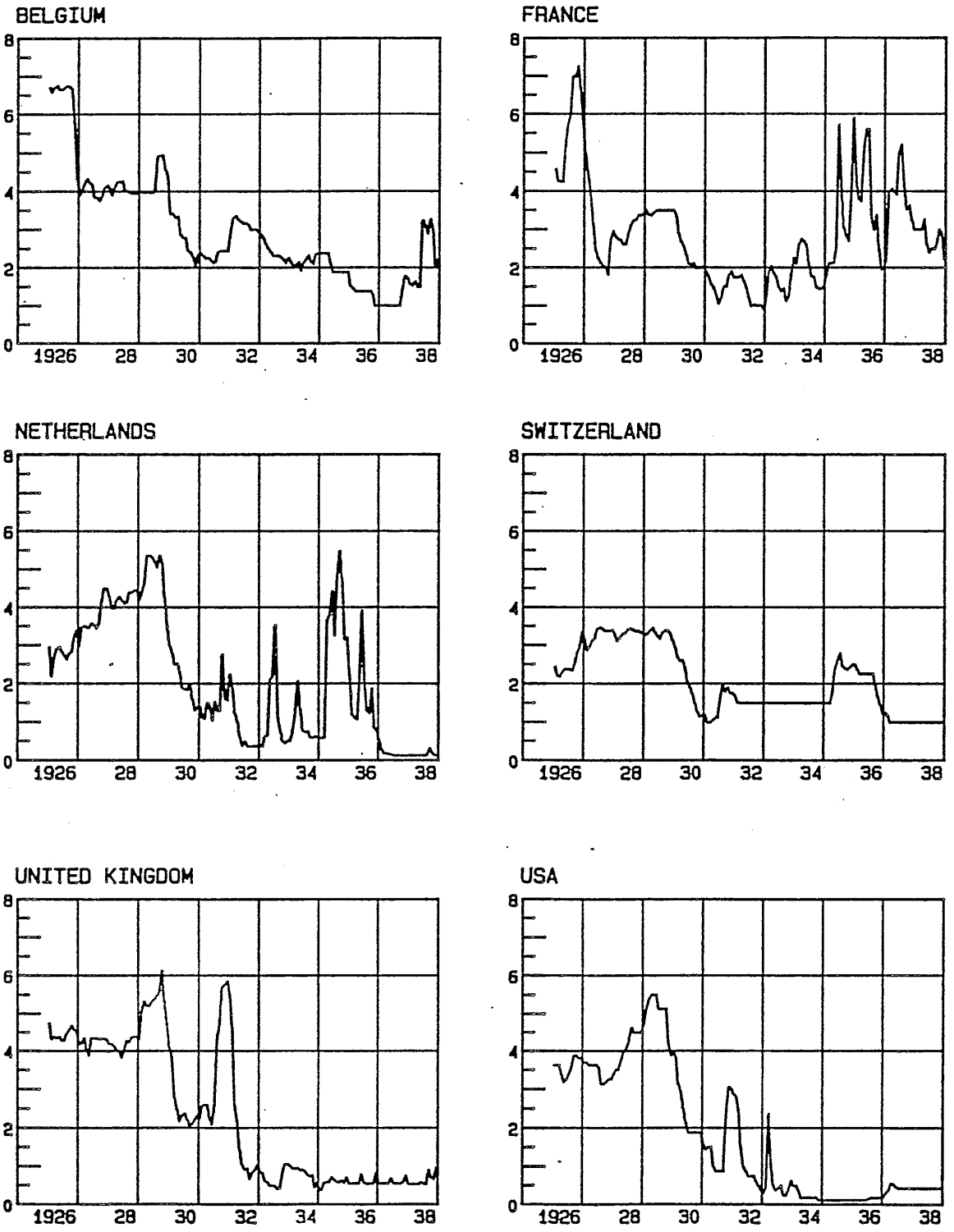
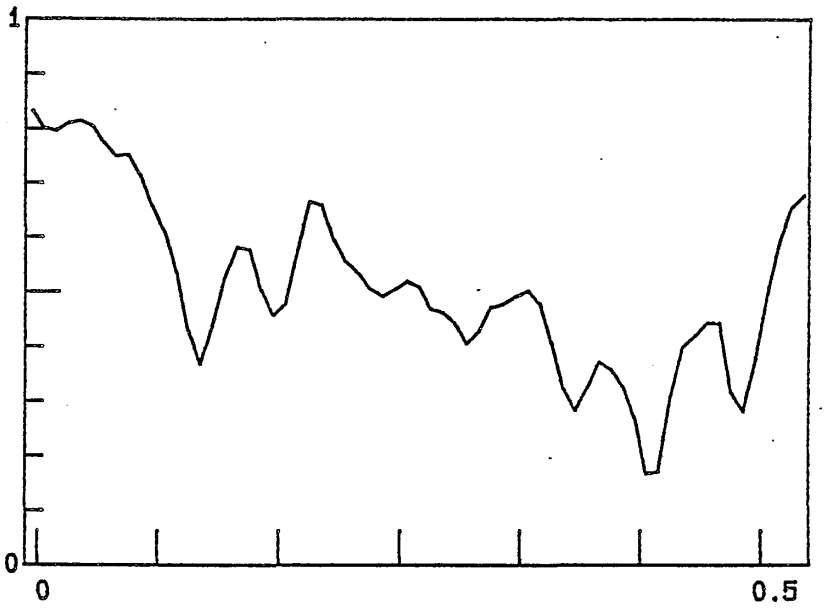


FIGURE 2

CROSS-COUNTRY AVERAGES OF COHERENCIES

rs and rd



rs and p

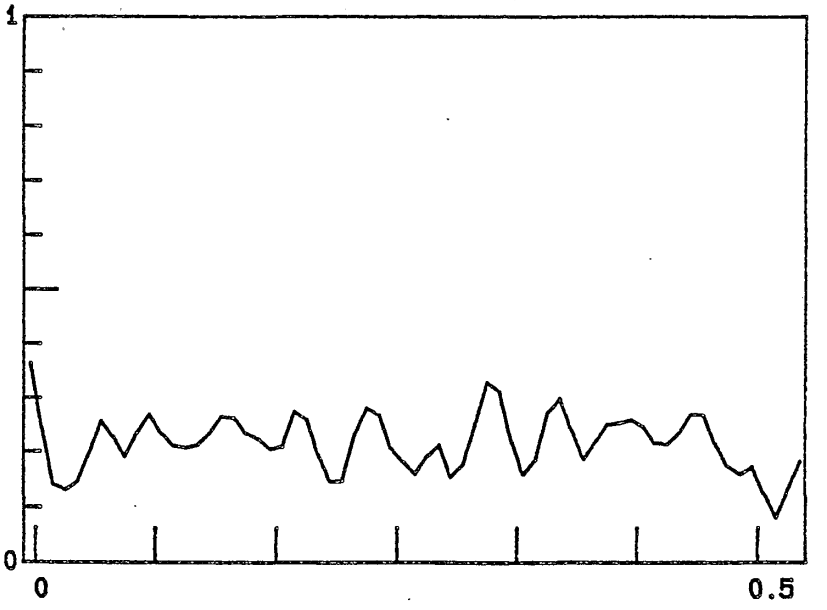


TABLE A1 Cross-Correlation Coefficients between Variables for the U.S. and Other Sample Countries

	rs		rb		rd		p		m		q	
Belgium	.77	(0)	.69	(0)	.75	(-24)	.27	(23)	.16	(2)	.17	(3)
France	.52	(-24)	-.34	(24)	.64	(-24)	.14	(24)	.17	(-24)	.17	(3)
Netherlands	.74	(0)	.89	(0)	.71	(-2)	.44	(0)	.24	(1)	.21	(-12)
Switzerland	.79	(-1)	.34	(0)	.85	(0)	.43	(0)	.24	(0)	.20	(-12)
United Kingdom	.93	(-1)	.88	(-24)	.85	(-2)	.48	(0)	.17	(9)	.24	(0)

Numbers are maximum absolute values of the sample cross-correlation coefficients between the U.S. variable and the lagged (k = -24, -23, ..., .23, 24) value of other countries' variable. Numbers in parentheses are the respective values of k; negative lags are leads. All correlation coefficients are positive except for rb in the case of France: the maximum positive value is .08 (0). A 5 per cent critical value for the correlation coefficient is .16. The unemployment rate is used for q in the case of the Netherlands and Switzerland.

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