CLASSIFICATION OF GERMAN BUSINESS CYCLES USING MONTHLY DATA[1]

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Introduction

The recent renaissance of business cycle analysis has led to a renewed interest in business cycle classification as pioneered by *Burns/Mitchell*, *Spiethoff* and resumed in the seventies by *Meyer/Weinberg* (1975a, b). The rather successful elaboration and test of a "modern" four-phase classification scheme for the United States and West Germany by Meyer/Weinberg motivated the present authors to develop such a classification scheme for West Germany. Based on a kind of stylised facts it should help to translate the multifaced quantitative picture of the cycle into qualitative information. Its test and application were rather encouraging: The explanatory power of this new scheme was comparatively high – both ex post and ex ante, for the total cycle as well as for its phases (Heilemann, Muench 1999). The explanatory power attributed to the 12

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classifying variables was in line with common ideas of stylised facts. Sample period variations (leave one period out/leave one cycle out techniques), however, also revealed some breaks and shifts in the nature and structure of West German business cycles (Heilemann, Münch 1999, 638ff., Heilemann 1999).

While generally encouraging, in a technical and empirical sense the results suffered from two shortcomings: firstly, the classification was based on quarterly data with too few observations for a scrupulous testing of the scheme, in particular the (short) turning point periods; secondly, most of the classifying variables were from the National Accounts (NA), which means that they are available too late for classifying the current situation, hence the classification has to be made with forecast values of the employed variables.

The present paper aims to overcome both deficiencies by using monthly data, more precisely by substituting the NA data by survey data compiled by the *Ifo Institute*. Although, instead of the survey data we could have used objective data offered by the *Federal Statistical Office*. However, we were particularly interested in exploiting the particular nature of the Ifo-data with regard to its assessment of the current state of the German economy and as to expectations of its future development.

The next section (I) shortly reports on the classification scheme used; section II reviews classification methods, presents the data and the final set of variables. The results are shown in section III, and section IV summarizes the findings and gives some hints for future research.

I. The classification scheme

As the relevant literature on business cycle classification and its role up to now has been summed up in a previous paper (Heilemann, Münch 1999), we can be brief at this point. The prototype for the scheme used here was, as mentioned above, the scheme developed by Meyer/Weinberg (1975a, b). It consisted of four phases (*Recession*, *Recovery*, *Demand Pull*, and *Stagflation*) and was tested with some success for West Germany and other countries by its authors over the period 1951 to 1967.

The establishment of schemes to classify business cycles requires two steps: firstly, the separation between the (complete) cycles, and, secondly, the separation of the various phases *within* the cycles (with, of course, implications for the prior separation of the complete cycles). The derivation of our scheme for quarterly data has been described in detail in a previous paper (Heilemann, Muench 1999, pp. 634ff.). Due to this definition, business cycles are again composed of four stages: the *Lower Turning Point Phase* (LTP), the *Upswing* (UP), the *Upper Turning Point Phase* (UTP), and the *Downswing* (DOWN). The resulting timing of cycles differs not much from that revealed by other classification techniques e.g., rates of change in GDP/GNP (Tichy 1994, p. 44, Heilemann 2000, Tabelle 1).

The present monthly classification started from the "final" classification of quarterly data. As revealed in Table 1, duration and starting dates of the various cycles/phases are more or less the same as with the quarterly set of NA data. The only differences to be observed are with the start of some UP and UTP periods. In addition, it should be noted, that similar to the quarterly "final" classification, the classification here has been based on a kind of fitted classification (see below).

Table 1

Classification of West German business cycles into a four-stage scheme
1960-1 to 1997-1

	Cycle	Starting month[1] LTP	UP	UTP	DOWN
3	... to 1962-12 (54)	...	1960-1 (3)	1960-4 (15)	1961-7 (18)
4	1963-1 to 1966-12 (48)	1963-1 (3)	1963-4 (18)	1964-10 (9)	1965-7 (18)
5	1967-1 to 1971-3 (51)	1967-1 (14)	1968-3 (17)	1969-8 (7)	1970-3 (13)
6	1971-4 to 1974-2 (35)	1971-4 (11)	1972-3 (7)	1972-10 (7)	1973-5 (10)
7	1974-3 to 1982-5 (99)	1974-3 (21)	1975-12 (42)	1979-6 (10)	1980-4 (26)
8	1982-6 to 1994-3 (142)	1982-6 (18)	1983-12 (77)	1990-5 (20)	1992-1 (27)
9	1994-4 to ...	1994-4 (1)	1994-5 (33)	-	-
	All 1960-1 to 1997-1 (445)	(68)	(197)	(68)	(112)

Authors‘ computations. – LTP: Lower Turning Point Phase; UP: Upswing; UTP: Upper Turing Point Phase; DOWN: Downswing. – 1) Cycle/phase length in parentheses.

II. Method, data, and variables

Method

Modern classification analysis comprises a multitude of procedures for separation of groups and objects. Besides the oldest and most simple technique of linear discriminant analysis (LDA, see Heilemann, Weihs 2000) modern procedures such as neural networks (NN, see Ripley 1994) and classification trees (TREE, see Breiman et al. 1984) have been developed. All these classification techniques differ in the way they separate the groups (phases of the business cycle) in the multidimensional space. The reasons for applying LDA here are again its robustness, its particularly large analytical possibilities and its clarity due to the linear character of the discriminant functions (see Erb 1990, p. 5). Due to limited space, this paper reports only on LDA results. Classification results for NN and TREE - which were not noticeable different from those obtained by LDA - and parameter results - which are hard to compare with LDA - are available from the authors.

Data/Variables

The selection of the variable set employed in the analysis is of crucial importance. In previous studies (Heilemann, Muench 1996, 1999, Weihs, Sondhauss 2000) quarterly NA data and some monetary variables for the 1955 to 1994 period were used. The first classification had started with more than 120 ("objective") variables, which, on the basis of literature and experience, were regarded as relevant for business cycle analysis. Formal selection criteria such as Wilks' λ (see Brosius 1989) together with ensuring that all important fields of economic activity were included resulted in a final list of 12 variables.

In order not only to test the cyclical relevance of other variables but also to overcome the deficiency of the quarterly time series, the present study employs monthly data. Because of our genuine interests in the explanatory power of survey data and because of monthly NA data are not available for Germany, we utilize survey data as published by the Ifo-Institute (Ifo Business Survey for Industry; see Oppenlaender, Poser (eds.) 1989); objective variables such as orders, production, prices etc. were not available for the highest aggregation level in the necessary length and in a consistent way. The Ifo-data examined comprised the seasonally adjusted answers to the 11 monthly recurring questions for Investment goods and Consumer goods manufacturing industry and the corresponding business climate series for the period 1961-1 to 1997-1. Since classification results based exclusively on survey data were successful only to a limited extent, the set was supplemented by two interest rates and the unemployment rate.

Monthly equivalents for these variables are missing in the survey set and these variables played a considerable role in the quarterly classification. The selection from these 27 variables was solely made with the help of formal selection criteria and resulted in a final list of 11 variables (see Figure* in the Appendix):

Three variables from the *Consumer goods manufacturing industry* (C):

Change in production versus preceding month (C)
Assessment of finished goods inventories (C)
Assessment of order backlog (C)

Five variables from the *Investment goods manufacturing industry* (I):

Assessment of order backlog (I)
Expected change in sales prices during the next three months (I)
Expected exports during the next three months (I)
Expected change in business situation during the next six months (I)
Business climate (I)

Additional variables from the monetary and employment sphere

Short-term interest rate
Long-term interest rate
Unemployment rate

Though this set is the product of formal selection criteria, an at least plausible cyclical meaning of the variables is not all to difficult to establish.

III. Results

Classification Properties

The present scheme (classification, variables) was developed for the period 1961-1 to 1997-1, the lack of pre-1961 Ifo-data preventing an earlier start. The new set of

Table 2

Estimation records for the standardized canonical discriminant functions[1]

1961-1 to 1997-1

Variable[2]		Coefficients Function 1	2	3	F Value to enter
Expected exports during the next three months (I)	a	.45	-.39	-.20	56.8
	b	.88	-.11	-.27	72.4
	c	.66	.13	-.60	67.2
	d	.53	.26	-.80	47.6
Exp. change in business situation during the next six months (I)	a	-.52	1.20	.72	50.8
	b	-1.15	.48	.67	59.7
	c	-1.22	.44	1.03	63.8
	d	-.52	-.06	1.55	73.2
Change in production versus preceding month (C)	a	-.47	-.33	-.36	38.6
	b	-.21	-.51	-.35	48.8
	c	-.65	-.33	-.63	48.4
	d	-.64	-.51	-.37	52.0
Assessment of order backlog (I)	a	-1.55	1.62	.88	65.2
	b	-1..33	-.32	.69	64.8
	c	-2.02	-.08	.44	56.9
	d	-.40	-.84	1.30	70.7
Expected change in sales prises during the next three months (I)	a	.24	-.46	.12	3.7
	b	.34	-.05	.10	5.1
	c	.43	-.01	.08	5.8
	d	.41	-.15	-.03	5.7
Business climate (I)	a	1.78	-2.31	-.92	78.8
	b	2.01	-.03	-.80	92.0
	c	2.62	-.25	-.87	92.6
	d	1.13	.58	-1.67	129.0
Assessment of finished goods inventories (C)	a	.95	.50	-.65	56.7
	b	.82	.88	-.54	61.7
	c	.58	1.01	.37	57.5
	d	.31	1.00	.50	54.5
Assessment of order backlog (C)	a	1.20	1.03	.43	73.0
	b	.82	1.27	.60	79.3
	c	1.16	1.17	1.52	83.3
	d	.90	1.33	.86	81.4
Short-term interest rate	a	.79	.99	-.57	79.0
	b	-.59	1.27	-.40	153.1
	c	-1.06	1.11	-.37	203.5
	d	-1.28	.98	-.35	183.0
Long-term interest rate	a	-.93	-.06	.60	54.6
	b	-.46	-.70	.53	82.1
	c	-.05	-.85	.68	82.6
	d	.06	-.57	.77	83.7
Unemployment rate	a	-.80	-.16	.42	113.4
	b	-.41	-.72	.38	109.2
	c	-.34	-.80	.02	104.8
	d	-.20	-.72	-.06	131.9

Table 2, continued

Eigenvalues

	Function[3]	Eigen-val.	% of variance	cum. %	canonical correl.	after function	Wilks' λ	χ^2	df	Significance
	1*	1.8	58.7	58.7	.80:	1	.1	831.9	33	.00
a	2*	1.0	33.1	91.9	.71:	2	.4	393.4	20	.00
	3*	.25	8.1	100.0	.45:		.8	95.0	9	.00
	1*	2.9	62.4	62.4	.86:	1	.1	1,013.0	33	.00
b	2*	1.46	31.1	93.6	.77:	2	.3	465.6	20	.00
	3*	.30	6.4	100.0	.48:		.8	105.4	9	.00
	1*	4.2	65.4	65.4	.90:	1	.1	1,069.6	33	.00
c	2*	1.7	27.3	92.7	.80:	2	.3	490.3	20	.00
	3*	.5	7.3	100.0	.56:		.7	134.6	9	.00
	1*	5.4	68.7	68.7	.92:	1	.03	1,018.3	33	.00
d	2*	1.9	23.6	92.3	.8:	2	.2	459.0	20	.00
	3*	.6	7.7	100.0	.6:		.6	142,654	9	.00

Authors' computations. Eigenval: eigenvalues of the discriminant functions in declining order. % of variance: % importance of the discriminant functions. cum %: cumulative importance in relative terms. df: degrees of freedom. For a detailed description of the statistics see Brosius (1989). - 1) a: Results for period 1961-1 to 1997-1, b: 1963-1 to 1997-1, c: 1967-1 to 1997-1, d: 1971-4 to 1997-1. - 2) I and C in parentheses stand for **I**nvestment and **C**onsumer good manfuactoring industry, resp. - 3) * marks the 3 canonical discriminant functions remaining in the analysis.

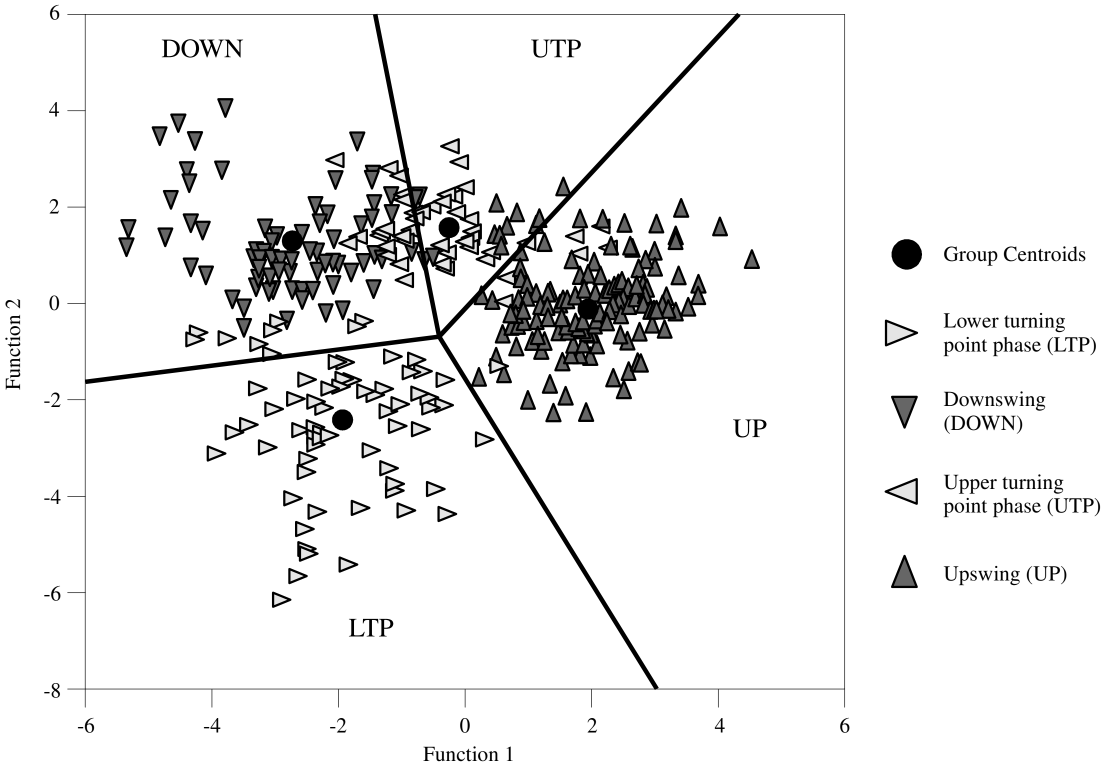
variables corroborated in general the four-phase scheme and the dating of cycles/phases as established with the quarterly data. This allows us to repeal here the general cyclical subject matter and implications of the scheme, which has been laid out in a previous paper (Heilemann, Muench 1999, pp. 638ff.) and to concentrate on the explanatory contribution of the Ifo-data.

The discriminant functions and classification results confirm the classification scheme remarkably well. The classification is generally met with no phases missing (Table 1). As to the statistical properties of the discriminant functions, the first function explains

Figure

Classification results[1]

1967-1 to 1997-1



Authors' calculations. – [1]The first two canonical discriminant functions with boundaries of classification regions; the third function has been neglected here.

about 59 % of the variance, the second about 33% which are nearly the same ratios as those of the original set (Table 2). – These results are also remarkable with respect to the original scheme, since a further, comparatively strong test (different variables, different periodicity) has now been passed.

The Figure illustrates the classification behaviour of the first two discriminant functions by plotting their scores and group centroids. Although the picture is not so clear-cut as

Table 3

Classification results for different samples

Actual group	No. of cases	LTP	UP	UTP	DOWN
		Predicted group membership			
		1961-1 to 1997-1			
		All			
LTP	68	59	6	0	3
		86.8%	8.8%	.0%	4.4%
UP	194	6	165	23	0
		3.1%	85.1%	11.9%	.0%
UTP	59	0	9	42	8
		.0%	15.3%	71.2%	13.6%
DOWN	112	1	16	21	74
		.9%	14.3%	18.8%	66.1%
Total error rate: 21.5%					
		1963-1 to 1997-1			
LTP	68	60	1	1	6
		88.2%	1.5%	1.5%	8.8%
UP	194	4	178	12	0
		2.1%	91.8%	6.2%	.0%
UTP	53	0	3	44	6
		.0%	5.7%	83.0%	11.3%
DOWN	94	0	0	18	76
		.0%	.0%	19.1%	80.9%
Total error rate: 12.51%					
		1971-4 to 1997-1			
LTP	51	45	1	0	5
		88.2%	2.0%	.0%	9.8%
UP	159	0	149	10	0
		.0%	93.7%	6.3%	.0%
UTP	37	0	1	36	0
		.0%	2.7%	97.3%	.0%
DOWN	63	1	0	4	58
		1.6%	.0%	6.3%	92.1%
Total error rate: 7.13%					

Authors‘ computations. – LTP: Lower Turning Point Phase; UP: Upswing; UTP: Upper Turning Point Phase; DOWN: Downswing.

one would like it to be (partly a consequence of the missing third discriminant function), the group centroids are well separated and the UP and DOWN phases as well as the in-between phases face each other as expected.

All in all, the explanatory power of the classifications is not as high as that of the original (quarterly) set (Table 3). However, this changes when the 60s are eliminated from the sample period. The explanation for the different stages looks less clear, in particular the UTP and DOWN phases. Closer inspections reveal, as with the original set, that about two third of the misclassification show up at the border-line of the phases. Particularly significant errors of this type occur from 1982-6 to 1982-11 where the downswing is missed, and from 1989-8 to 1990-4 where an upswing is indicated when the classification scheme still sees a LTP. While the latter is definitely a consequence of unification and the high economic aspirations generated then, the 1982 misclassification may be the result of overly optimistic expectations stimulated by the change in government. Other misclassifications occur between 1970-2 and 1970-8, which may be a consequence of the announcement of contractive fiscal policies and currency turmoils, and in 1973-2 which may also be a result of currency turmoil and the break down of the *Bretton Woods* System. Most of these findings and the classification difficulties they point at are backed by the fact that in these cases the quarterly classification (as indicated by the probabilities) is also "weak" (Heilemann, Muench 1999, Table 1*, Appendix). In any case it should be remembered that we have chosen a classification based on a rather inhomogeneous set of variables. For a further cyclical evaluation, Table 4 presents the average values for the classification variables. Similar to the NA data of the set previously examined, they more or less confirm common expectations

Table 4

Average values of classifying variables
1961-1 to 1997-1

Variable[1]		LTP	UP	UTP	DOWN	ALL
Expected exports during the next three months (I)	a	-15.4	4.3	.2	-4.5	-1.6
	b	-15.4	4.3	-3.0	-7.2	-2.6
	c	-15.3	5.1	-2.6	-5.1	-1.6
	d	-12.0	5.1	-1.1	-5.4	-.6
Exp. change in business situation during the next six months (I)	a	-13.2	3.9	4.1	-13.3	-3.2
	b	-13.2	3.9	4.0	-16.6	-3.6
	c	-14.0	2.7	.9	-20.2	-5.3
	d	-19.8	.7	-.4	-21.6	-7.3
Change in production versus preceding month (C)	a	-9.8	-.2	3.0	-8.7	-3.5
	b	-9.8	-.2	3.3	-11.1	-3.8
	c	-10.1	-.7	2.3	-13.2	-4.7
	d	-10.9	-2.2	1.9	-15.2	-5.8
Assessment of order backlog (I)	a	-40.0	-14.0	10.1	-19.4	-16.2
	b	-40.0	-14.0	6.9	-24.8	-18.1
	c	-41.2	-15.2	7.2	-25.8	-19.3
	d	-39.2	-18.1	.5	-35.5	-22.9
Expected change in sales prices during the next three months (I)	a	11.9	12.4	17.4	12.0	12.9
	b	11.9	12.4	18.8	12.9	13.2
	c	12.5	12.6	20.1	14.3	13.9
	d	17.3	12.4	17.7	12.2	13.8
Business climate (I)	a	-17.7	6.9	18.4	-6.9	-1.0
	b	-17.7	6.9	17.3	-11.6	-7.8
	c	-18.9	5.5	15.1	-15.0	-2.0
	d	-21.8	3.0	11.8	-20.1	-4.7
Assessment of finished goods inventories (C)	a	28.3	18.4	11.7	23.7	20.4
	b	28.3	18.4	11.2	25.1	20.6
	c	28.8	18.9	13.3	26.1	21.5
	d	26.8	20.5	14.5	27.3	22.2
Assessment of order backlog (C)	a	-47.2	-25.8	-7.9	-33.7	-28.8
	b	-47.2	-25.8	-7.7	-37.8	-29.8
	c	-48.3	-27.2	-9.3	-42.1	-32.0
	d	-47.8	-30.1	-11.1	-45.6	-33.9
Short term interest rate	a	6.2	4.7	7.5	8.3	6.2
	b	6.2	4.7	7.9	9.2	6.4
	c	6.3	4.7	8.6	9.9	6.6
	d	6.9	4.8	8.7	10.0	6.7
Long term interest rate	a	8.2	6.6	7.7	7.9	7.4
	b	8.2	6.6	8.0	8.3	7.4
	c	8.3	6.7	8.3	8.4	7.5
	d	8.6	6.7	8.5	8.5	7.6
Unemployment rate	a	84.2	-2.8	-14.6	12.5	13.2
	b	84.2	-2.8	-12.2	18.3	15.3
	c	86.4	-3.4	-12.9	19.2	16.3
	d	61.9	.9	-8.6	24.5	14.6

Authors' computations. – LTP: Lower Turning Point Phase; UP: Upswing; UTP: Upper Turning Point Phase; DOWN: Downswing. – 1) a: Results for period 1961-1 to 1997-1, b: 1963-1 to 1997-1, c: 1967-1 to 1997-1, d: 1971-4 to 1997-1.

about their cyclical behaviour. In a simplified form, the phases might be portrayed as follows: for the assessment variables (*Assessment of finished goods inventories (C), Assessment of order backlog (C, I)*) the cycle starts in the LTP-phase; for most expectation variables (*Expected change in sales prices during the next three months (I), Expected exports during the next three months (I), Expected change in business situation during the next six months (I)*), this role plays the UP phase. No convincing picture is given by the *Unemployment rate* (change rate) which reflects the increasing trend since the 70's.

Parameters

As to the classificatory power of the variables, table 2 reveals a number of interesting features. Firstly, the separation between the upswing and the downswing phases seems to be primarily generated by the assessment variables *Business climate (I)*, *Assessment of backlog (C, I)*, and *Assessment of finished goods inventories (I)* and the S*hort-term interest rate*; the separation within both phases is very much determined by these, but also by the forward looking variable *Expectation change in business situation during the next six months (I)*. It should be noticed, however, that the hierarchy of explanatory power of the single variables is very different from that of the weights attributed in the multivariate approach. Over the 1967/1997 period the short-term interest rate, the change in unemployment rate (hit rate: 60 %) and long term interest rate (56 %) are much superior to the *Expected exports during the next three months (I)* (50 %) or *Assessment of finished goods inventories (C)* (47 %). In particular, it should be noted that the explanatory power of *The Business climate (I)* is at 41 % comparatively small – an experience not unlike that made with real GDP (43 %) in the original set, again pointing at the multivariate character of the business cycle. The parameter results can hardly be compared to those of the original set. But some implications should be kept in mind: firstly, the Business climate (I) is an important classifier but it needs to be complemented by other judgement variables; second, most expectation variables as well as the actual production do not seem to be of particular discriminative power; third, the ”surviving” variables of the original set – interest rates, change in unemployment rate (replacing employment growth) – lost much of their previous classificatory importance.

Changes

German business cycle characteristics have changed considerably over the last 40 years (for some of the reasons see Heilemann, Muench 1999, pp. 633ff.) and any classification scheme will reflect this. Hence it was not surprising that we have had similar experiences with regard to shifts of explanatory power of the discriminant functions and of the weights of the parameters with the original set.

As to the explanatory power, again it is much improved when the start of the sample period is shifted forward as Table 3 displays (for the 1967-1 to 1997-1 sample period results see Table 5). The benefits are greatest when the 1961/63 period is eliminated from the sample period, but those from the elimination of the 1963/71 are considerable too. Both results indicate, as with the original set, considerable changes in

Table 5

Classification results for the 1967-1 to 1997-1 period
1967-1 to 1997-1

Actual group	No. of cases	Predicted group membership LTP	UP	UTP	DOWN
		All			
LTP	65	57	2	0	6
		87.7%	3.1%	.0%	9.2%
UP	176	1	164	11	0
		.6%	93.2%	6.3%	.0%
UTP	44	0	4	39	1
		.0%	9.1%	88.6%	2.3%
DOWN	76	0	0	3	73
		.0%	.0%	3.9%	96.1%
Total error rate: 7.8%					
		"Leave one out"[1]			
LTP	65	56	2	1	6
		86.2%	3.1%	1.5%	9.2%
UP	176	1	164	11	0
		.6%	93.2%	6.3%	.0%
UTP	44	0	5	37	2
		.0%	11.4%	84.1%	4.5%
DOWN	76	0	0	5	71
		.0%	.0%	6.6%	93.4%
Total error rate: 9.1%					
		For cycle 5 (1967-1 to 1971-3)[2]			
LTP	14	13	0	1	1
		92.9%	.0%	7.1%	.0%
UP	17	0	13	4	0
		.0%	76.5%	23.5%	.0%
UTP	7	0	1	6	0
		.0%	14.3%	85.7%	.0%
DOWN	13	1	1	11	0
		7.7%	7.7%	84.6%	.0%
Total error rate: 37.3%					
		For cycle 6 (1971-4 to 1974-2)[2]			
LTP	12	8	0	4	0
		66.7%	.0%	33.3%	.0%
UP	7	0	7	0	0
		.0%	100.0%	.0%	.0%
UTP	7	0	3	4	0
		.0%	42.9%	57.1%	.0%
DOWN	10	0	0	0	10
		.0%	.0%	.0%	100.0%
Total error rate: 19.4%					
		For cycle 7 (1974-3 to 1982-5)[2]			
LTP	20	20	0	0	0
		100.0%	.0%	.0%	.0%
UP	42	2	40	0	0
		4.8%	95.2%	.0%	.0%
UTP	10	0	3	4	3
		.0%	30.0%	40.0%	30.0%
DOWN	24	3	0	0	21
		12.5%	.0%	.0%	87.5%
Total error rate: 11.5%					

Table 5, continued

Actual group	No. of cases	Predicted group membership LTP	UP	UTP	DOWN
		For cycle 8 (1982-6 to 1994-3)[2]			
LTP	18	14	0	0	4
		77.8%	.0%	.0%	22.2%
UP	77	0	65	12	0
		.0%	84.4%	15.6%	.0%
UTP	20	1	0	12	7
		5.0%	.0%	60.0%	35.0%
DOWN	29	5	4	1	19
		17.2%	13.8%	3.4%	65.5%
Total error rate: 23.6%					
		For part of cycle 9 (1994-4 to 1997-1)[2]			
LTP	1	0	0	0	1
		.0%	.0%	.0%	100.0%
UP	33	0	33	0	0
		.0%	100.0%	.0%	.0%
UTP	0	0	0	0	0
		.0%	.0%	.0%	.0%
DOWN	0	0	0	0	0
		.0%	.0%	.0%	.0%
Total error rate: 2.9%					

Authors‘ computations. – LTP: Lower Turning Point Phase; UP: Upswing; UTP: Upper Turning Point Phase; DOWN: Downswing. – 1) Successive elimination of one month from the sample period. – 2) Classification same as cycle excluded from the sample.

business cycles but the results do not allow conclusions about the causes or even the structure of these changes, one of the reasons being the qualitative character of the classification scheme.

Some hints on such changes can be found in the development of the parameter of the discriminant functions. As to the first function, the role of the *Business climate (I)* and of *Assessment of order backlog (I)* is rather stable in the various sample periods, though with the 5th cycle the *Short term interest rate* suddenly gains considerable importance while the *Order backlog (C)* looses. The second discriminant function first governed by

Business climate (I) is increasingly dominated by *Assessment of order backlog (C)* but also by a greater role of the S*hort-term interest rate* and the *Unemployment rate*. Economically, these shifts are plausible given the increasing meaning of financial variables and the increasing role of Unemployment.

As to the four classes of Ifo-data, interesting questions are, first, the role/parameters of *assessment variables* and *expectation variables* and, secondly, the role of indicators of *consumer goods* industries and *investment goods* industries. As to the former class, in general the assessment variables are much more important (and stable) than the expectation variables; as to the latter the picture is rather balanced.

IV. Summary and conclusions

Replacing a quarterly based classification analysis of West German business cycles with a set of monthly and mostly survey variables, the results of the present study confirm more or less the classification results of the former. Although in some cases, such as with the change of government in 1982 or with German unification at the end of 1989/beginning of 1990, the correct phase is missed, the overall performance is as convincing as that with quarterly data. Given the rather quick availability of the data employed, these results improve very much the functioning of the classification scheme. In addition, they may also be used as an easy check of the usefulness of the overall scheme emerging from the survey data.

From a subject matter point of view, two results should be emphasised: firstly, the comparatively great weights of interest rates and employment found in the preceding study are to some extent confirmed; secondly, from the Ifo-data employed here the assessment variables seem to be more important than the expectation variables. It should also be noted, that prices are of minor importance in the present set of variables.

The methodical implications and possibilities of the scheme in general have been laid out in detail elsewhere (Heilemann 1999). Even though the present study is still at the explorative stage, it seems obvious that the scheme and the classification analysis offer interesting possibilities to test the explanatory capabilities of the Ifo-data as the quarterly scheme does for macroeconometric models. Here the results can serve as a guide as to tracking shifts in the nature and structure of business cycles such as the increasing importance of interest rates or the decline in the *Expected change in business situation during the next six months*. First of all, however, the monthly data improve very much the use of the scheme in the daily business cycle analysis. Whether this holds for the "objective" monthly data on orders, promotion, prices and income will have to be examined.

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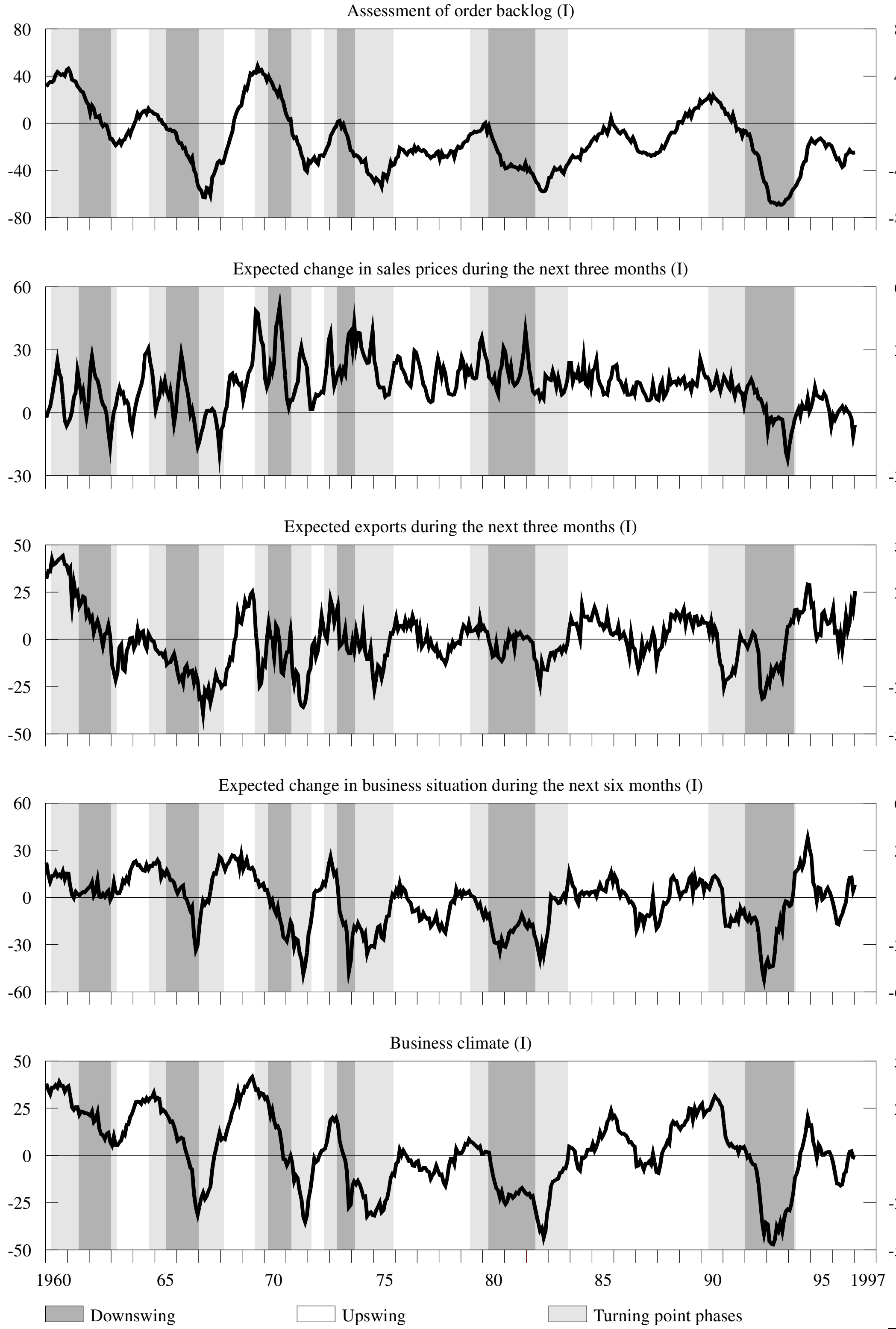
Appendix

Figure*

Classification variables[1]

1960-1 to 1997-1



Authors' computations. – 1) I and C in parentheses stand for Investment and Consumer good manufactoring industry, resp.

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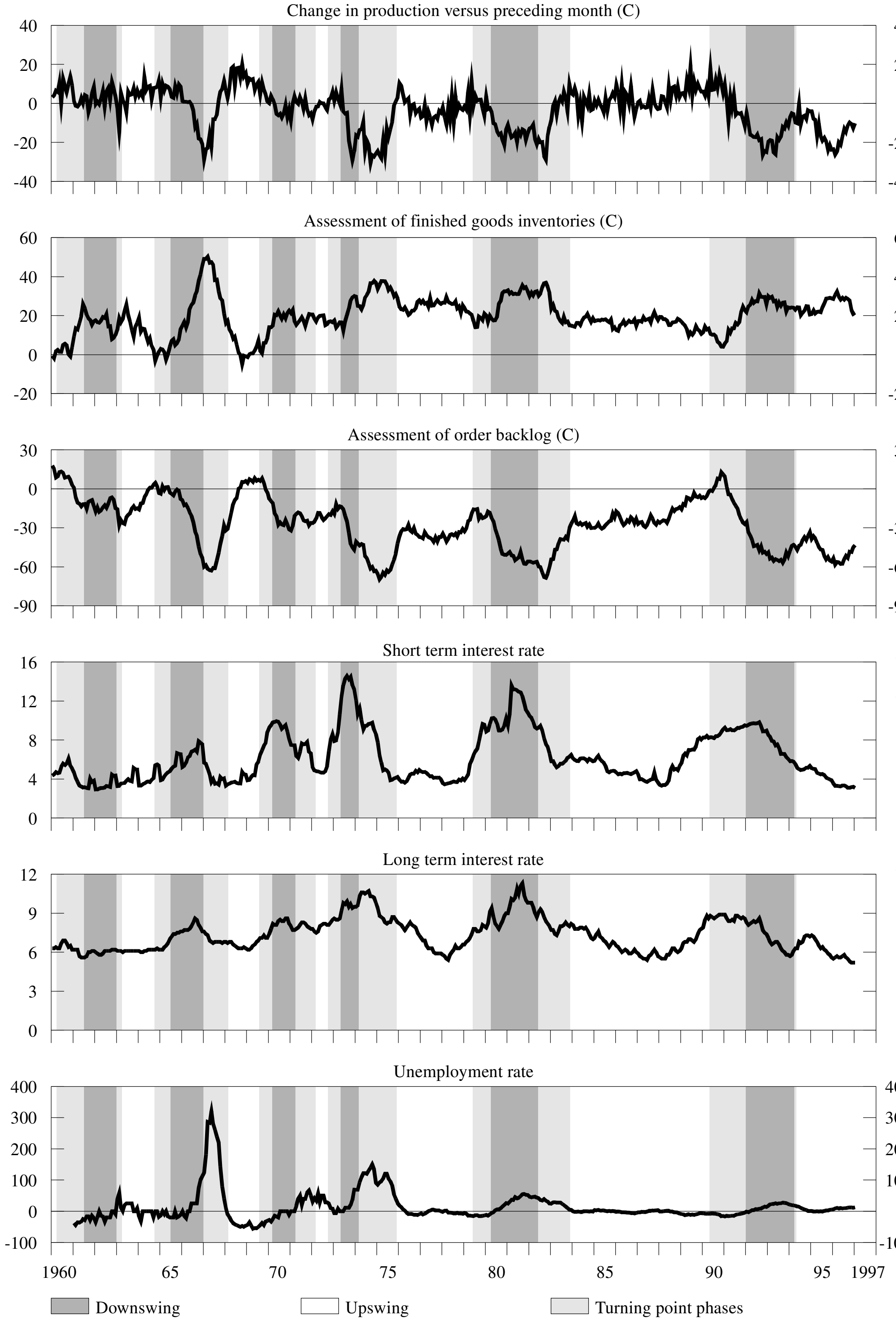
Figure*, continued

Classification variables[1]

1960-1 to 1997-1



Authors' computations. – 1) I and C in parentheses stand for Investment and Consumer good manufactoring industry, resp.

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