Chapter Title: Appendix D: Average Monthly Percentage Amplitudes and Related Measures for New Orders, Production, and Shipments: Additional Evidence

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APPENDIX D

AVERAGE MONTHLY PERCENTAGE AMPLITUDES AND RELATED MEASURES FOR NEW ORDERS, PRODUCTION, AND SHIPMENTS: ADDITIONAL EVIDENCE

MONTHLY PERCENTAGE CHANGES in the seasonal, trend-cycle, and irregular components, as well as some related measures, have been computed for many time series on new orders (N), shipments (S), and production (Z) in the process of adjusting these data for seasonal variation. Such statistics were presented and discussed in Chapter 3 for groups of series matched by industry and period. In Table D-1, estimates of the same type are shown for selected industries and products, including several cases where data on N and S or Z correspond only approximately, having overlapping rather than coextensive periods of coverage.[1]

The comparisons in Table D-1 indicate again, with strong regularity, that the mean amplitudes of the seasonally adjusted series and of their cyclical and irregular components are greater for new orders than for shipments, often by large differentials. The same is generally true for the original (unadjusted) series and the seasonal components. Furthermore, the average amplitudes for production also are systematically smaller than the corresponding measures for new orders. In fact, they

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[1] The items in this category are machine tools, lumber, oak flooring, printing and publishing, and leather and leather products. In one case, there is also an analogous divergence in product coverage (for the iron and steel and metal products series in lines 1–3). Measures based on exactly matched series are available for the remaining items: electric overhead cranes; railroad freight cars; southern pine lumber; furniture; paper, excluding building paper, newsprint, and paperboard; boxboard and paperboard; printing and publishing; leather and leather products. See Table D-1, column 1.

Table D-1
Average Monthly Percentage Amplitudes and Related Measures of the Irregular and Cyclical Components of New Orders, Shipments, and Production, Selected Industries, 1919–58

| Line | Variable and Period Covered[a] (1) | Average Monthly Amplitude[b] of | | | | | Ratio, $\bar{I}/\overline{Cy}$ (MCD[b] in brackets) (7) | ADR[b] (8) |
		$\overline{Or}$ (2)	$\overline{Se}$ (3)	$\overline{Cyl}$ (4)	$\bar{I}$ (5)	$\overline{Cy}$ (6)		
IRON AND STEEL — METALS[c]								
1	N, 1920–33	12.3	8.1	9.1	7.7	4.4	1.8[3]	2.01
2	Z, 1919–39	8.7	3.9	7.5	5.6	5.5	1.0[2]	3.59
3	Z, 1924–39	13.2	3.0	6.1	4.0	4.0	1.0[2]	3.47
MACHINE TOOLS[d]								
4	N, 1940–56	19.4	7.7	16.2	14.8	6.4	2.3[3]	1.80
5	S, 1945–56	10.9	7.8	6.4	5.4	2.8	1.9[2]	2.03
ELECTRIC OVERHEAD CRANES								
6	N, 1925–46	50.1	19.6	43.1	40.5	8.6	4.7[5]	1.63
7	S, 1925–46	28.3	10.3	24.7	23.9	6.7	3.6[4]	1.58
RAILROAD FREIGHT CARS								
8	N, 1941–56	154.2	98.0	143.7	157.6	21.8	7.2[n.a.]	n.a.
9	S, 1941–56	17.4	8.5	14.0	11.2	7.0	1.6[4]	2.21
LUMBER INDEX[e]								
10	N, 1920–33	13.8	9.5	9.4	8.2	3.5	2.3[3]	2.12
11	Z, 1919–39	n.a.	n.a.	4.0	3.0	2.0	1.5[2]	2.56
12	N, 1953–62	9.1	5.4	6.2	6.0	1.6	3.7[3]	1.44
13	Z, 1947–56	n.a.	n.a.	3.5	3.3	1.0	3.4[5]	1.84
OAK FLOORING								
14	N, 1936–56	17.1	8.9	13.2	11.9	3.9	3.1[4]	2.02
15	S, 1941–55	n.a.	n.a.	n.a.	6.2	2.6	2.3[n.a.]	1.98
SOUTHERN PINE LUMBER								
16	N, 1929–56	10.8	7.6	7.7	7.2	2.6	2.7[4]	1.73
17	S, 1929–56	n.a.	7.0	n.a.	4.9	2.2	2.3[n.a.]	1.93
18	Z, 1929–56	n.a.	4.7	n.a.	4.2	2.1	2.0[n.a.]	1.82
FURNITURE[f]								
19	N, 1923–46	36.8	26.4	18.1	17.5	4.8	3.7[4]	1.87
20	S, 1923–46	13.1	10.3	8.0	7.2	2.7	2.7[3]	2.17

(continued)

Table D-1 (concluded)

Line	Variable and Period Covered[a] (1)	Average Monthly Amplitude[b] of					Ratio, $\overline{I}/\overline{Cy}$[b] (MCD[b] in brackets) (7)	ADR[b] (8)
		$\overline{Or}$ (2)	$\overline{Se}$ (3)	$\overline{Cyl}$ (4)	$\overline{I}$ (5)	$\overline{Cy}$ (6)		
PAPER, EXCLUDING BUILDING PAPER, NEWSPRINT, AND PAPERBOARD								
21	N, 1934–55	7.2	5.7	4.3	3.7	1.7	2.2[3]	1.96
22	S, 1934–55	6.5	5.7	3.0	2.6	1.3	2.0[n.a.]	1.70
23	Z, 1934–55	n.a.	n.a.	2.3	1.8	1.2	1.5[n.a.]	2.05
BOXBOARD AND PAPERBOARD[g]								
24	N, 1923–32	9.3	7.3	5.1	4.9	1.0	4.8[6]	1.59
25	Z, 1923–32	8.2	6.6	4.8	4.6	1.1	4.1[5]	1.64
26	N, 1933–42	10.4	7.3	6.4	5.2	2.9	1.8[3]	2.35
27	Z, 1933–42	7.9 .	6.6	4.4	3.3	2.4	1.4[2]	2.53
28	N, 1938–56	8.4	6.0	5.5	4.9	1.6	3.1[3]	1.72
29	Z, 1938–56	7.4	6.9	3.4	3.0	1.4	2.2[3]	1.62
PRINTING AND PUBLISHING[h]								
30	N, 1949–58	11.8	8.2	7.6	7.5	1.0	7.2[6]	1.43
31	S, 1939–58	8.1	7.1	3.5	3.2	1.1	3.0[3]	1.76
LEATHER AND LEATHER PRODUCTS[h]								
32	N, 1949–58	19.2	14.3	11.6	11.4	1.7	6.6[6]	1.61
33	S, 1939–58	11.4	9.5	5.7	5.2	1.5	3.5[4]	1.81

n.a. = not available.

Source: In addition to notes c to h for this table, see Appendix A.

[a] N denotes new orders; S, shipments; and Z, production. Dates indicated are the earliest and latest years covered.

[b] For description of these measures, see Chapter 3, pp. 110 ff. Following the notation in that chapter, $\overline{Or}$ denotes the original series; $\overline{Se}$, the seasonal component; $\overline{I}$, the irregular component; $\overline{Cy}$, the cyclical component; and $\overline{Cyl}$, the seasonally adjusted series.

[c] Line 1: iron and steel, index of new orders in physical terms, 1923–25 average = 100, Department of Commerce; line 2: pig iron production, monthly, daily averages in long tons, F. R. Macaulay (for NBER), Iron Age; line 3: metal products index, NBER.

[d] National Machine Tool Builders' Association. Value in current dollars. New orders are net of cancellations. The figures for the corresponding series of gross new orders, 1940–56, show generally smaller amplitudes, as follows: 14.4, 7.1, 11.7, 10.4, 5.3, 2.0[3], 1.88 (compare with the entries in line 4, columns 1–8, respectively).

[e] Line 10: index of new orders in physical terms, 1923–25 average = 100, Department of Commerce; lines 11 and 13: indexes of physical volume of production, 1947–

Notes to Table D-1 (concluded)

49 average = 100, Federal Reserve Board; line 12: Department of Commerce (OBE), value in current dollars.

ᶠ Seidman & Seidman. In numbers of days' production. Series refer to the manufacturers in the Grand Rapids district.

ᵍ Lines 24–25: boxboard; lines 26–29: paperboard. National Paperboard Association and Bureau of the Census. In thousands of short tons.

ʰ Department of Commerce (OBE). Value in current dollars.

are even smaller than the figures for shipments in the two cases where series on all three variables are matched, which suggests that some stabilization here is attributable to stock adjustments.[2]

Rank correlations based on these and other (Standard and Poor's) data show that the cyclical amplitudes tend to be positively associated with the irregular amplitudes, less so with the seasonal ones (see tabulation below). Rankings according to the corresponding component amplitudes in N and S show particularly high correlations.[3]

New Orders		*Shipments*		*New Orders and Shipments*	
Variables (ranks)	r_s	*Variables (ranks)*	r_s	*Variables (ranks)*	r_s
$\overline{Cy}$ vs. $\overline{I}$	.85	$\overline{Cy}$ vs. $\overline{I}$	.85	$\overline{Cy}_n$ vs. $\overline{Cy}_s$	1.00
$\overline{Cy}$ vs. $\overline{Se}$	.65	$\overline{Cy}$ vs. $\overline{Se}$	.57	$\overline{Se}_n$ vs. $\overline{Se}_s$	0.81
$\overline{Se}$ vs. $\overline{I}$	.86	$\overline{Se}$ vs. $\overline{I}$	.80	$\overline{I}_n$ vs. $\overline{I}_s$	0.95

The new orders-to-shipments amplitude ratios computed from the data in Table D-1 are positively associated with the variability

[2] Compare the estimates for southern pine lumber, lines 14–16, and for paper excluding building paper, etc., lines 19–21. The ratios of average monthly amplitudes of shipments to those of new orders and production are as follows:

	Cyclical		Irregular		Seasonal	
	$\overline{Cy}_s/\overline{Cy}_n$	$\overline{Cy}_z/\overline{Cy}_s$	$\overline{I}_s/\overline{I}_n$	$\overline{I}_z/\overline{I}_s$	$\overline{Se}_s/\overline{Se}_n$	$\overline{Se}_z/\overline{Se}_s$
Southern pine lumber	.83	.95	.69	.86	0.99	.67
Paper, excl. bldg. paper, newsprint, and paperboard	.78	.94	.69	.72	1.00	n.a.

[3] The correlations for new orders are based on twenty-eight series, including some that have not been matched with shipments. Those for shipments are based on twenty-one series, including some that have not been matched with new orders. The correlations involving both N and S are based on matched series for nine items (eight in the case of the seasonal amplitudes).

measures for new orders. (The same also applies to statistics based on Standard and Poor's data.) The rank correlations, approximately significant at the 3 to 8 per cent levels, are as follows: $\overline{CyI}_n$ versus $\overline{CyI}_n/\overline{CyI}_s$, .57; versus $\bar{I}_n/\bar{I}_s$, .59; versus $\overline{Cy}_n/\overline{Cy}_s$, .65; versus $\overline{Se}_n/\overline{Se}_s$, .71.

In addition to the average amplitudes, Table D-1 includes indexes of the number of months required for cyclical dominance (MCD) and of the average duration of run (ADR). As the $\bar{I}/\overline{Cy}$ ratios are systematically larger for new orders than for shipments and outputs, the related MCD figures tend to be so, too. (However, note that the MCD are

Table D-2

Average Monthly Percentage Amplitudes and Related Measures of the Irregular and Cyclical Components of New Orders, Shipments, and Production, Summary by Groups of Series, 1919–58

Line	Variable and Number of Series Covered [a] (1)	Average Monthly Amplitude [b] of					Ratio, $\bar{I}/\overline{Cy}$ (MCD [b] in brackets) (7)	ADR [b] (8)
		$\overline{Or}$ (2)	$\overline{Se}$ (3)	$\overline{Cyl}$ (4)	$\bar{I}$ (5)	$\overline{Cy}$ (6)		
NEW ORDERS AND SHIPMENTS [c]								
1	N(23)	30.2	16.6	23.2	22.2	4.6	4.4[4.8]	1.69
2	S(23)	13.0	8.6	8.2	7.3	2.6	3.1[3.9]	1.88
NEW ORDERS AND PRODUCTION [d]								
3	N(8)	10.1	7.3	7.4	6.6	2.8	2.6[3.5]	1.91
4	Z(8)	8.0	5.7	4.6	3.7	2.5	1.8[2.7]	2.41
NEW ORDERS AND SHIPMENTS AND PRODUCTION [e]								
5	N(31)	27.0	14.9	19.6	18.2	4.1	3.9[4.5]	1.75
6	S and Z(31)	12.2	8.1	7.3	6.4	2.5	2.7[3.6]	2.02

[a] N denotes new orders; S, shipments; Z, production. Numbers of series used to compute the $\bar{I}$, $\overline{Cy}$, $\bar{I}/\overline{Cy}$, and ADR figures in columns 5–8 are given in parentheses. The other entries (in columns 2–4 and the MCD figures in column 7) are based on smaller numbers of observations because the required measures have not been computed for all series. The number of series omitted from these averages varies from one to four for lines 1–4 and from one to six for lines 5 and 6.

[b] See Table D-1, note b.

[c] Includes Standard and Poor's indexes for fourteen industries and series on N and S for nine items covered in Table D-1.

[d] Includes series on N and Z covered in Table D-1.

[e] Includes the N series from lines 1 and 3, the S series from line 2, and the Z series from line 4.

equal for N and Z in lines 26–27, column 7; as noted before, these measures are considerably less sensitive than the $\bar{I}/\overline{Cy}$ ratios.) Again, the ADR values tend to be larger for S and Z than for N, as would be expected, although there are a few exceptions (column 8).

Table D-2 contains a summary in the form of averages for broad groups of items, suppressing the industry detail. The contents covers both the Standard & Poor's indexes and the series that are included in Table D-1. These group averages demonstrate the strength and persistence of the rule that new orders are subject to larger and more frequent fluctuations of all sorts than are either production or shipments. Invariably, whether in the years before or after World War II,[4] the average cyclical, seasonal, and irregular amplitudes were larger for N than for S or Z. New orders also had systematically larger irregular-cyclical amplitude ratios, and larger numbers of months required for cyclical dominance, i.e., for the $\bar{I}/\overline{Cy}$ ratios to fall below 1. Finally, they show shorter average durations of run, that is, of a unidirectional movement. These characteristic differences still persist among averages that cover larger numbers of series for which the decomposition measures were computed, including noncorresponding series on N, S, and Z.[5]

[4] The comparisons with production in Table D-2, lines 3 and 4, include five pairs of series for the interwar period. The comparisons with shipments on lines 1 and 2 include fourteen pairs of series (the S&P indexes) for the post-World War II period. The tabulation below sums up the evidence for these two groups of series.

	$\overline{Or}$	$\overline{Se}$	$\overline{Cyl}$	$\bar{I}$	$\overline{Cy}$	$\bar{I}/\overline{Cy}$	ADR	MCD
INTERWAR PERIOD								
N	10.7	7.6	8.4	7.4	3.2	2.6	1.97	3.6
Z	8.3	5.7	5.4	4.1	3.0	1.8	2.76	2.6
POST-WW II PERIOD								
N	23.9	12.7	18.0	17.1	3.7	4.4	1.64	4.7
S	12.6	8.8	7.6	7.0	2.2	3.4	1.86	4.1

[5] This is shown by the following summary for forty-one series on new orders and forty-five series on shipments and production.

	$\overline{Or}$	$\overline{Se}$	$\overline{Cyl}$	$\bar{I}$	$\overline{Cy}$	$\bar{I}/\overline{Cy}$	ADR	MCD
N	28.7	16.1	22.5	21.8	4.6	4.1	1.72	4.4
S	12.8	8.3	7.7	7.0	2.6	2.8	1.96	3.6