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TEST BY TIME SERIES

From the reflections and investigations that have been reviewed in the previous sections, we arrive at the hypothesis that the following factors may have been capable of exerting a significant impact, of a sort that might perhaps be identified in time series, on the course of aggregate shoe buying in the United States in the interwar period: consumer disposable income, recent changes in income, expectations about future income, changes in income distribution, the price of shoes relative to that of other things consumers buy, perhaps stocks of usable shoes that people hold, and, finally, a group of factors that for the period reviewed tended to change in one direction over time and that may consequently be impounded in a time trend – factors such as aspects of some of the variables already mentioned, development of goods that competed with shoes for the income dollar and, opposing it, growing interest in style in clothing, changes in what the shoe industry offered its customers, changes in age and family composition of the population, as well as in its size, and shifts from rural to urban living.

The Plan of Multivariate Analysis

Our plan is to select the time series that represent these influences. We do this although the correspondence between the factors that seem likely to influence buying and the time series that it is possible to summon is never ideal and often poor. We introduce the series into a multiple correlation analysis in which they are the "independent" variables and shoe sales the "dependent" one; by this method we derive in effect a system of weights for combining these various influences in such a fashion as to reproduce actual shoe sales, 1929-1941, as nearly as possible. The computation is, however, confined in certain ways: for one thing, we use a straight-line formula, so that a change of one unit in any of the explanatory factors must always account for a uniform amount of change in shoe sales;[1] for another thing, a least-squares requirement is imposed; finally, as stated at the outset, we use an incomplete model – it is necessary to ignore changes in supply and its possible influence on shoe sales, as well as the influence of purchases of commodities other than shoes.

Table 7 indicates the computations that were made and summarizes their results. Enough has already been said about the difficulty of representing and isolating variables to indicate that the measurements can at best be taken only as very rough approximations. We know also that they can be assumed to apply

[1] There seems little indication that some other formula would be preferable for the period covered, and this one is the simplest to apply. It would nevertheless have been desirable to test other sorts of relationships, particularly for the income variable, but this we did not do.

TABLE 7

INFORMATION CONCERNING VARIOUS ESTIMATES OF SHOE SALES BY MULTIPLE CORRELATION ANAYLSIS, 1929-1941

FORM IN WHICH SHOE SALES WERE ESTIMATED (1)	COEFFICIENT OF MULTIPLE CORRELATION (2)	STANDARD ERROR OF ESTIMATE AS % OF AVERAGE VALUE FOR SHOE SALES (3)	AVERAGE VALUE OF SHOE SALES PER YEAR OR PER MONTH AT ANNUAL RATE (4)
Annual Sales			
1 Per capita, current $	.9952	1.72	$10.12 $ per cap.
2 Per capita, deflated	.9936	1.13	10.00, 1935-1939 $ per cap.
3 Per capita, current $	.9987	.91	10.12 $ per cap.
4 Total, current $	.9985	.93	1.242 bill. $
5 Per capita, current $	.9987	.89	10.12 $ per cap.
6 Per capita, deflated	.9966	.82	10.00, 1935-1939 $ per cap.
7 Total, current $	.9988	.85	1.242 bill. $
Monthly Sales, Total			
8 Smoothed, current $[a]	.9924	2.1	1.243 bill. $
9 Smoothed, current $[a]	.9946	1.8	1.243 bill. $
10 Unsmoothed, current $[b]	.9791	3.5	1.243 bill. $
11 Smoothed, current $[a]	.9947	1.8	1.243 bill. $
12 Smoothed, current $[a]	.9949	1.7	1.243 bill. $
13 Smoothed, current $[a]	.9949	1.7	1.243 bill. $

	ELASTICITY COEFFICIENTS, % CHANGE IN SHOE SALES AT AVERAGE VALUE ASSOCIATED WITH 1% INCREASE IN INDEPENDENT VARIABLES AT THEIR AVERAGE VALUES				
	Income[e] (11)	*Price*[f] (12)	*ΔIncome*[g] (13)	*ΔPayrolls Ratio*[h] (14)	*Time* (15)
Annual Sales					
1 Per capita, current $	+.897				—1.16
2 Per capita, deflated	+.792				—1.89
3 Per capita, current $	+.882	+.589			—1.78
4 Total, current $	+.877	+.581			—1.69
5 Per capita, current $	+.889	+.664	—.0005		—1.78
6 Per capita, deflated	+.811	—.285	—.001		—1.58
7 Total, current $	fact. pay. +.066 other inc.[e] +.837	+.570			—1.61
Monthly Sales, Total					
8 Smoothed, current $[a]	+.890				—1.03
9 Smoothed, current $[a]	+.880	+.400			—1.43
10 Unsmoothed, current $[b]	+.873	+.443			—1.54
11 Smoothed, current $[a]	+.883	+.397	—.002		—1.40
12 Smoothed, current $[a]	+.887	+.443	—.006	+.004	—1.44
13 Smoothed, current $[a]	+.889	+.468	—.009	+.007 Δman-hours[i]	—1.46

See page 48 for notes.

TABLE 7 (*Continued*)

COEFFICIENTS OF THE VARIABLES

Disposable Income[e] *($ per cap. or bill. $)*[d] (5)	*Shoe Prices Divided by Cost of Living Index*[f] *1935-1939=100* (6)	*ΔIncome for Past 5 Months*[g] *($ per cap. or bill. $)*[d] (7)	*ΔRatio Payroll to Income*[h] (8)	*Time, per Year, Origin in 1935 or July 1935* (9)	*Constant*[i] *($ per cap. or bill. $)*[d] (10)
+.01689				—.11774	+1.04
+.01529				—.18943	+2.08
+.01661	+.06110			—.18041	—4.76
+.01648	+.00741			—.02099	—.569
+.01674	+.06888	—.00078		—.18043	—5.59
+.01565	—.02926	—.00064		—.15811	+4.75
fact. pay. +.00963	+.007258			—.019515	—.587
other inc.[e] +.01808					
+.016771				—.012787	+.136
+.016582	+.004969			—.017798	—.336
+.016428	+.00564			—.019152	—.392
+.016634	+.005064	—.003612		—.017424	—.348
+.016706	+.005654	—.009480	+.034590	—.017914	—.408
+.016747	+.005973	—.015120	+.004800 Δman-hours[j]	—.018173	—.441

RELIABILITY OF REGRESSION COEFFICIENTS, NUMBER OF TIMES BY WHICH THEY EXCEED THEIR STANDARD ERROR OF ESTIMATE

Income[e] (16)	*Price*[f] (17)	*ΔIncome*[g] (18)	*ΔPayrolls Ratio*[h] (19)	*Time* (20)
35.2				8.9
30.6				18.8
63.9	5.2			12.9
61.0	4.9			11.9
62.0	5.4	1.5		13.1
39.1	2.6	.9		12.5
fact. pay. 2.4	5.3			10.6
other inc.[e] 18.9				
99.8				22.0
115.2	7.9			22.1
56.6	4.6			12.1
115.5	8.0	1.5		20.9
114.1	8.8	3.0	2.9	21.4
112.5	8.7	3.3	2.9 Δman-hours[j]	21.0

(*Continued on page 48*)

TABLE 7 *(Continued)*

FORM IN WHICH SHOE SALES WERE ESTIMATED	BETA COEFFICIENTS[k]				
	Income[c] (21)	*Price*[f] (22)	*ΔIncome*[g] (23)	*ΔPayrolls Ratio*[h] (24)	*Time* (25)
Annual Sales					
1 Per capita, current $	+1.014				−.255
2 Per capita, deflated	+1.200				−.730
3 Per capita, current $	+.997	+.161			−.390
4 Total, current $	+.865	+.136			−.317
5 Per capita, current $	+1.004	+.181	−.032		−.390
6 Per capita, deflated	+1.228	−.137	−.031		−.609
7 Total, current $	fact. pay. +.180 other inc.[e] +.906	+.160			−.357
Monthly Sales, Total					
8 Smoothed, current $[a]	+1.043				−.226
9 Smoothed, current $[a]	+1.031	+.114			−.314
10 Unsmoothed, current $[b]	+1.014	+.128			−.336
11 Smoothed, current $[a]	+1.034	+.116	−.016		−.308
12 Smoothed, current $[a]	+1.039	+.130	−.041	+.033	−.316
13 Smoothed, current $[a]	+1.041	+.137	−.065	+.051Δman-hours[i]	−.321

[a] Regression calculated using 5-month centered moving average of retail sales as the dependent variable.

[b] Regression calculated using individual monthly sales as the dependent variable.

[c] Personal Income Series of the Department of Commerce (July 1947 revision) converted by the National Bureau of Economic Research to civilian disposable income (with the soldiers' bonus of March 1931 and June 1936 distributed over the next 9 months).

[d] Figures are dollars per capita or billions of dollars, in current or constant dollars as indicated for each line in the stub or in col. 4. Monthly figures are always given at annual rates.

[e] Income (see note c) was broken into two subdivisions — factory payrolls (see first sentence of note i) and other income.

[f] National Industrial Conference Board and Bureau of Labor Statistics retail shoe price index divided by the BLS index of living costs for the urban worker.

[g] Monthly first differences in income payments (see note c) summed for 5 months ending in the current month.

[h] The BLS index of factory payrolls was linked to an estimate of dollar payrolls and divided by income payments. Monthly first differences in this series were averaged for 5 months and the average change in the ratio from, for example, January to June was used as the May figure (in effect the 5-month centered moving average was used with a 1-month lead). For further discussion see note 15, p. 60.

[i] Based on the NICB index of factory man-hours, 1921-1932, and BLS data on factory employment and the average hours, 1932-1941. Monthly first differences in this series were averaged for 5 months and the average change from, for example, January to June was used as the June figure.

[j] The absolute value of this constant is misleading unless considered in connection with the minimum value of the price ratio which also acts as a constant in the computation.

[k] Beta coefficients give the proportion of the standard deviation of shoe sales that is "explained" by the standard deviation times the regression coefficient of each independent variable; thus

$$\beta_{12.34} = b_{12.34}\frac{\sigma_2}{\sigma_1}, \quad \beta_{13.24} = b_{13.24}\frac{\sigma_3}{\sigma_1}.$$

only to the period for which there is reason to suppose that structural relationships have remained stable, and this would certainly exclude the volcanic eruptions of the war period and thereafter.

We did some experimenting with annual data before undertaking the time-consuming monthly analyses, and the result of this work is shown in the first seven lines of the table. In most of the calculations using monthly data, shoe sales were smoothed by a five-month moving average; but one set of computations (line 10) was done for the monthly figures proper. The smoothing was predicated on a lack of confidence in the seasonal correction and the knowledge that many factors, such as weather or catchy styles which we do not endeavor to explain, could cause monthly ups and downs that had compensating downs and ups in neighboring months.[2]

For each set of computations (each line), several sorts of information are given. Columns 5-10 give the independent variables — their units are stated in the column heads and explained in the notes. For those variables used in a given computation, coefficients appear in the appropriate column; in view of the straight-line formula, the figures state the amount by which shoe sales increased when the variable increased (or decreased if its sign is negative) by one unit. Columns 11-15 convert these figures to elasticities at the average value of all variables — the percentage amount by which shoe sales increased at their average value when the variable increased by 1 per cent of its average value for the period. The beta coefficients in columns 21-25 provide an additional way to evaluate the importance of each variable. They show the proportion of the total variation of shoe sales around their mean for the period (specifically, the standard deviation) accounted for by the total variation of the variable multiplied by its regression coefficient; where several variables are used, the figure can of course be larger than one. The reliability measures for the multiple correlation in columns 2 and 3 and for each parameter in columns 16-20 are useful for comparative purposes within each class of computation. In an absolute sense they need to be taken with more than a grain of salt, in view of the questionable applicability of many of the theoretical propositions on which they are based. The serial association of sequential observations is especially disturbing, as is usual for time series. In the smoothed data such correlation is of course artificially imposed, and the reliability measures are therefore certainly too high.[3]

[2] The coefficients yielded by a least-squares regression calculation are quite sensitive to erratic observations. Were we to use data for individual months, we would wish to examine the calculations for the influence of eccentric figures, since we cannot regard the eccentricities as interesting or even real phenomena, or actually attributable to income or other explanatory variables in *that month*. All in all, in view of the enormously time-consuming character of the work, it seemed wiser to use the smoothed figures. The few comparisons that were made did not suggest that insofar as the coefficients would be different, if the figures for individual months were used as the dependent variable, they would necessarily provide a truer representation of the underlying causal relationships.

Month-by-month data were used in line 10 of the table, which can be compared with line 9. We find income a trifle less important in the unsmoothed data and price a bit more so. The higher coefficient of price introduces, in effect, a stronger upward trend which is counterbalanced by a higher negative coefficient for time. The greater importance of price in the unsmoothed calculations might well be a function of the particular conformation of the individual cross products in 1933 when the price relative underwent its drastic change and people were perhaps more aware of price change than usual.

[3] Examination of the residuals for autocorrelation, using the mean square successive difference test, shows no reason to reject the hypothesis that those for the annual or individual month calculations are uncorrelated, though, as I have said, I hesitate to base much reliance on tests of

(Continued on page 50)

With these qualifications in mind we turn to what the calculations suggest about each variable.

The Influence of Each Variable

Income: This is clearly the overpowering influence, as is indicated by the very high beta coefficients and the relatively small deterioration in the correlation coefficient when all other variables except trend are omitted. At the same time it is interesting that it *is* deteriorated; in other words, taking account of other factors improves the correlation, even after adjusting for lost degrees of freedom. By and large an increase of $1 billion in disposable personal income is associated with an increase of around $16 to $17 million in shoe sales – nearer the lower figure when both shoe sales and income are adjusted for changes in prices; in other words, the marginal propensity to buy shoes is .016 or .017. Expressed in percentage terms at the average value of the variables, the income elasticity of shoe buying is around .8 or .9, the lower figure when computed for constant prices.[4] We did not experiment with the formula, so there is no way of being sure that the uniform incremental relationship is really the most stable one.[5]

Perhaps the best way to appreciate the importance of the income parameter is to view graphically its contribution to the explanation of shoe sales. Chart 6 depicts estimated and actual shoe sales when three variables – income, price, and time – contribute to their explanation (equation in line 9). The overpowering importance of income can be seen at a glance; perusal of columns 11 and 21 of the table indicates this same remark would apply to all the other equations.

Trend: The second most important factor in explaining variation in shoe sales from month to month or year to year, as the beta coefficients in column 25 indicate, is time, for shoe sales have been subject to a marked downward trend, other things the same. The decline amounted to about 1.5 per cent per year.[6] But extension of the equation to earlier and to postwar years raises a question as to

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these data based on probability theory. Of course, when we introduce serial correlation in the dependent variable by a moving average, the error term is likely to show autocorrelation, and this the tests reveal to be the case.

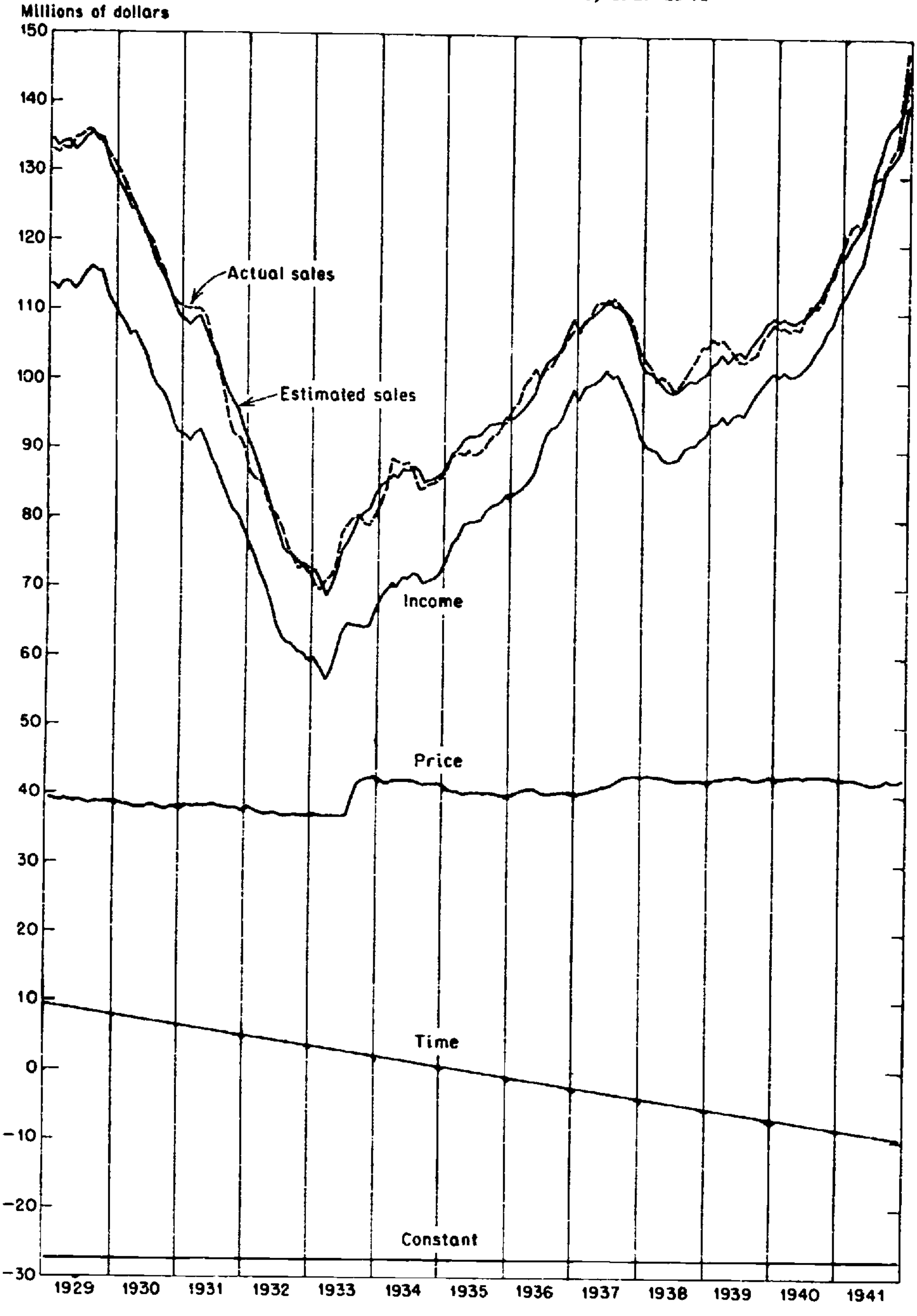
[4] It is interesting that this figure is very close to that of buying of all commodities and services together. For total consumption likewise, elasticity is less when computations are made in constant prices. The figure is compared with that based on cycle amplitudes and area surveys in a later section.

[5] The income elasticity of shoe buying for, say, line 12 is .89 at the average value, as shown in column 11; were it computed when income was at its peak in the third quarter of 1941, and shoe sales at the figure for that month, it would have been .97; the corresponding figure at the lowest value in March 1933 was .84. Had we used a logarithmic equation, elasticity would have been constant throughout.

[6] The size of this figure is associated with the price variable for, as we noted, the price ratio had an upward trend. Consequently, for current dollars the trend is smaller when price is not included; for deflated figures, for which the price ratio has a negative coefficient, it is smaller when price is included.

Chart 6

CONTRIBUTION OF EACH OF THREE VARIABLES TO THE ESTIMATION OF SHOE SALES, 1929-1941



whether the trend was not steeper than usual over the particular period studied.[7]

Of the many factors that contribute to the net change over time, the regres-

[7] If the equations are used to compute shoe sales in 1926, 1927, and 1928, the error of estimate is positive and increases progressively from 1926-1928. Were the trend variable simply dropped in the projection, most of the error in estimating sales for 1926-1928 on the basis of the 1929-1941 relation would be eliminated. In postwar years, too, the error of estimate has a downward trend

(Continued on page 52)

sion analysis contributes nothing except in the case of population. By making computations both on a per capita and aggregate basis, we find that the data at least do not contradict the thought that per capita figures overcompensate and aggregate figures undercompensate for the influence of the number of people in the country.[8] The per capita statistics appear to provide a bit more comprehensive explanation but the difference is probably not significant. In any event, for the particular period that our figures cover, the extra work of making monthly computations on a per capita basis would not be warranted. However, for periods when change in population does not follow substantially a straight-line trend, such as when data for the twenties and thirties are combined or when the postwar period is included, it seems likely that per capita calculations would be preferable and that population might also be included as an additional variable.[9]

Prices: Income and time go a long way toward explaining shoe sales. But certainly we must test the familiar and reasonable notion that people buy more of a given article, *ceteris paribus*, when they feel that the price of the article is relatively low compared with other things that they might buy. The variable that we use to express this tendency is the price of a comparatively stable and unchanged group of shoes divided by an index of all consumer prices.[10] Changes in the parameters and measures of reliability can be seen in Table 7 by comparing lines 8 and 9 for the monthly data and, for the annual data, lines 1 and 3 for per capita figures in current dollars and lines 2 and 6 in deflated shoe and income dollars. Multiple correlations all improve when price is added, and this improvement may be seen visually in Charts 7 and 8. In Chart 7 the first line shows shoe sales estimated on the basis of income and time alone, and these figures are superimposed on the actual series smoothed, as we have said, by a five-month moving average. The second set of lines are entirely analogous, except that the estimates were based on the behavior of income, time, and relative shoe prices. Certainly the spaces between the lines — the errors of estimate

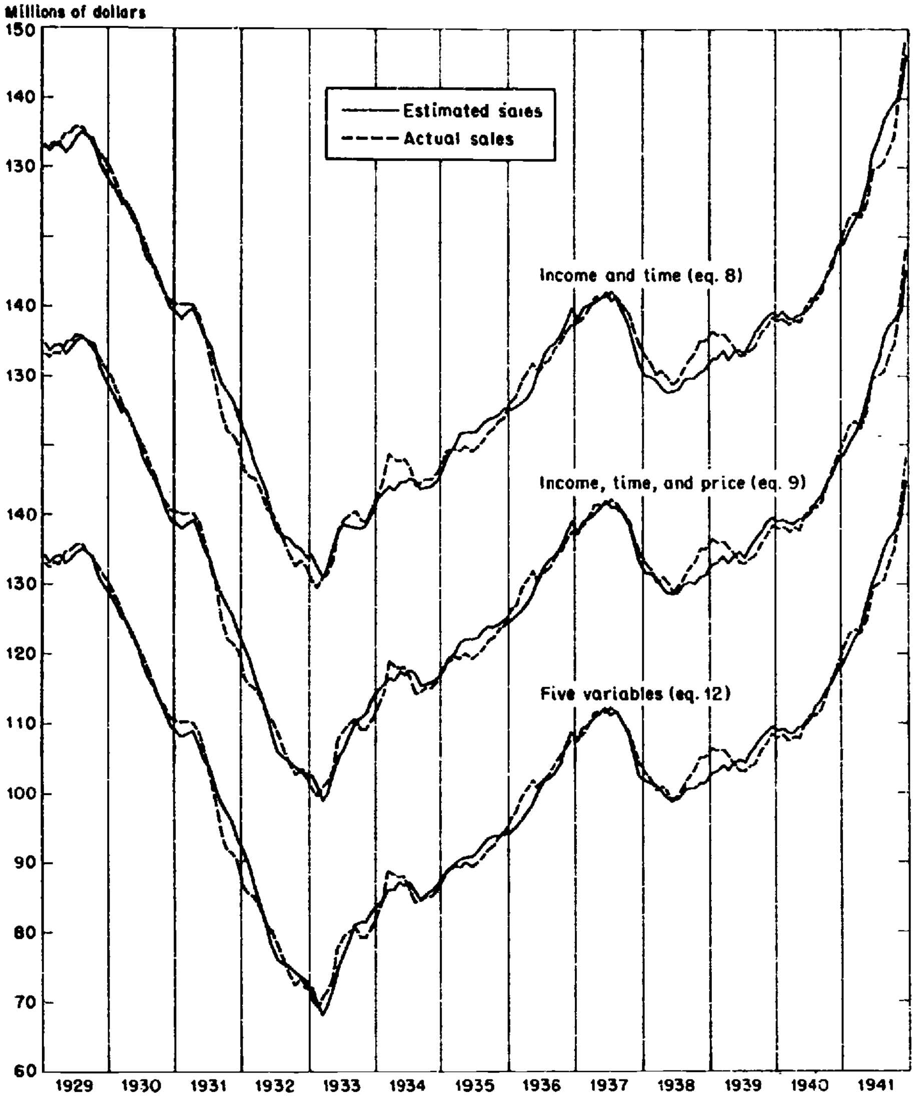
— it goes from plus in 1946 to minus in 1949 — and thus, for this span of four years, estimates would be slightly improved by dropping the trend variable, though the statement does not apply to the intervening 1941-1946 period. But so much else changed over these years that these facts are not very meaningful.

[8] I refer to the fact that the downward trend was less in aggregate than per capita figures (col. 15). The reduction is probably not statistically significant, but it conforms to the thesis: shoe buying is less when population is small than large; population increases over the years; consequently, aggregate shoe buying should also increase, *ceteris paribus;* and consequently the downward trend as shown in the statistics has been moderated. For the per capita figures the opposite argument applies, for the area surveys suggest that per capita shoe sales are less for larger than for smaller families.

[9] When equations in lines 3 and 4 are projected for 1926-1928 and 1946-1949 inclusive, the error is less for the per capita than aggregate figures in virtually every year. For the early group of years the error of estimate as a percentage of average shoe sales averaged 2.5 and 3.0 respectively for the per capita and aggregate data; for the four postwar years the corresponding figures were 6.2 and 7.2 per cent respectively.

[10] For further description, see Table 7, note f.

CHART 7
THREE ESTIMATES OF SHOE SALES COMPARED TO ACTUAL SALES, 1929-1941



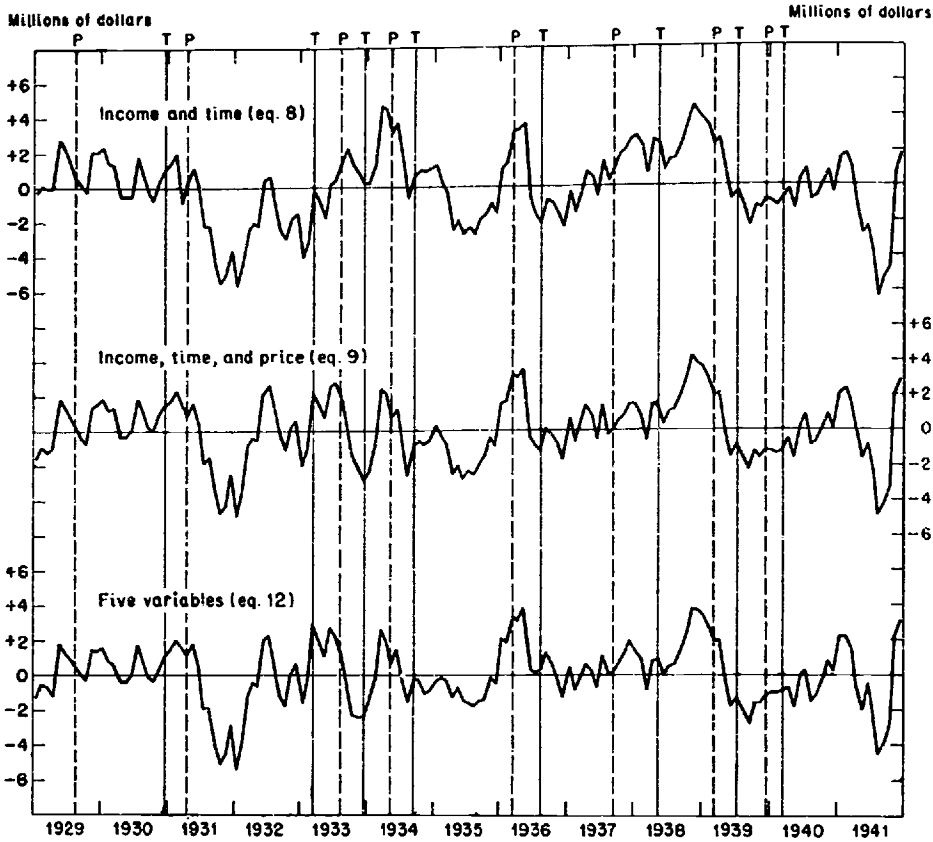
— are diminished when the price variable is added. This can be seen when the errors of estimate — actual minus estimated sales — are plotted in Chart 8. Allowing for the influence of price (second line) rids the error term of some of its longer cumulative swings.[11]

However, inspection of Chart 6 reveals grounds for uneasiness. We see there that the price variable jumped vigorously during the days of the National Recov-

[11] Statistical measures of the improvement achieved through the addition of the price variable appear in Table 7 in the slightly increased coefficient of multiple correlation and decreased standard errors (cols. 2 and 3) when line 2 is compared with line 3, and 8 with 9. The fact that the coefficient of price was 4 or 5 times its standard error (col. 17, lines 3-5 and 10) — the absolute level of this figure for the smoothed monthly data is certainly too high — is perhaps further evidence in favor of the relevance of a price variable in estimating shoe sales.

CHART 8

ACTUAL MINUS ESTIMATED SHOE SALES FOR THREE ESTIMATING EQUATIONS, 1929-1941



P and T are specific peaks and troughs in actual month-by-month shoe sales.

ery Administration, when shoe prices apparently rose more than other living costs; for the rest of the time the price of shoes and other consumer goods tended to change proportionately, and, consequently, the ratio remained fairly stable. This means that there was really only one short period in which the behavior of the ratio was distinctive. For the rest it was, in effect, two broken almost horizontal lines, the later one higher than the earlier one. To make matters worse, at a time when relative (and absolute) shoe prices are changing sharply, the reaction of consumers to price could well be different per unit of price change than when change is slight. Further, reaction to slight change may in our calculations be confounded with the trend parameter; we noted that the trend coefficient shifted when price was added.

For these reasons we view the actual coefficient of relative price with some suspicion. For whatever it may be worth, however, we learn from Table 7 that when the monthly equations are phrased in current dollars, shoe sales rose roughly .4 per cent when the price ratio rose 1 per cent (col. 12). This means that the price elasticity of demand in physical units as conventionally stated was "inelastic"; dollar value of shoe buying rose when prices rose, other things the same. Physical volume fell by about .6 per cent (.6 – 1.0) as relative prices rose 1 per cent; this calculation made directly on an annual per capita deflated basis (line 6) shows a still more inelastic reaction.[12]

An important question related to the influence of prices is whether decisions are actually made in terms of some sort of *ad hoc* deflation or in dollar terms; findings as to the relative stability of the relationship in current as compared with constant dollars might bear on the question. The higher correlation coefficients for the current dollar rather than deflated calculations (compare col. 3, lines 5 and 6; 1 and 2) might be interpreted as favoring the view that decisions are made in terms of relationships conceived at market prices, but I certainly would not care to push this point. It is also possible that the higher correlation coefficients for figures in current dollars are due to the greater total variance and nothing more.[13]

The three variables, income, time, and price, account for a substantial portion of the history of shoe buying between 1929 and 1941: for the annual data the coefficient of multiple correlation is almost .999; for the monthly data it is .979 (.995 for the smoothed figures). Nevertheless, a glance at the difference between "actual" sales and those estimated by the three-variable equation (Chart 8, second line) indicates that there is a good bit about month-by-month shoe buying, 1929-1941, which remains unexplained by a straight-line relationship to income, time, and price. Is the pattern of this error term reminiscent of that of variables that previous study has suggested might influence consumer buying?

To aid in answering the question, the error term is replotted in Chart 9, where it may be compared with other time series.

The first fact that the chart brings out is that the estimating formula shares a common attribute of efforts to explain buying – that of underestimating rates of change in buying. Comparing the errors with first differences in sales (the first line in the chart), we see that when shoe buying was accumulating momentum in a rise or fall, our explanatory series often failed to account for the full impetus of the change, and this was especially clear in connection with the rise at the

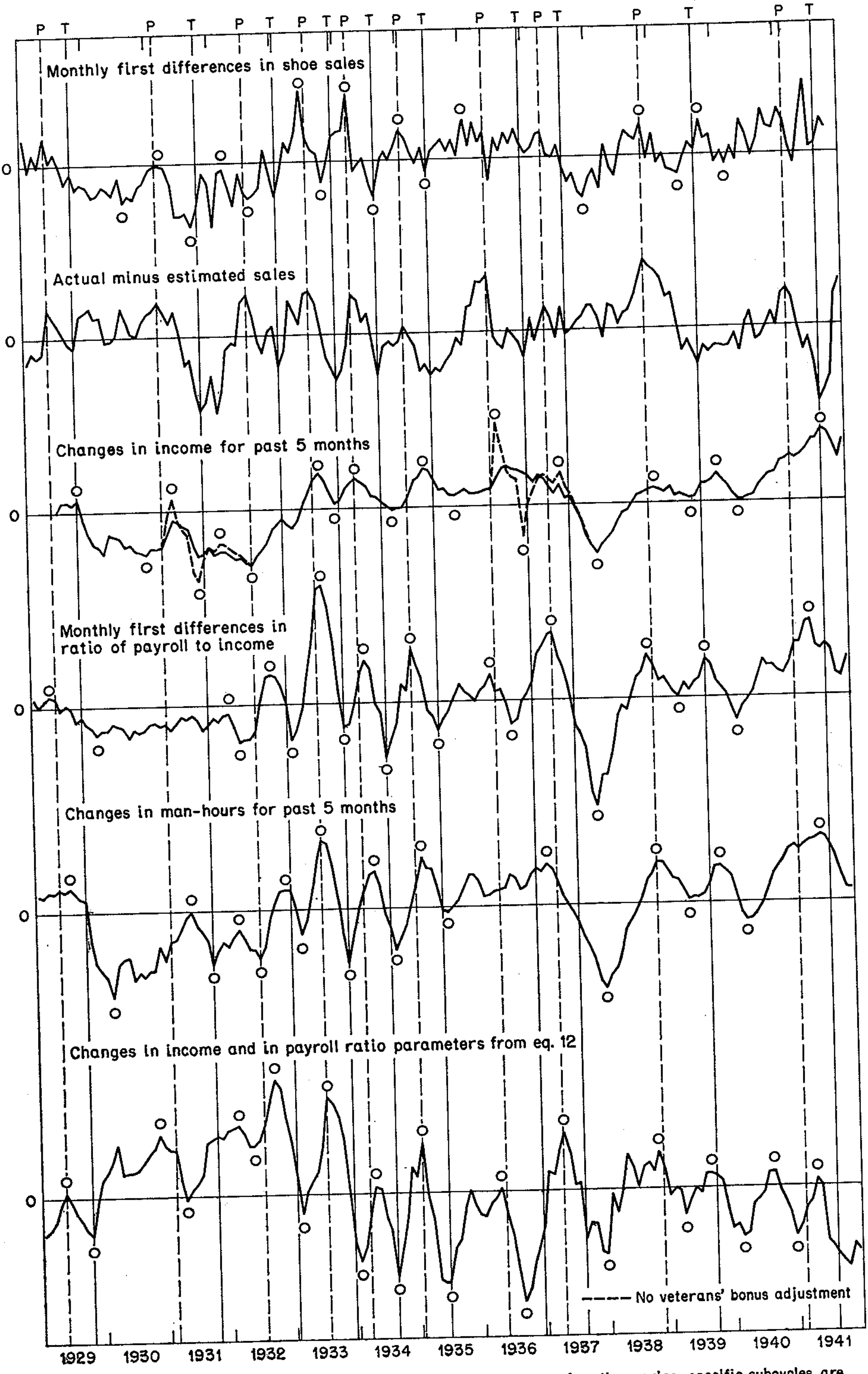
[12] Elasticity of quantity with respect to price is approximately equivalent to elasticity of dollar value with respect to price minus one, though a calculation in current prices with price as an additional variable suffers from a technical deficiency of including prices twice. But this is certainly a very minor objection. (See, for example, Stone's interesting point mentioned in note 1, pp. 24-25.)

Lines 5 and 6 give a pair of calculations, one made in current and the other in deflated figures, and directly comparable in other respects. Price elasticity for the dollar calculation is .664. Subtracting 1 yields a conventional elasticity figure of –.336. The direct calculation in line 6 shows price elasticity of –.285.

[13] It might be argued that though this interpretation could apply to a period when price change was reasonably moderate, it would not apply when drastic alterations in prices were under way. But for whatever it is worth, our data shows the opposite: if shoe sales for 1946-1949 are calculated from the equations, the error for deflated figures (line 6) averages 7.1 per cent of sales for the four years and 6.2 per cent for sales in current dollars. If the equation is fitted to the whole stretch of years from 1926 to 1948, the multiple correlation coefficients are .9870 for the current dollar figures and .9610 for the deflated ones. The difference is still larger if the price variable is omitted, .9652 and .9329 respectively.

CHART 9

ERROR OF ESTIMATING SHOE SALES BY THREE-VARIABLE EQUATION COMPARED WITH INFLUENCE OF ADDITIONAL FACTORS, 1929-1941



P and T are specific peaks and troughs in actual minus estimated sales; for other series, specific subcycles are designated by circles.
Scales adjusted to foster visual comparison of fluctuations.

beginning of 1931, the several fluctuations in 1933, 1934, 1935, and 1938. The failures to explain, however, are not, as Table 8, line 1, indicates, confined to this sort of episode.

At least some of the unexplained behavior of shoe buying might, earlier discussion suggested, be due to the influence of factors such as the direction and rate of change in income, shifts in income distribution, changing expectations, and, perhaps, previous holdings of shoes. Of course, a large part of such influence would be taken account of implicitly in the correlation of the time pattern of these influences with that of trend or income; to make matters worse, our ability to hit upon a time series capable of quantitative representation of the portion of these influences not so accounted for is miserably limited. Chart 9 reveals another difficulty – our best endeavors to achieve such representations (the several lines plotted below the residuals to be discussed presently) yield series that are highly correlated among themselves. The third section of Table 8 gives figures that support the visual impression. Nevertheless, I want to review the efforts to select and use these variables, for at worst they teach a lesson of utmost importance – the lesson of what *cannot* be found out about consumption functions, at least not by the means at hand.

Direction of change in income: The first question is whether there is evidence in the time series that, other things the same, consumers spend less (or more) on shoes when income has recently risen to a given level than when it has fallen to it. To express this factor quantitatively, we would theoretically like to know the number of people having experienced at specified times in the past changes in income in a given direction and of a given severity. As a rough facsimile of the ideal statistics we use monthly first differences in income payments during the past five months. As a preliminary test we study the temporal association of this variable (Chart 9, third line) and the residuals.

There does seem to be some slight negative association that appears not so much in the contours of the individual movements (as Table 8, line 2, indicates, the association is nil for these) as in the existence of several areas where the residuals tend to be well above the zero mark and income payments well below it, and vice versa. The uncertain visual impression receives uncertain confirmation when the variable is introduced as a fourth independent variable in the regression scheme. This was done for the annual calculations for per capita sales in current and constant prices, and for the monthly calculations for the aggregate undeflated data. In all cases the sign of the variable was negative as expected, but its significance, in either a common sense or statistical sense, was highly questionable. This equivocal answer does not, of course, conflict with our expectations, for shoes are not a commodity for which either a large negative coefficient (as might apply to rents or staple foods) or a large positive one (as might apply to durable goods often purchased on installment) is to be expected.

TABLE 8

TIMING COMPARISONS FOR SELECTED DATA, JANUARY 1929–JANUARY 1941

	SPECIFIC SERIES[a]	NO. OF TURNS (1)	NO. OF MATCHED TURNS[b] (2)	AVERAGE LEAD (—) OR LAG (+) (3)	AVERAGE DEVIATION (4)	MONTHS IN OPPOSITE PHASE: Synchronous Timing, % of All Mos. (5)	MONTHS IN OPPOSITE PHASE: Timing That Maximizes Correspondence: Allowance, Mos. (6)	MONTHS IN OPPOSITE PHASE: Timing That Maximizes Correspondence: % of All Mos. (7)
	I REFERENCE SERIES: ACTUAL MINUS ESTIMATED SHOE SALES; 3-VARIABLE EQUATION[c] (20 TURNS)							
1	ΔRetail shoe sales,[d] 5-m.m.a., centered	17	15	—.8	1.9	30.5	0	30.5
2	ΔIncome payments,[e] 5-m.m.a., plotted on last month (inverted)[f]	16	9	—1.6	2.9	59.0	—2	53.5
3	ΔRatio of factory payrolls to income payments,[g] 5-m.m.a., centered	20	15	—.7	1.2	31.2	—1	29.2
4	ΔIncome payments, 5-m.m.a., centered	18	13	+.3	1.9	35.4	0	35.4
5	ΔMan-hours,[h] 5-m.m.a., centered	20	13	—.2	1.4	36.1	—1	33.3
6	ΔPayrolls,[i] 5-m.m.a., centered	21	16	—.4	1.5	32.6	—1	30.5
7	Parameter: Δincome and Δpayrolls ratio[j]	24	16	—.1	1.1	30.5	0	30.5
	II REFERENCE SERIES: ΔRETAIL SHOE SALES, 5-M.M.A., CENTERED (17 TURNS)							
8	ΔRatio of factory payrolls to income, 5-m.m.a., centered	20	13	—.8	1.1	31.2	—1	27.1
9	ΔIncome payments, 5-m.m.a., centered	18	17	—.5	1.4	22.9	—1	21.5
10	ΔMan-hours, 5-m.m.a., centered	20	17	—.7	1.8	29.9	—1	24.3
11	ΔPayrolls, 5-m.m.a., centered	21	17	—1.1	1.3	27.1	—1	22.2
	III REFERENCE SERIES: ΔRATIO OF FACTORY PAYROLLS TO INCOME (20 TURNS)							
12	ΔIncome payments, 5-m.m.a., centered	18	16	+1.1	1.7	33.3	+1	30.5
13	ΔMan-hours, 5-m.m.a., centered	20	18	—.3	.9	17.4	0	17.4
14	ΔPayrolls, 5-m.m.a., centered	21	19	—.1	.9	16.7	0	16.7
15	Parameter: Δincome and Δpayrolls ratio	24	19	+.9	.5	23.6	+1	18.0

Income distribution and expectations: Earlier discussions also lead to the conclusion that the larger the proportion of total income received by low-income urban families, other things the same, the higher shoe sales might well be. A positive association was also expected between optimistic expectations about the future and shoe sales. In neither case did there seem to be much hope of disentangling these influences from their association with the passage of time and the major cycles in business, so well reflected in the income variable.

We have made one unsuccessful effort to achieve this separation; we used two income variables instead of one – payrolls and other income. The results are shown in Table 7, line 7; the far higher marginal propensity for other income than payrolls is contrary to the suggestion of budget data that the marginal propensity to buy shoes is higher for low than high income families. The difficulty doubtless involves the technical impact in the regression calculation of longer term factors that have effected a changing relation between payrolls and other income.[14]

Concentrating, then, on an effort to impersonate only the shorter and doubt-

[14] An alternative was to divide income payments according to the amount going to the upper 5 per cent and lower 95 per cent of the population on the basis of Kuznets' calculations (*Shares of Upper Income Groups in Income and Savings* [National Bureau of Economic Research, 1953]). I did not do this because, for one thing, the work with annual data was preparatory to work with monthly figures, and only annual figures for percentage shares are available. For another thing, payrolls include only lower incomes, urban incomes, incomes of manual workers, and highly periodic income receipts, all of which have characteristics that might tend to carry a high marginal propensity to buy shoes. Recipients of factory payrolls would thus be, in the context, a particularly important section of the lower 95 per cent of total income.

I also made some preliminary experiments adding salaries and relief payments to payrolls and using first differences in payrolls, but they did not seem promising. Nor did the effort to isolate income payments received by farmers seem productive. Another variable that we tried was the difference between the ratio of payrolls to income payments and a 12- or 18-month centered average of the ratio.

NOTES TO TABLE 8

[a] Figures are all 5-month moving averages of monthly first differences.

[b] Specific turns are related to reference turns according to rules developed by the National Bureau of Economic Research. (See Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles* [NBER, 1946], p. 118.) Owing to the short duration of the subcycles, however, in the case of competing turns, 2 months rather than 3 are considered the maximum amount a specific turn can be separated from the reference turn and be selected as related.

[c] Variables are income, time, and price. See Table 7, line 9.

[d] Derived from the NBER series on retail shoe sales, seasonally adjusted.

[e] Personal Income Series of the Department of Commerce (July 1947 revision) converted by the NBER to civilian disposable income (with the soldiers' bonus of March 1931 and June 1936 distributed over the next 9 months), seasonally adjusted.

[f] Inverse timing – peaks matched with troughs, and vice versa.

[g] See notes e and i.

[h] Based on seasonally adjusted National Industrial Conference Board indexes of factory man-hours, 1921-1932, and Bureau of Labor Statistics data on factory employment and average hours, 1932-1941.

[i] From the BLS index of factory payrolls, converted by the NBER to an estimate of actual dollar payrolls, seasonally adjusted.

[j] The sum of first differences in income and first differences in payrolls weighted by their regression coefficients in the multiple regression equation, Table 7, line 12 (cols. 7 and 8 respectively).

less slighter variation in the two variables, income distribution and expectations, we resort to difference series. For income distribution it is necessary to measure the ratio to total income (which is retained as one parameter) of that income to which a higher shoe spending propensity might attach. Factory payrolls are selected as at least one important segment of such income. The ratio of payrolls to income payments has strong major and minor cycles that coincide with those in factory payrolls and in a looser fashion in income, too; it also has an upward trend over the period. First differences in the ratio smoothed by a five-month moving average are plotted on Chart 9. These data would, according to the logic of the case, bear a synchronous and positive association with shoe sales.[15]

The line directly below this line is perhaps as good a representation as we can concoct of the short-term changes in optimistic or pessimistic expectations of a group in the population likely to gear spending to such short vistas – the factory worker. I select first differences in the number of hours worked as perhaps slightly preferable to payrolls or employment and the most direct form that news of changing prospects for future income is likely to take, but I would not try to defend the choice or claim it other than a marginal one. This series, too, is smoothed by a five-month moving average and the logic of the association would suggest a synchronous or perhaps very slightly leading relationship to sales. Chart 9 shows, as a matter of fact, that the two difference series – the ratio of payrolls to total consumer income and factory man-hours – are strikingly similar; Table 8 compares the number of months in opposite subcyclical phase and indicates in the last column of line 13 that they constitute 17 per cent of the total stretch, a decidedly low figure when the phases are as short as in these data. This strong correlation means that we certainly could not hope to identify both the influence of income distribution and expectations as represented by these time series. At best, their joint effects would appear in any temporal association between either the ratio or man-hours and shoe sales. Further, we cannot hope to determine empirically which of the two facsimiles should be used. The ratio is, I think, on theoretical grounds a slightly preferable series to carry the double meaning; therefore, I drop the other.[16]

[15] The averaging is simply a smoothing device which probably could be omitted. Theoretically, it is the current relationship in which we are interested, and no lead or lag is called for. Actually, the association looked as if it would be better if the ratio, instead of being centered, was moved back by one month. This timing association seemed permissible, since the moving average of first difference series may have some tendency to cause turns to lead, which tendency is reversed by, in effect, lagging the series a month.

[16] Another reason for abandoning the man-hours variable is its marked similarity to change in income payments. Where the one carries a negative and the other a positive sign, both could be assigned coefficients of some magnitude. Could we have confidence in statistical measures of reliability, the possibly misleading character of the findings would be revealed by large margins of error. But the many reasons for not putting confidence in such measures in connection with these data seem to me to counsel avoiding the use of the variable. Since the computations actually were made at an earlier stage of these investigations, I include them in Table 7, line 13, where it may be seen that the importance of both the income change and the income distribution variables are higher when man-hours are used than when the income-payroll ratio is used, whereas our measures of reliability, for whatever they are worth, show no deterioration.

A preliminary examination of the association between the ratio and the unexplained residuals from the three-variable regression suggests a parallelism of movement in quite a few minor fluctuations. As Table 8, line 3, shows, of all of the months covered, 29 per cent are in unlike subcyclical phase after adjusting for a one-month lead (cols. 6 and 7), and the average deviation for the fifteen matched turns is low (col. 4). We push the matter to its logical conclusion by adding this variable in the multiple correlation scheme; the statistics appear in Table 7, line 12. The positive association is apparent, though it is quantitatively weak and uncertain.

The final line in the chart shows the combined influence of short-term fluctuation in the direction of change in income (with a negative sign) and income distribution (and, implicitly, expectations, too). The two factors are, in effect, weighted by the coefficients they carry in the five-variable equation (Table 7, line 12). The series is in unlike phase to the unexplained differences in the three-variable equation 30.5 per cent of the time, and the average deviation for the sixteen matched turns is only 1.1 months. This set of influences may cause buying to be higher when income is sweeping downward and lower when it is climbing, other things the same, though the minor waves in buying are, on the contrary, fostered. But their total influence as recorded in the regression coefficients is very small indeed, and even their signs do not command confidence (Table 7, cols. 18 and 19). The unexplained residuals from this equation are hardly perceptibly different from those of the three-variable equation. They are drawn at the bottom of Charts 7 and 8.

Stock: We were not able to produce an identifiable time series depicting the total stock-influence for inclusion in the multivariate scheme, and so, it will be recalled, we determined to study the unexplored residuals for traces of that influence. The results of the examination were summarized earlier. By and large they are simply that though it is possible that considerations involving stocks could have contributed to the unexplained portion of shoe buying, so might other factors imperfectly accounted for or omitted, such as income and its distribution or short-term shifts in expectations; there is no affirmative and selective testimony pointing to stocks. The influence of replacement demand under the "sudden death" (or similar) formula seems, as far as the eye can detect, absent from the residuals as suggested by comparing them with sales 9 or 15 months earlier. Traces of first differences in sales (see Table 8, line 1) in the residuals might conceivably bespeak an inverse impact of stocks proper on buying; but, as Section II of Table 8 indicates, first differences in sales bear a very close association to several of the other variables, too, that seem relevant to shoe buying. The inverse impact of stocks proper might also be hinted in the association between the residuals and first differences in income (though it is not at all clear – Table 8, line 4) on the theory that for minor movements, which these data primarily display, the income parameter was underestimated in the regression formula because of the influence of the parallel and negative impact of stocks during the major swings of business. I have tried several ways of pushing the identification of the stock-influence further and have invariably been blocked by its correlation with other influences and the inability to state firmly just what its basic pattern might be.

Other factors: Leaving the search for systematic influences of importance affecting the residuals after the influence of income, time, and price have been allowed for, I turn to four particular periods when under- or over-estimation was quite marked. In the first – the second half of 1931 and early 1932 – shoe sales were substantially lower than our estimates show; it was sales of men's rather than women's shoes that seemed chiefly responsible. I can offer no explanation. But the situation raises several haunting questions. These were days of intense pessimism: banks were closing, prices of all sorts were plummeting, and unemployment, under-employment, and falling wages seemed to have accepted permanent tenancy. Certainly it would be more surprising if matters of this sort did not affect judgments about spending than if they did.[17]

Actual shoe sales were, on the other hand, higher than we estimated between March and August of 1933. These were the days of PRA (the "Blue Eagle") and early NRA,[18] when much publicity was given to the fact that prices would rise with rising labor costs. People may have rushed to buy while prices were low. When prices did rise – abruptly in August and September – the spurt in buying turned to a deficiency. There is some very interesting support for this explanation which, though a digression, is worth a glance.

Our indexes of sales of departments of department stores suggest that the spurt of buying in early 1933 tended to be large relative to that in 1934 *when the unit of purchase was comparatively large*, and this seems reasonable, for people would presumably be more willing to distort their usual buying patterns in order to achieve a larger saving than a smaller one – the same percentage saving on a more costly item. Consequently, if the same percentage rise in price were expected on articles of varying unit costs, the importance of trying to buy before the rise took effect would be directly associated with the size of the expenditure. We seem to see this association in the department store data.

[17] I give the figures on the number of bank suspensions as reported in Federal Reserve bulletins. They averaged 249 a month for June 1931 through February 1932 as compared with 100 for the rest of 1932.

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1931	202	77	86	64	91	167	93	158	305	522	175	358
1932	342	121	48	74	82	151	132	85	67	102	93	161

The disproportionate decline in buying relative to income payments also seems visible in the other two departments selling men's wear on which we have information – men's clothing and men's furnishings – but not for the remaining departments. There is a suggestion that total department store sales might show the slump, at least faintly, and mail order sales seem to do so quite clearly. Income from agriculture slumped heavily also.

[18] President's Reemployment Agreement and National Recovery Administration.

For seven different departments, upward movements in buying were (with one exception) marked as specific subcycles at about the same time in both 1933 and in 1934. I give the amplitude for each movement expressed as a percentage of the average standing of the series and the ratio of the 1933 to the 1934 amplitude.

DEPARTMENT	*1933*	*1934*	*1933 ÷ 1934*
Furniture	32.8	11.7	2.8
Floor coverings	37.5	9.0	4.2
Men's clothing	27.5	9.4	2.9
Shoes	15.2	15.9	1.0
Men's furnishing	16.2	23.3	.7
Toilet articles	4.5	18.1	.2
Hosiery	none marked	14.7	

Actual sales were again clearly higher than estimated between January and May of 1936. In January the veterans' Adjusted Compensation Act was passed and appropriations cleared in March. But it was not until June that bonds could actually be cashed and receipts appear in income payments. Our figures suggest that spring wardrobes might have been refurbished in anticipation of the June bonanza.[19]

Another failure of the predicting series occurred toward the close of 1938. This exaggerated movement (relative to that of income) appears in most of the components of shoe sales but most clearly in sales of women's shoes. It does not appear, as far as one can say, in most other retail sales data, which show typically a bulge more nearly proportional to that of income payment. The picture, then, points to a style event in women's shoes capable of really stimulating consumer interest. I have asked several people in the industry whether they knew of any such occasion in the dozen or so years preceding World War II. The answers did seem to agree that the fall of 1938 was such a time.[20] But even if shoes did exert some special magnetism on the income dollar, it probably was

[19] It will be recalled that the income series we have used distributes funds from cashed bonds over a series of subsequent months. Thus the very large hump in the income series that would otherwise have appeared in June is distributed over the next half of the year.

[20] The sling-back pump became a mass consumption item in 1938, though it had been introduced much earlier; this is also the time when the "loafer" shoe, introduced originally from Sweden via Bermuda, became an important selling item in the United States. The Sears, Roebuck catalogue of 1938 also speaks of the "success story" of the saddle oxford "rediscovered" by the college girl; it was featured in a half-page spread in the fall catalogue. One individual, who was mentioned by several people as the best person with whom to discuss the question, mentioned a number of style trends that seemed to converge on 1938 -- the round-toed "baby doll" shoe, platform construction, and the lower heel height, as well as the styles just mentioned; she felt that these things (enumerated of course independently of any question about a specific year) constituted an exceptional stimulus to sales in the winter of 1938-1939.

Lending support to these stories is the fact, already noted, that the movement was more marked in the retail sales of women's than of men's shoes. Production statistics likewise, though they bear a pretty fuzzy relation to sales, also add assent: production of all shoes was about 7 per cent lower between August 1938 and July 1939 than for the other twelve months of these two years; production of women's shoes was about 2.5 per cent lower and of misses' and children's shoes 8.5 per cent higher.

TABLE 9

ACTUAL AND ESTIMATED SHOE SALES FOR SUCCESSIVE SIX-MONTH PERIODS, 1929-1941, AND ANNUAL PROJECTIONS, 1946-1950

(dollars in millions)

	SHOE SALES PROPER				
				Error of Estimate	
SEMESTER	Actual Shoe Sales (1)	Estimated Shoe Sales (3 Variables)[a] (2)	Estimated Shoe Sales (5 Variables)[b] (3)	Actual minus Estimated (3 Variables) (4)	Actual minus Estimated (5 Variables) (5)
1929 I	$802.8	$803.2	$802.4	—$ .4	+$ .4
II	807.0	800.5	799.3	+6.5	+7.7
1930 I	751.8	747.7	749.3	+4.1	+2.5
II	686.0	682.6	684.7	+3.4	+1.3
1931 I	659.7	646.2	646.1	+13.5	+13.6
II	562.7	587.2	589.0	—24.5	—26.3
1932 I	508.4	509.9	511.2	—1.5	—2.8
II	438.7	443.7	446.3	—5.0	—7.6
1933 I	431.4	429.6	426.6	+1.8	+4.8
II	477.5	480.5	483.2	—3.0	—5.7
1934 I	527.3	516.7	515.1	+10.6	+12.2
II	507.5	517.5	515.9	—10.0	—8.4
1935 I	535.3	542.6	538.9	—7.3	—3.6
II	553.2	561.8	559.3	—8.6	—6.1
1936 I	596.8	582.9	581.3	+13.9	+15.5
II	627.3	632.3	626.7	—5.0	+.6
1937 I	663.3	658.5	661.2	+4.8	+2.1
II	654.9	650.2	649.0	+4.7	+5.9
1938 I	601.4	599.6	601.6	+1.8	—.2
II	614.2	600.7	603.4	+13.5	+10.8
1939 I	633.5	621.4	622.5	+12.1	+11.0
II	630.9	641.3	643.1	—10.4	—12.2
1940 I	649.1	654.5	654.5	—5.4	—5.4
II	681.7	683.3	684.9	—1.6	—3.2
1941 I	738.5	741.3	742.2	—2.8	—3.7
II	804.6	827.5	825.4	—22.9	—20.8
	1929-1941 SUMMARY FOR SEMESTER DATA				
Average semester value	621.0			±7.66	±7.48
Error as % of av. value				1.23%	1.20%
Rank correlation coefficient					
Year	ANNUAL PROJECTION				
1946	$3,007.2	$2,557.2	$2,552.4	+$450.0	+$454.8
1947	3,155.0	2,817.8	2,838.2	+337.2	+316.8
1948	3,147.0	3,128.6	3,144.7	+18.4	+2.3
1949	3,013.7	3,071.3	3,105.4	—57.6	—91.7
1950	3,138.8	3,341.3		—202.5	

[a] Three-variable equation included income, time, and price, Table 7, line 9.

[b] Five-variable equation included income, time, price, income change, and change in the income-payroll ratio, Table 7, line 12.

Table 9 *(Continued)*

(dollars in millions)

CHANGE IN SALES BETWEEN SEMESTERS OR YEARS							
Actual Sales		*Estimated Sales (3 Variables)*		*Estimated Sales (5 Variables)*		*Error of Estimate*	
						Actual minus Estimated (3 Variables)	*Actual minus Estimated (5 Variables)*
Change (6)	*Rank* (7)	*Change* (8)	*Rank* (9)	*Change* (10)	*Rank* (11)	(12)	(13)
+$ 4.2	12	—$ 2.7	10	—$ 3.1	10	+$ 6.9	+$ 7.3
—55.2	4	—52.8	5	—50.0	5	—2.4	—5.2
—65.8	3	—65.1	3	—64.6	3	—.7	—1.2
—26.3	7	—36.4	7	—38.6	7	+10.1	+12.3
—97.0	1	—59.0	4	—57.1	4	—38.0	—39.9
—54.3	5	—77.3	1	—77.8	1	+23.0	+23.5
—69.7	2	—66.2	2	—64.9	2	—3.5	—4.8
—7.3	10	—14.1	8	—19.7	8	+6.8	+12.4
+46.1	22	+50.9	23	+56.6	23	—4.8	—10.5
+49.8	23	+36.2	21	+31.9	20	+13.6	+17.9
—19.8	8	+.8	11	+0.8	11	—20.6	—20.6
+27.8	17	+25.1	18	+23.0	18	+2.7	+4.8
+17.9	14	+19.2	14	+20.4	15	—1.3	—2.5
+43.6	21	+21.1	17	+22.0	17	+22.5	+21.6
+30.5	18	+49.4	22	+45.4	22	—18.9	—14.9
+36.0	20	+26.2	19	+34.5	21	+9.8	+1.5
—8.4	9	—8.3	9	—12.2	9	—.1	+3.8
—53.5	6	—50.6	6	+47.4	6	—2.9	—6.1
+12.8	13	+1.1	12	+1.8	12	+11.7	+11.0
+19.3	16	+20.7	16	+19.1	14	—1.4	+.2
—2.6	11	+19.9	15	+20.6	16	—22.5	—23.2
+18.2	15	+13.2	13	+11.4	13	+5.0	+6.8
+32.6	19	+28.8	20	+30.4	19	+3.8	+2.2
+56.8	24	+58.0	24	+57.3	24	—1.2	—.5
+66.1	25	+86.2	25	+83.2	25	—20.1	—17.1
1929-1941 SUMMARY FOR SEMESTER DATA							
±36.86						±10.17	±10.87
						27.6%	29.5%
			.96		.95		
ANNUAL PROJECTION							
+$147.8		+$260.6		+$285.8		—$112.8	—$139.5
—8.0		+310.8		+306.5		—318.8	—313.0
—133.3		—57.3		—39.3		—76.0	—94.0
+125.1		+235.9				—110.8	

merely a contributing factor in the sales history of the period rather than a complete explanation.[21]

Estimates of Shoe Sales

One purpose in analyzing the factors that influence shoe buying is to estimate what buying will be. As the standard errors in Table 7 show, we could have made very respectable guesses about the value of shoe sales for 1929-1941 had we known what disposable personal income and relative shoe price were to be and had we known what the equation relating them was. Table 9 supplements these average measures with semester-by-semester estimates. The "predictions" are quite as satisfactory using three variables as five – on the average they land within 1.2 per cent of the actual figure for each six-month period. Moreover, they estimate *change* from semester to semester on the average within 30 per cent of the correct figure. Not only are the signs correct in all but three of the twenty-five cases, but if the amount of change for actual and estimated sales is ranked, the two sets of figures have rank correlation coefficients of about .95.[22]

These figures suggest, on the one hand, that a few well selected variables, together with whatever unidentified factors parallel their course, "explain" consumer shoe buying for the period covered by our time series. On the other hand, this good explanation adds its weight to the conclusion developed in the Appendix that our statistical representation of shoe sales probably bears a reasonable likeness to actual consumer shoe buying.

The last lines of Table 9 – giving annual projections for 1946-1950 – emphasize quite a different point: the equation that provides the excellent estimations for 1929-1941 gives poor ones for 1946-1950, especially with respect to year-to-year change. In view of the very poor estimation of change, I am quite unimpressed by the fact that the broad level of shoe sales (the 1948 estimates were very close indeed to actual sales) was so well reproduced by our formula in spite of virtual doubling of sales during the war. Whether the estimates are made in current or deflated dollars, per capita or aggregate, the 1929-1941 relationship when projected to later years overestimates shoe sales during the war, underestimates them for several years afterwards, and returns close to the actual figure in 1948. This picture could be explained in terms of impoverishment of selections and rationing during the war, with makeup buying afterward. But whether this is an important part of the explanation, and what other factors are also involved, needs examination preceded by far more careful

[21] The explanation applies to the shoes worn by women and older girls. Assuming that these constitute about 60 per cent of shoe sales, the error for the eight months between September 1938 and April 1939 amounted to almost 5 per cent of this 60 per cent share of shoe sales for the same period. This strikes me as rather more stimulation than seems likely, though it is certainly not out of the question.

[22] For annual data the signs are correct in all cases and the ranks virtually identical. Change averages ±8 per cent of the correct figure. For sales proper there is as much as a 1 per cent error in only three years.

attention than I have given to the estimates of postwar shoe sales, prices, and the like.

For the whole tenor of our work has emphasized the fact that shoe buying, and I have no doubt buying of most other commodities, too, is substantially influenced by aspects of the environment that are not at all likely to remain unaffected by changes in the economy such as those accompanying a war. There were changes in what the industry supplied, in competing products, in the rate at which population grew; during the war, income distribution departed radically from its trend of the thirties; there were marked changes in the relationship among prices of major commodity groups and between shoes and the cost of living (relative shoe prices rose considerably); the buying power of current income was augmented by huge personal savings; consumer stocks of shoes, as well as of other commodities, were depleted. What effect would these changes have on the downward trend in shoe buying, on the propensity to consume shoes, and, finally, on the size of the impact of the several other factors, some of which could not be isolated for the prewar period but might, because of their greater range of fluctuation, be apparent now?

It is to deal with questions such as these shifts in structural relations, with differences in patterns of buying among major sorts of goods, as well as with those aspects of buying or saving in a given year or quarter which can only be understood in the light of the special situation at the time, that the more delicate information of the sort we have aimed to achieve in this paper might be useful. I want to summarize the net result of all of the thinking or information that we have reviewed for each of the possible influences on buying that have been discussed.