CYCLICAL CLASSIFICATION
OF THE RWI SHORT TERM FORECAST
1997-3 TO 1999-4[1]

by

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Summary

This paper describes shortly the application of multivariate discriminant analysis to classify the RWI-macroeconomic short term forecast 1997-3 to 1999-4 into a four phase cycle scheme. It presents the empirical base, discusses the classification results and names directions of future work.

Key words: Business cycles, classification, short term forecast

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1 Slightly modified version of Rheinisch-Westfälisches Institut für Wirtschaftsforschung (Hrsg.), Zyklische Klassifikation der Prognose 1997-3 bis 1999-4. In: Die wirtschaftliche Entwicklung im Inland. „RWI-Konjunkturberichte", vol. 48 (1997), pp. 146-148.

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Introduction

Since a couple of years the cyclical dimension of short term economic development finds increasing interest among producers as well as consumers of forecasts. In correspondence with this fact, the *RWI-Konjunkturberichte* also started looking at comparable cyclical phases of the past when analysing the current stage and dynamics of GDP or of selected aggregates. The present paper reports on the RWI's most recent attempt to supplement and broaden traditional short term forecasting by statistical classification methods, more precisely linear discriminance analysis. The underlying idea is that the business cycle has to be understood as a *multivariate* phenomenon, that means that to date complete business cycles or their phases it is necessary to employ more variables than just GDP or industrial production, as usually done; it is rather necessary to employ variables reflecting the composition of GDP as well as of other markets (labour market, finance market).

Empirical and methodical considerations

The classification of the German business cycle used here follows a four phase scheme, comprising „lower turning point phase", „upswing", „upper turning point phase", and „downswing". The necessary *a priori* separation or dating of the complete cycles as well as of their different phases is based on deviations of industrial production from its long term trend. The analysis is made with quarterly data. The two turning point periods were defined as the quarters immediately proceeding and following the turning point-quarters, the remaining periods are classified as „upswing" and „downswing". The sample period of the classification exercise cov-

Table 1

Average Values of Classifying Variables during the cycle

	1963-1 bis 1994-4				1995-1 to 1996-4	1997-3 to 1999-4
	Lower turning point	Up-swing	Upper turning point	Down-swing		
Real GNP[1]	0,2	3,8	5,5	1,9	1,3	3,1
Real private consumption[1]	1,9	3,5	5,4	2,6	1,6	2,1
Real Investment in (comer-cial) construction[1]	-5,5	3,7	5,4	1,7	-3,7	0,7
Net exports as percent of GNP	3,0	3,9	3,3	3,2	0,4	2,0
Wage and salary earners[1]	-1,4	1,0	2,4	0,6	-0,9	0,2
Consumer price index [1]	4,5	2,3	3,7	4,6	1,6	1,5
GNP price deflator[1]	4,8	2,8	4,2	4,8	2,0	1,4
Short term interest rate	6,1	4,8	7,6	9,2	3,9	4,1
Long term interest rate	3,5	4,0	3,8	3,5	4,5	4,8
Unit labor cost[1]	4,9	2,2	4,0	6,6	0,6	-0,8
Money supply M1[1]	9,1	8,3	12,0	5,1	7,1	5,0
Government deficit as per-cent of GNP	-2,0	-1,4	-1,6	-1,6	-7,0	-2,5

Authors' computations. - 1) Percentage change on previous year.

ers the period 1963 to 1994. The data employed are those for West Germany, on account of quality we cannot yet use data for all Germany.

The *a posteriori* classification is based on *linear discriminant analysis* (Krzanowski 1990). The variables employed were selected with both theoretical deliberations and the "stylised facts" of the West German economy in mind. They include data of the

Table 2

Classification of West German Business Cycles into a Four-Stage Scheme
1963 to 1994

Cycle	Starting quarters[1]			
	Lower turning point	Upswing	Upper turning point	Downswing
1963-1 to 1966-4 (16)	1963-1 (1)	1963-2 (6)	1964-4 (3)	1965-3 (6)
1967-1 to 1971-1 (17)	1967-1 (4)	1968-1 (6)	1969-3 (2)	1970-1 (5)
1971-2 to 1974-1 (12)	1971-2 (4)	1972-2 (2)	1972-4 (2)	1973-2 (4)
1974-2 to 1982-1 (32)	1974-2 (7)	1976-1 (13)	1979-2 (4)	1980-2 (8)
1982-2 to 1994-1 (48)	1982-2 (6)	1983-4 (27)	1990-3 (6)	1992-1 (9)
1994-2 to ...	1994-2 (1)	1994-3 (2)	-	-

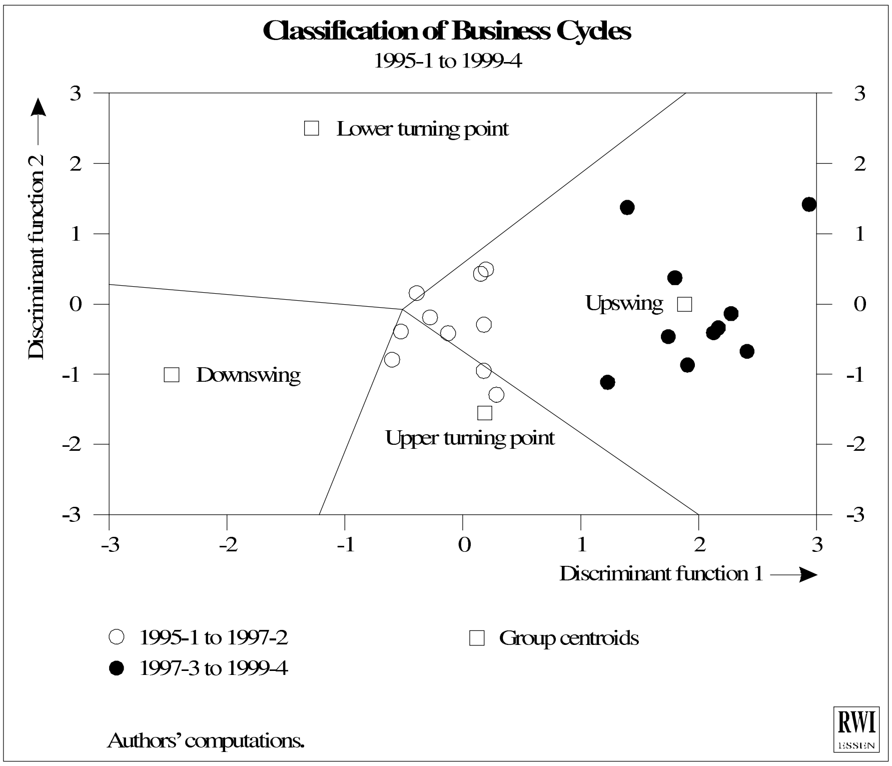
Authors' calculations. - 1) Cycle/phase length in parentheses (quarters).

side of GDP origin, demand, prices and of the monetary sector, from the foreign trade sector, and from the government sector, all in all twelve variables, which are listed in *Table 1*. Their selection and results of the discriminant analysis are discussed in Heilemann/Münch (1996). - The parameters of the discriminant functions are shown in *Table 3* (Appendix).

Classification results

The empirical characteristics of the various stages of the business cycle as developped here are due on the one hand to the estimated discriminant parameters and on the other hand to the average values of the variables („co-factors"), respectively, as shown in Table 1. There are considerable differences between the values for the

Figure 1



sample period of the discriminant analysis 1963-1 to 1994-4, the *ex post* period 1995-1 to 1996-4, and the *ex ante* forecast 1997-3 to 1999-4, such as a more restrained increase of the real variables, a clearly weaker price expansion, a decline of short term interest rates and higher real long term interest rates.

The *between* and *within* business cycle classifications are presented in *Table 2*. For the outside of the sample period (1995-1 to 1997-2) as well as for the ex ante period (1997-3 to 1999-4), the values of the first two discriminant functions (representing more than 90 % of the explanationary power; see Heilemann/Münch (1996)) are displayed in *Figure 1*.

The figure suggests the following idea of the current cyclical situation: ex post as well as ex ante periods are identified more or less as upswing phases, with the exception of the 1996-3 to 1997-2 interval which is classified as one quarter of an upper turning point phase, followed by two downswing periods. To a large extent, these results correspond to the interpretation in previous RWI business cycle reports (Rheinisch-Westfälisches Institut für Wirtschaftsforschung (Hrsg.), 1997, p. 35) and are in so far not surprising. However, the classification results allow additional conclusions. The ex post observations - classified by the two most important discriminant functions - are close to an upswing or barely beside, a further result confirmed by most analyses' of the forecasting community in 1997; in contrast to the ex post periods, the ex ante forecasts are classified near the group centroids of the upswing sector. In other words: The now predicted development from 1997-3 to 1999-4 again tends towards a "typical" upswing in the sence used here.

What can be said about the reasons for the slow upswing in 1995 and 1996 and its interruption at the end of 1996 in the light of the classification exercise? Weighted with the unstandardised discriminant coefficients, the contributions of the employed variables let us clearly discerne the decline of employment and price increases (GNP-deflator) as the main causes for the classification difficulties in the period previous to the upswing. In other words: labour markets and prices show a nontypical behaviour when measured against previous cyclical experiences in West Germany. In contrast to this, the strengthening of the upswing in the period forecast is the result of marked expansion of employment.

Outlook

Of course, this assessment should not ignore that the classification has been performed with predicted values, which in the end may not be accurate. However, up to now, the specification of the discriminant functions and hence the set of variables used for classification have proved to be robust so that the presentation of these first results here seems to be justified. Nevertheless, further methodical as well as substantial improvements of this approach are possible. They will be the subject of further studies within this project.

References

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SPSS, SPSS Professional statistics. Release 6.1. Chicago 1994.

Appendix

Table 3
Standardized Canonical Discriminant Function

Variable	Coefficients Function 1	2	3	F-Value to enter
Wage and salary earners	1.169	-.385	.284	34.8
Real GNP	.490	-.579	-.348	25.6
Government deficit	-.130	.486	.203	0.3
Net exports	.507	.152	-.408	1.2
Money supply M1	-.298	.035	.611	10.4
Unit labor cost	-.229	-.369	-1.132	15.4
GNP price deflator	1.326	2.464	1.252	16.8
Consumer price index	-.253	-.375	-.100	22.9
Real long term interest rate	1.276	1.580	.576	0.9
Real private consumption	-.817	-.093	.633	9.3
Real investment in commercial construction	-.176	-.018	-.348	11.7
Short term interest rate	-1.854	-1.297	.177	44.8

Function[1]	Eigen-value	% of variance explained	Cum. %	Canonical correl.	After function	Wilks' λ	χ^2	df	Signi-ficance
		:	0	.056826	341.26	36	.00		
1*	3.4815	61.50	61.50	.8814 :	1	.254665	162.77	22	.00
2*	1.7533	30.97	92.47	.7980 :	2	.701165	42.25	10	.00
3*	.4262	7.53	100.00	.5467 :					

Authors' computations. - 1) * marks the 3 canonical discriminant functions remaining in the analysis. For a detailed description of the statistical measures see SPSS (1994).