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PRICE FLEXIBILITY AND PRICE MOVEMENTS  
IN THE UNITED STATES AND OTHER COUNTRIES

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# PRICE FLEXIBILITY AND PRICE MOVEMENTS IN THE UNITED STATES AND OTHER COUNTRIES<sup>1</sup>

MARK T. BUCHANAN

## INTRODUCTION

Some prices change more rapidly and in larger amounts than do others. These differences in rates and amounts of price changes are often called "variations in price flexibility".

The purpose of the study here reported was to examine variations in the price flexibility of internationally important products, and to determine their relation to international price movements and price alignment between countries. The study was based on an analysis of price movements of 56 to 64 internationally important products for four countries—the United States, Canada, the United Kingdom, and France. Other economic series were used for verification and supplementation. Official wholesale-price indexes, cost-of-living indexes, and index numbers of prices of 40 basic commodities, were examined for ten countries.<sup>2</sup>

## DEFINITION OF PRICE FLEXIBILITY

The word "flexible" is a general term which is here applied to those products whose prices changed more frequently and/or more in amount than did prices of other products. Conversely, the term "inflexible" is applied to those products whose prices changed less frequently and/or less in amount than did prices of other products. The two aspects of price flexibility—frequency of change and amount of change—are measured by "indexes of frequency" and "indexes of amplitude".

Differences in frequency of price change were clearly evident in seven monthly price series for the United States (figure 1, page 4). During the twelve-year period 1926 to 1937, prices of rye and of eggs changed frequently whereas changes in the prices of rayon and of shoes were relatively few.

Prices which change often, usually change also by a considerable amount. That this is not always the case, however, is illustrated by rye and eggs as compared with coal (figure 1). Coal prices changed almost as frequently as did prices of either rye or eggs, but changes in coal prices were of much less magnitude. Prices of rayon and of shoes changed infrequently, but in considerable amounts. Prices of rayon decreased steadily from 1926 to 1932 and then leveled off, while prices of shoes increased steadily from 1926 to 1937. Neither rayon nor shoe nor coal prices reflected the depression, from 1929 to 1933.

Although the seven products shown in figure 1 illustrate extremes in the diversity of price movements of individual products, probably no two price series among the several hundred products included in the "Index of

<sup>1</sup>The funds used in the preparation of this study were supplied by General Motors Corporation. The author expresses appreciation to Professor F. A. Pearson, of Cornell University, under whose supervision the study was made.

<sup>2</sup>The United States, the United Kingdom, France, Canada, the Netherlands, Belgium, Australia, Sweden, Finland, and New Zealand.

All Commodities" prepared by the federal Bureau of Labor Statistics have had exactly the same movements since 1913.

The problem of price flexibility is greatest when prices as a whole fall rapidly. During such periods, wide disparities are set up between prices of different types of commodities. Adjustment of these price disparities may come slowly, or only with rising prices.

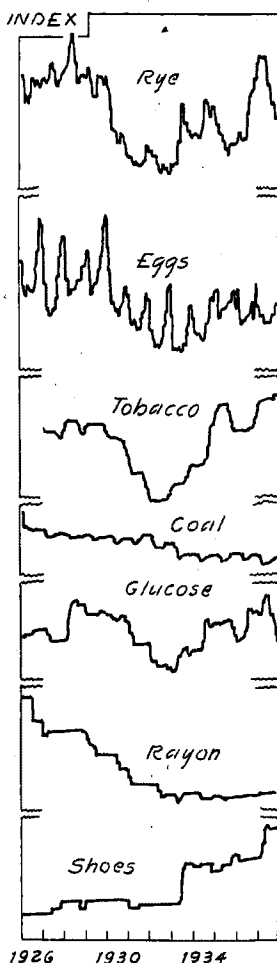


FIGURE 1. EXAMPLES OF BEHAVIOR OF WHOLESALE PRICES OF SEVEN PRODUCTS, BY MONTHS, 1926 TO 1937 (1926=100)

The separate series show great diversity of price behavior  
(*The Structure of the American Economy, Part I. Basic Characteristics*, National Resources Committee, Washington, D. C., June 1939, pages 127 and 385)

#### MEASUREMENT OF PRICE FLEXIBILITY

The index of frequency of price change was calculated by expressing the number of months that prices changed, in the period under consideration, in per cent of the number of months that prices could have changed. For example, from 1922 to 1929, monthly prices of corn in the United States changed 94 times. The index of frequency of price change was  $99$  ( $94 \div [96 - 1] = 0.99$ ). In contrast, smoking-tobacco prices changed only once during this period and the index of frequency was  $1$  ( $1 \div 95 = 0.01$ ).

The index of amplitude of price change was computed by expressing the difference between the lowest and the highest monthly price of a commodity, for the period under consideration, in per cent of the average of all prices for that commodity for the same period. For example, during the eight-year period 1922 to 1929, the highest monthly price of corn in the United States was \$1.292 a bushel, the lowest was \$0.491, and the average was \$0.886. The index of amplitude of price change was  $90$  ( $[(1.292 - 0.491) \div 0.886 = 0.90]$ ).

#### METHOD OF ANALYSIS

Comparisons of the relative flexibility of prices in each country were made for the eight-year period 1922 to 1929, for the nine-year period 1930 to 1938, and for the seventeen-year period 1922 to 1938. Comparisons of flexibility between countries were made also.

The products were classified by five factors: stage of fabrication; durability; use; industry represented; and importance in world trade. Average indexes of frequency and amplitude were calculated for various subgroups of products according to these five factors. In this way it was possible to determine the characteristics of products of low and of high price flexibility. Comparisons were made between countries to determine whether or not similar price flexibility was associated with similar product characteristics in each of the countries studied.

Index numbers of price movements of products of similar price flexibility were computed for each of the four countries—the United States, Canada, the United Kingdom, and France. These and other index numbers of price movements were compared within and between countries.

Most of the price comparisons between countries were made through application of the purchasing-power-parity approach. That is, the purchasing power of one currency relatively to another in terms of goods (price ratio) was compared with the exchange rate (money ratio). By this means it was possible to observe any differences which existed between movements in prices and movements in the exchange rates.

Gold prices were used where comparisons were made between prices in one country and prices in other countries.

## PRICE FLEXIBILITY

### FACTORS AFFECTING PRICE FLEXIBILITY

#### *Comparison of commodities*

Prices of raw materials from 1922 to 1938 were highly flexible, semi-finished goods were less flexible, and finished goods were relatively inflexible. This principle was evident in prices of internationally important products in the United States, Canada, the United Kingdom, and France (table 1).

TABLE 1. STAGE OF FABRICATION, AND INDEXES OF FREQUENCY AND AMPLITUDE OF PRICE CHANGE

(For 56 to 64 internationally important products for four countries, 1922 to 1938)

Stage of fabrication	Number of products	Frequency index	Amplitude index	Stage of fabrication	Number of products	Frequency index	Amplitude index
United States:				United Kingdom:			
Raw .....	22	87	105	Raw .....	18	81	83
Semi-finished .....	14	69	70	Semi-finished .....	16	79	77
Finished .....	28	46	51	Finished .....	22	59	52
Canada:				France:			
Raw .....	21	72	96	Raw .....	21	80	118
Semi-finished .....	14	54	65	Semi-finished .....	16	80	116
Finished .....	28	26	39	Finished .....	23	49	94

In general, for each country studied, non-durable and semi-durable goods were more flexible than durable goods (table 2), food products were more flexible than clothing and other products (table 3), and producers' goods were more flexible than consumers' goods (table 4).

TABLE 2. DURABILITY, AND INDEXES OF FREQUENCY AND AMPLITUDE OF PRICE CHANGE

(For 56 to 64 internationally important products for four countries, 1922 to 1938)

Durability	Number of products	Frequency index	Amplitude index	Durability	Number of products	Frequency index	Amplitude index
United States:				United Kingdom:			
Non-durable...	34	67	73	Non-durable...	30	74	65
Semi-durable...	13	72	92	Semi-durable...	12	86	87
Durable.....	17	57	61	Durable.....	14	55	63
Canada:				France:			
Non-durable...	33	51	61	Non-durable...	32	71	102
Semi-durable...	13	54	88	Semi-durable...	13	82	126
Durable.....	17	37	52	Durable.....	15	50	105

TABLE 3. USE OF COMMODITIES, AND INDEXES OF FREQUENCY AND AMPLITUDE OF PRICE CHANGE

(For 56 to 64 internationally important products for four countries, 1922 to 1938)

Use	Number of products	Frequency index	Amplitude index	Use	Number of products	Frequency index	Amplitude index
United States:				United Kingdom:			
Food.....	19	82	88	Food.....	18	92	69
Clothing.....	5	49	67	Clothing.....	3	83	73
Other use.....	40	60	68	Other use.....	35	60	69
Canada:				France:			
Food.....	17	76	82	Food.....	18	85	114
Clothing.....	5	33	58	Clothing.....	6	86	109
Other use.....	41	37	57	Other use.....	36	56	105

TABLE 4. PRODUCERS' AND CONSUMERS' GOODS, AND INDEXES OF FREQUENCY AND AMPLITUDE OF PRICE CHANGE

(For 51 to 61 internationally important products for four countries, 1922 to 1938)

Producers' or consumers' goods	Number of products	Frequency index	Amplitude index	Producers' or consumers' goods	Number of products	Frequency index	Amplitude index
United States:				United Kingdom:			
Producers' goods	48	69	78	Producers' goods	38	71	75
Consumers' goods	13	52	58	Consumers' goods	13	81	59
Canada:				France:			
Producers' goods	46	51	70	Producers' goods	44	65	105
Consumers' goods	12	36	46	Consumers' goods	13	73	113

When the products were classified by industry represented, it was found that agricultural, forestry, and mining products were all considerably more flexible than products of manufacturing industries (table 5).

A classification of the products by importance in world trade indicated that there was little or no difference in price flexibility as between products which were important in world trade and those which were not (table 6).

TABLE 5. INDUSTRY, AND INDEXES OF FREQUENCY AND AMPLITUDE OF PRICE CHANGE  
(For 56 to 64 internationally important products for four countries, 1922 to 1938)

Industry	Number of products	Frequency index	Amplitude index	Industry	Number of products	Frequency index	Amplitude index
United States:				United Kingdom:			
Agriculture.....	26	86	96	Agriculture.....	25	90	79
Forestry.....	2	99	90	Forestry.....	2	64	71
Mining.....	11	66	75	Mining.....	11	66	84
Manufacturing.....	25	41	49	Manufacturing...	18	50	47
Canada:				France:			
Agriculture.....	26	75	91	Agriculture.....	25	86	124
Forestry.....	2	59	75	Forestry.....	2	64	94
Mining.....	11	44	51	Mining.....	10	60	109
Manufacturing.....	24	18	40	Manufacturing...	23	53	93

TABLE 6. IMPORTANCE OF PRODUCT IN WORLD TRADE, AND INDEXES OF FREQUENCY AND AMPLITUDE OF PRICE CHANGE  
(For 50 to 56 internationally important products for four countries, 1922 to 1938)

Importance in world trade*	Number of products	Frequency index	Amplitude index	Importance in world trade*	Number of products	Frequency index	Amplitude index
United States:				United Kingdom:			
Least important...	19	67	78	Least important..	17	77	70
Intermediate.....	19	61	67	Intermediate.....	17	70	69
Most important...	18	72	86	Most important...	16	76	74
Canada:				France:			
Least important...	18	57	67	Least important...	17	74	122
Intermediate.....	18	41	58	Intermediate.....	17	65	105
Most important...	18	52	78	Most important...	18	73	109

\*Ranked in order of the percentage that the value of world trade in each product was of the total value of world trade, 1929-1937.

### Comparison of periods

The seventeen-year period 1922 to 1938 was divided into the eight-year period of the twenties and the nine-year period of the thirties. The frequency of price change during the thirties was somewhat less than that during the twenties, for all products in all countries (table 7). In other words, there was a slightly smaller number of changes in commodity prices during the thirties than during the twenties.

The declines from the twenties to the thirties were general for all groups except grains. The decline was greater for processed groups than for basic commodities. This merely means that, relatively to the twenties, changes in the prices of processed materials during the thirties were less than changes in the prices of basic commodities.

During the thirties, the different groups of commodities for each country maintained practically the same relative positions with respect to frequency of price change as they held during the twenties.

### Comparison of countries

For the seventeen-year period 1922 to 1938, the average indexes of frequency of price change for all commodities were 48 for Canada and 66

TABLE 7. INDEXES OF FREQUENCY OF PRICE CHANGE FOR GROUPS OF 56 TO 64 INTERNATIONALLY IMPORTANT PRODUCTS IN FOUR COUNTRIES, 1922 TO 1929 AND 1930 TO 1938

Product	Index of frequency of price change							
	United States		Canada		United Kingdom		France	
	1922 to 1929	1930 to 1938	1922 to 1929	1930 to 1938	1922 to 1929	1930 to 1938	1922 to 1929	1930 to 1938
40 basic:								
Grains.....	91.5	89.9	82.3	84.7	95.6	97.8	90.5	93.0
Livestock and livestock products.....	98.4	96.6	82.0	92.1	91.0	90.5	84.5	82.0
Other foods.....	67.5	65.9	57.3	54.4	93.3	86.3	82.6	79.9
Average.....	85.8	84.1	74.9	78.4	93.3	91.5	85.9	84.9
Textiles.....	87.7	86.7	86.9	83.2	85.9	86.9	79.8	76.8
Fuels.....	39.8	38.0	11.3	19.6	54.6	38.0	29.6	22.5
Metals.....	85.4	71.8	68.8	70.2	89.8	82.1	80.5	77.4
Miscellaneous.....	83.8	74.7	58.6	59.1	68.9	72.4	75.7	73.7
Average.....	79.1	71.6	61.4	62.2	76.5	73.7	71.6	68.4
Average for basic products.....	82.2	77.3	67.3	69.3	84.1	81.7	78.0	75.9
Processed:								
Textiles.....	61.7	58.9	17.3	19.2	93.7	90.3	83.6	84.5
Fuel and lighting.....	62.8	60.8	20.8	10.7	23.2	24.6	51.1	25.8
Metals.....	48.9	35.8	26.1	18.4	67.0	50.2	54.3	28.7
Building.....	48.2	33.0	18.1	5.2	15.8	8.4	10.1	11.7
Miscellaneous.....	19.9	20.5	5.3	9.2	23.2	39.8	61.5	48.3
Average for processed products.....	45.9	39.4	17.1	13.1	49.7	47.7	54.3	42.4
Average for all products.....	68.6	63.1	48.1	47.9	77.2	72.4	70.1	65.5

to 75 for the other three countries. In Canada, which may have been a retail outlet for the products of low flexibility of other countries, the average indexes of frequency for all groups of products by stage of fabrication, durability, use, and industry represented were below those in the other countries (tables 1, 2, 3, and 5).

The various groups of products maintained approximately the same relative positions in each of the four countries. That is, the same products or types of products were relatively flexible or inflexible in each of the four countries studied. Likewise, the same factors were associated with variation in price flexibility in each of the four countries (tables 1 to 7).

#### *Other factors associated with price flexibility*

Administrative control of various public-utility rates has been exercised by State Governments and the Federal Government. These rates have been highly inflexible (figure 2). The purpose of government regulation has been to eliminate monopoly profits. Such profits may have been eliminated, but the result has been price inflexibility. When prices as a whole decline, these inflexible rates help to cause wide disparities in the price system and thus create a problem which is more important than monopoly profits.

One of the primary reasons for the unequal decline in prices of different products is the inflexibility of wage rates and other costs.



## EFFECT OF VARIATIONS IN PRICE FLEXIBILITY ON PRODUCTION

From this study it was apparent that there was a significant negative relationship between frequency of price change and depression decline in production for 24 to 40 internationally important products in the United States and Canada (table 8). In the case of France and the United Kingdom, however, there was little or no relationship between frequency of price change and depression decline in production.

In the United States and Canada, as frequency increased 1 per cent, production declined 0.5 per cent. In the United Kingdom and France, the rates of change in frequency and production were negligible.<sup>3</sup>

Substantially the same results were obtained for the decline in production from 1929 to the low-price year following (table 8).

## SUMMARY

In general, processed materials had lower price flexibility than had basic commodities. Prices of foods and raw textiles were more flexible than were prices of other products. Prices of agricultural products in general were more flexible than were prices of products of other industries.

Although there was a considerable amount of overlapping of products among the various classifications of commodities by stage of fabrication, durability, use, and the like, the flexibility of prices of products in the higher stages of fabrication and of durable goods was less than that of prices of non-durable and semi-durable goods. Prices of consumers' goods were less flexible than were prices of producers' goods.

## DISEQUILIBRIA IN PRICE STRUCTURES

Index numbers of price movements were computed from prices of products of low and of high flexibility in each of the four countries in such a manner that the average index of frequency of price change for the low-

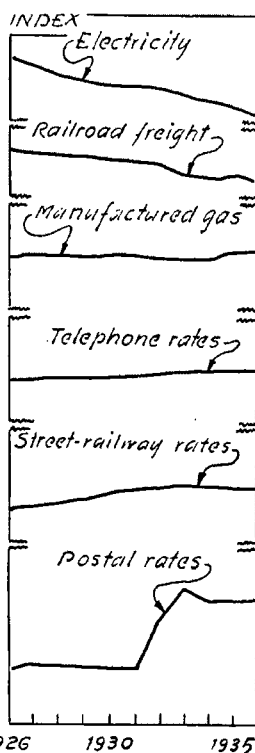


FIGURE 2. INDEX NUMBERS OF RATES CHARGED BY SIX PUBLIC UTILITIES IN THE UNITED STATES, 1926 TO 1936 (1926=100)

Public-utility rates were highly inflexible

<sup>3</sup>Since the articles produced varied for each of the four countries, the products included in the correlation between frequency and depression decline in production were of necessity not the same for each of the four countries. In addition, even though there may have been some production of a particular commodity in a given country, domestic production of that commodity may have made up a small part of the total amount used. The percentages of the goods included which were processed were as follows: in the United States, 34; in Canada, 21; in the United Kingdom, 26;

TABLE 8. CORRELATION AND REGRESSION COEFFICIENTS BETWEEN FREQUENCY OF PRICE CHANGE AND DEPRESSION DECLINE IN PRODUCTION  
(For 24 to 40 internationally important products for four countries)

Country	Frequency and depression decline in production, 1929 to 1932			Country	Frequency and depression decline in production, 1929 to low-price year following*				
	Number of products (N)	Coefficient of determination ( $r^2$ )	Coefficient of correlation (r)		Coefficient of regression (b)	Number of products (N)	Coefficient of determination ( $r^2$ )	Coefficient of correlation (r)	Coefficient of regression (b)
United States . . . . .	40	0.262	-0.512	-0.494	United States . . . . .	40	0.262	-0.512	-0.494
Canada . . . . .	30	0.223	-0.472	-0.509	Canada . . . . .	30	0.175	-0.418	-0.521
United Kingdom . . . . .	24	0.004	-0.062	-0.104	United Kingdom . . . . .	24	0.002	-0.046	-0.026
France . . . . .	33	0.004	-0.059	-0.069	France . . . . .	31	0.005	-0.069	-0.083
All four countries . . . . .	127	0.096	-0.310	-0.307	All four countries . . . . .	125	0.083	-0.288	-0.293

\*The low-price year following 1929 for the United States was 1932; for Canada, 1933; for the United Kingdom, 1931; and for France, 1935.

frequency group was approximately the same in all four countries. The average index for the high-frequency group also was similar for all four countries.

When the index numbers of prices of high flexibility were compared with those of low flexibility, it was clearly evident that wide disequilibria were

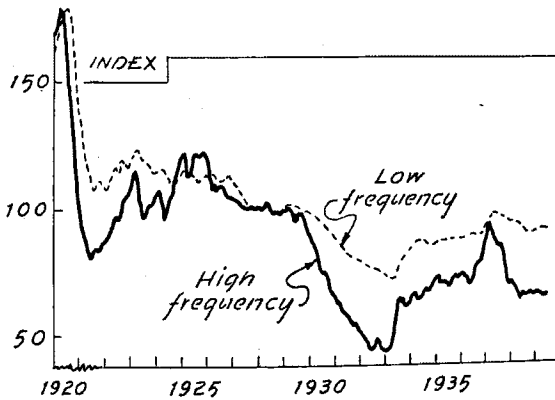


FIGURE 3. INDEXES OF WHOLESALE PRICES OF PRODUCTS OF HIGH AND OF LOW FREQUENCY OF PRICE CHANGE, UNITED STATES, 1920 TO 1938 (1928=100)

Prices of low-frequency products fell less during periods of falling prices and rose less during periods of rising prices than did prices of high-frequency products. Wide disparities between prices of these two types of products were set up by falling prices in depression years. Reduction or elimination of these disparities came only with rising prices.

set up with the declining prices that occurred in the United States, Canada, the United Kingdom, and France (figures 3 to 6). During the depression of the early thirties, prices of products of high frequency declined much more than did prices of low-frequency products.

An important characteristic of products with low price flexibility is that prices of such products move more readily upward than downward. This was clearly illustrated by price movements in the United Kingdom. There, the downward swing of prices stopped in 1931 and prices were fairly stable at a low level from 1931 to 1935 (figure 5). During that five-year period, when prices of high flexibility were very low but were no longer trending downward, prices of low flexibility did not decline. In other words, when the decline in prices stopped, both high- and low-frequency products were affected. Further adjustment of disequilibria came only with rising prices.

In France, the reaction of low-frequency products relatively to high-frequency products was similar to that in the other countries until 1937 (figure 6). With rising prices in France in 1936, most of the disparity was temporarily eliminated. Following 1936, however, prices of low flexibility rose faster than did prices of high flexibility. This caused a widening price disparity during a period when prices were rising—a direct contrast to the situation in the other countries.

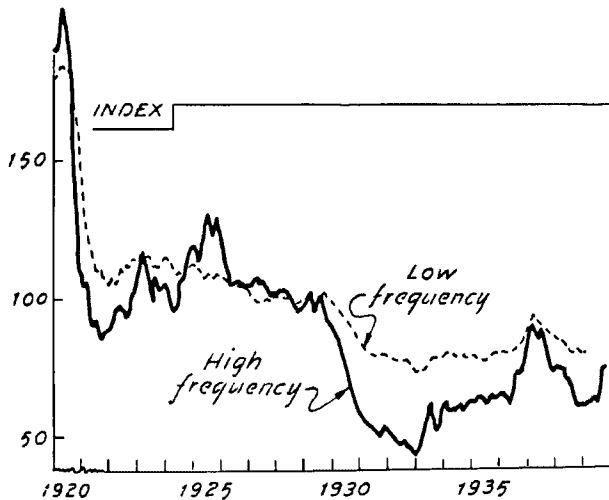


FIGURE 4. INDEXES OF WHOLESALE PRICES OF PRODUCTS OF HIGH AND OF LOW FREQUENCY OF PRICE CHANGE, CANADA, 1920 TO 1938 (1928=100)

During the depression years 1930 to 1932, prices of low-frequency products declined much less than did prices of high-frequency products. Reduction of this disparity came with rising prices from 1932 to 1937

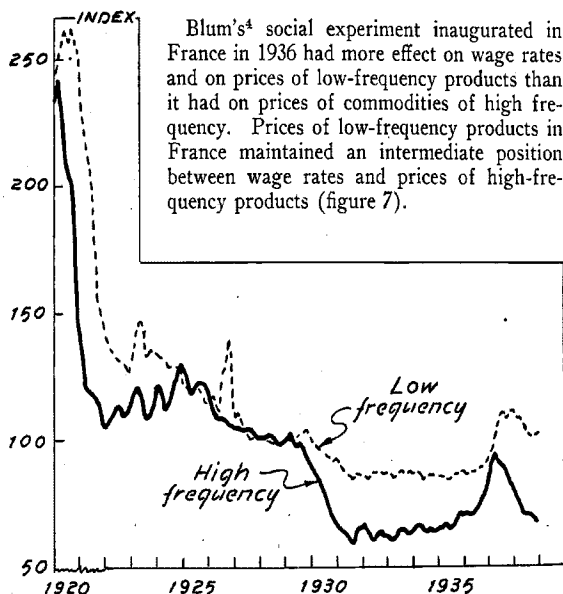


FIGURE 5. INDEXES OF WHOLESALE PRICES OF PRODUCTS OF HIGH AND OF LOW FREQUENCY OF PRICE CHANGE, UNITED KINGDOM, 1920 TO 1938 (1928=100)

With deflation, prices of low-frequency products fell less than did prices of high-frequency products. The gradual rise in prices from 1931 to 1936 reduced the disparity between these two groups. With the sharp fall in prices during 1937 and 1938, a disparity again appeared

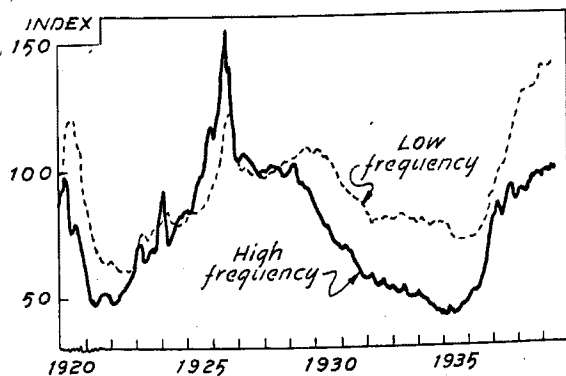


FIGURE 6. INDEXES OF WHOLESALE PRICES OF PRODUCTS OF HIGH AND OF LOW FREQUENCY OF PRICE CHANGE, FRANCE, 1920 TO 1938 (1928=100)

From 1929 to 1935 a wide disparity existed between prices of low-frequency and those of high-frequency products. From 1935 to 1937 the disparity was reduced with rising prices; but during 1937 and 1938, prices of low-frequency products rose faster than did prices of high-frequency products

<sup>4</sup>Blum, L. Declaration to the Chamber of Deputies. *New York Times*, June 7, 1936, page 29 column 2.

## DISEQUILIBRIUM AND INDUSTRIAL PRODUCTION

The purchasing power of products of high frequency in terms of that of products of low frequency was taken as a measure of disequilibrium in the price structure. In the computation of this purchasing power, the indexes of prices of high flexibility were divided by the indexes of prices of low flexibility. A comparison of this measure of disequilibrium in the price structure with indexes of industrial production for the eleven years 1928 to 1938 (figures 8 to 11), indicated that fluctuations in industrial production in the United States and in Canada were closely related to price disequilibria. In the United Kingdom and in France the directional movements were similar. There was a decided tendency for business to be most active when the price structure was in equilibrium, and least active when the price structure was in disequilibrium.

Industrial production declined in the United Kingdom until 1931, in the United States and Canada until late in 1932, and in France until 1935. Following these years, prices began to rise after the severe decline of the early thirties. With the general rise in prices, flexible prices rose more rapidly than did inflexible prices (except in France), and the disequilibria in the price structures were partially corrected.

Blum's social plans probably prevented a partial or a total correction of the disequilibria in France which might have come with the rising prices of 1936. This suggests that equilibrium between wholesale prices and wage rates also is an important consideration. Unfortunately, comparable data on this phase of the subject were not available for all four countries.

An explanation of the close relationship between industrial activity and the equilibrium index<sup>5</sup> probably lies in the fact that the producer of finished goods cannot lower his prices below operating costs, of which labor costs are a large proportion. With falling prices, producers of raw products

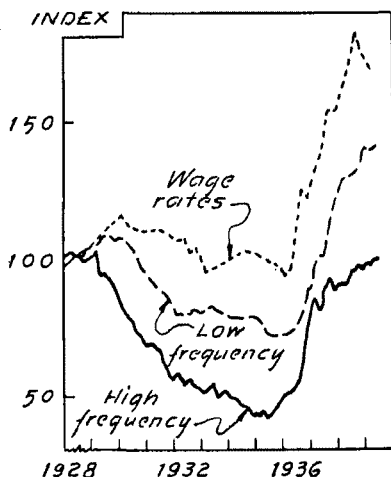


FIGURE 7. INDEXES OF WAGE RATES PER UNIT OF PRODUCT, AND OF WHOLESALE PRICES OF PRODUCTS OF HIGH AND OF LOW FREQUENCY OF PRICE CHANGE, FRANCE, 1928 TO 1939 (1928=100)

Prices of low-frequency products moved between prices of high-frequency products and wage rates. With the rapid rise in wage rates during the period from 1936 to 1938, prices of low-frequency products rose more than did prices of high-frequency products.

Indexes of wage rates per unit of product were calculated by dividing an index of hourly wage rates by an index of hourly productivity of labor. The index of hourly productivity of labor was calculated by dividing the index of industrial production by an index of the total hours spent by labor in industry. (*Bulletin de la Statistique Générale de la France*, Paris, April-June 1929, pages 386 and 492-494, and other issues)

<sup>5</sup>Factors other than price equilibrium probably explain a major part of the long-time movements in industrial production. (See Brandow, G. E., *Cycles in Industry and Prices*. Thesis, Cornell University, June 1939.)

cannot buy so many finished products as formerly, because their prices fall more than do prices of finished goods. This forces a reduction in the volume of finished goods produced, because the producers of finished goods sell no more than will be taken at their stated price. Producers of raw materials frequently cannot limit their production in a manner similar to that of the producer of finished goods. This is particularly true in the case of agriculture, which is a biological industry and in which production is not controllable at will.

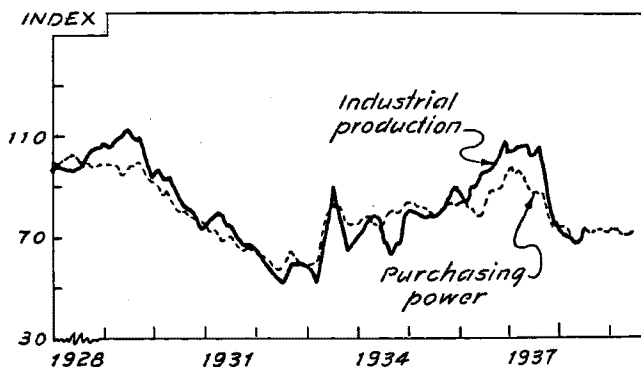


FIGURE 8. PURCHASING POWER OF PRODUCTS OF HIGH FREQUENCY OF PRICE CHANGE IN TERMS OF THOSE OF LOW FREQUENCY, COMPARED WITH INDUSTRIAL PRODUCTION, UNITED STATES, 1928 TO 1938 (1928=100)

There was a very close relationship between the purchasing power of high-frequency products in terms of low-frequency products, and industrial production

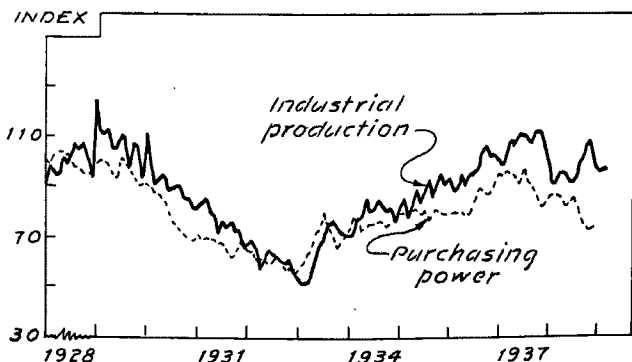


FIGURE 9. PURCHASING POWER OF PRODUCTS OF HIGH FREQUENCY OF PRICE CHANGE IN TERMS OF THOSE OF LOW FREQUENCY, COMPARED WITH INDUSTRIAL PRODUCTION, CANADA, 1928 TO 1938 (1928 = 100)

There was a fairly close relationship between the purchasing power of high-frequency products in terms of low-frequency products, and industrial production

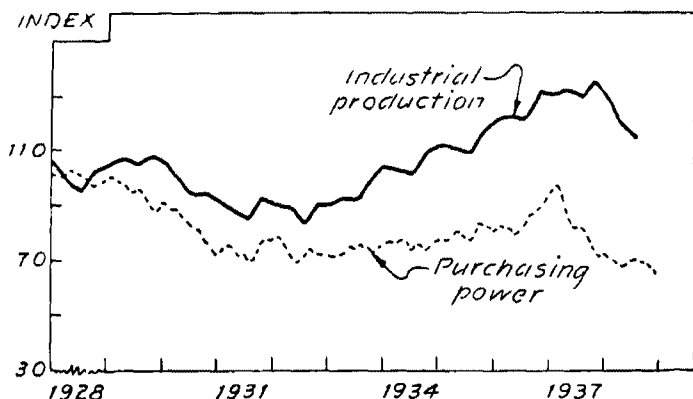


FIGURE 10. PURCHASING POWER OF PRODUCTS OF HIGH FREQUENCY OF PRICE CHANGE IN TERMS OF THOSE OF LOW FREQUENCY, COMPARED WITH INDUSTRIAL PRODUCTION, UNITED KINGDOM, 1928 TO 1938 (1928=100)

Except for the upward trend in industrial production, there was a considerable relationship between movements in the two series

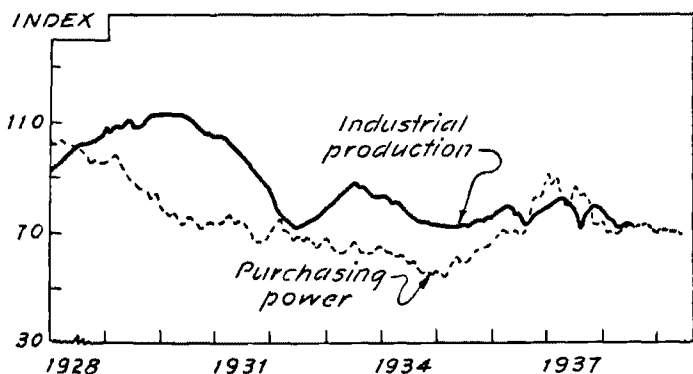


FIGURE 11. PURCHASING POWER OF PRODUCTS OF HIGH FREQUENCY OF PRICE CHANGE IN TERMS OF THOSE OF LOW FREQUENCY, COMPARED WITH INDUSTRIAL PRODUCTION, FRANCE, 1928 TO 1938 (1928 = 100)

The general trends in movements of the two series were somewhat similar  
(Industrial production: *Bulletin de la Statistique Générale de la France*, Paris, October-December 1938, page 18, and other issues)

It has been contended that, since wage rates remain relatively stable, the purchasing power of the laborers in terms of finished goods rises during periods of depression. This type of reasoning was the basis for the wage-and-hour legislation for the United States and France. If the purchasing power of farmers and other producers declines, then fewer manufactured products are produced and less labor is needed. Even though the wage rates do not decline, earnings decline rapidly because total hours worked are very closely related to business activity (figure 12). Legislative action designed to help labor by raising wage rates more rapidly than the increase

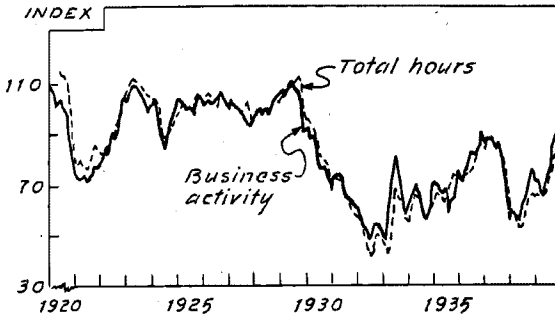


FIGURE 12. INDEXES OF BUSINESS ACTIVITY AND OF TOTAL HOURS SPENT BY FACTORY WORKERS, UNITED STATES, 1920 TO 1939 (1928=100)

The number of hours spent by labor depended directly upon business activity (Business activity: *Standard Trade and Securities, Basic Statistics*, vol. 88, no. 9, sec. 7, April 29, 1938, page D-78; and *Current Statistics*; converted to 1928 base. Total hours: index of employment multiplied by index of hours spent per worker per week; employment and hours per worker per week from Beney, M. A., *Wages, Hours, and Employment in the United States, 1914-1936*, New York, 1936, pages 44-47, and *Survey of Current Business*, Bureau of Foreign and Domestic Commerce, Washington, D. C., vol. 20, no. 1, January 1940, page 18; calculated on 1928 base)

in labor efficiency, may in fact be detrimental to labor. Frequently this type of legislation occurs during the later phases of a depression or in the very early stages of recovery from it. If wages rise as fast as or faster than basic-commodity prices during the recovery from depression levels, disequilibria in the price structure are not corrected; the recovery in business activity is retarded, and the laborer's position is not improved.

Deflation of wage rates, debt structures, taxes, and other inflexible items, apparently has not been possible in any of these countries. When prices of high-frequency products reached and maintained a low level, there was little or no tendency for prices of low-frequency products to continue to decline. There was no indication that attempts to improve conditions during depression periods by reducing prices of inflexible products were effective. Apparently the only solution adapted to the correction of disequilibria in the price structure is rising prices.

#### PRICE MOVEMENTS BETWEEN COUNTRIES

One method of studying the monetary and price situation in two countries is to compare prices of commodities in those countries with their exchange rate. This is a very brief statement of the purchasing-power-parity approach. For example, prices of commodities in the United States may be divided by prices of commodities in Canada; and these relative prices may be compared with the United States dollar price of the Canadian dollar. In such a computation, the division of index numbers of prices in the United States by comparable indexes for Canada results in an index of the purchasing power of United States commodities in terms of Canadian products, or a purchasing-power parity.

This parity, according to the purchasing-power-parity doctrine, should determine the normal United States dollar price of the Canadian dollar, or the exchange rate. This "normal" rate of exchange should be the equi-



librium rate to which the actual rate should tend to conform, because any deviation from this rate would undervalue one currency in terms of the other. For example, if prices in the United States were lower than prices in Canada, the United States dollar would be undervalued relatively to the Canadian dollar. That is, the United States dollar would buy more products in the United States than it would buy in Canada. Similarly, the Canadian dollar would be overvalued because it would buy less products in Canada than in the United States. Increased purchases of United States dollars and decreased purchases of Canadian dollars should force the United States dollar price of the Canadian dollar up until the two currencies would again buy the same amounts of goods in each country.

Since the purchasing-power-parity theory assumes that changes in relative price levels determine changes in the exchange rates, changes in the purchasing-power parities should precede or coincide with changes in the exchange rate.

Whether or not the purchasing-power-parity doctrine holds, the approach is very useful in comparing prices and exchange rates. It is possible to see clearly what happens to prices in one country relatively to prices in another when the exchange rate changes, and what happens to exchange rates when purchasing-power parities change.

In order to obtain additional statistical evidence concerning the relation that exists between prices and exchange rates, purchasing-power parities were computed for the United States in relation to Canada, to the United Kingdom, and to France, from index numbers of prices of 40 basic commodities,<sup>6</sup> wholesale prices of all commodities, and cost of living.

#### UNITED STATES AND CANADA

For the United States relatively to Canada, a study was made of: (a) the purchasing power of 40 basic commodities for the United States in terms of similar products for Canada; (b) the purchasing power of all commodities in the United States as calculated by the United States Bureau of Labor Statistics, in terms of all commodities in Canada as calculated by the Dominion Bureau of Statistics; and (c) the purchasing power of the cost of living in the United States in terms of the cost of living in Canada. These purchasing-power parities were computed by dividing United States indexes by Canadian indexes, and were compared with the United States dollar price of the Canadian dollar, or the exchange rate (figure 13).

Except for the year-and-a-half period from September 1931 to April 1933, the exchange rate was in closer adjustment with the purchasing-power parity computed from cost-of-living indexes than with the other parities. As a result of the droughts in the United States in 1934 and 1936, the United States indexes of prices of 40 basic commodities and of all commodities were high as compared with indexes of comparable products in Canada. During other periods, purchasing-power parities computed from 40 basic commodities and from all commodities were similar to the exchange rate. (Figure 13.)

Movements in the "normal rate" computed from indexes of prices of 40 basic commodities *preceded* movements in the exchange rate from 1930 to 1932 and from 1933 to 1935 (figure 13). The movements were coincident

<sup>6</sup>The General Motors-Cornell world price index. 40 basic commodities.

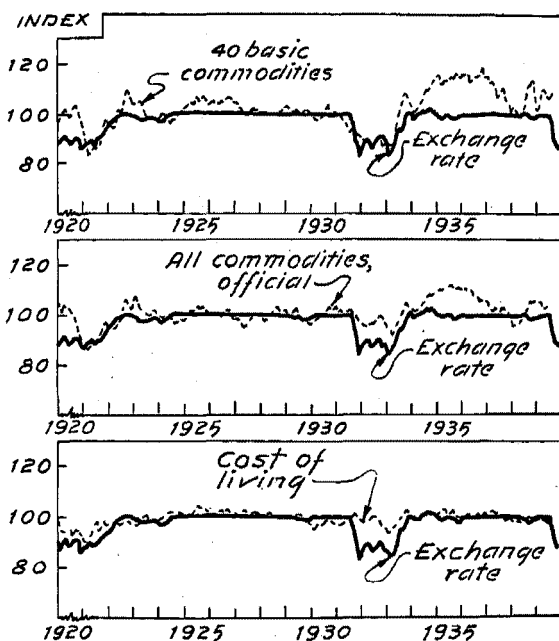


FIGURE 13. PURCHASING-POWER PARITIES BASED ON INDEXES OF PRICES OF 40 BASIC COMMODITIES AND OF ALL COMMODITIES, AND OF COST OF LIVING, COMPARED WITH THE UNITED STATES DOLLAR PRICE OF THE CANADIAN DOLLAR, 1920 TO 1938 (1928=100)

Except for the period 1931 to 1933, the exchange rate was in closer adjustment with the purchasing-power parity computed from cost-of-living indexes than with the parities computed from indexes of prices of 40 basic commodities and of all commodities. During the severe depression, from 1931 to 1933, parities computed from cost of living and from prices of all commodities declined less than did the exchange rate

from 1920 to 1924. There was little or no tendency for the purchasing-power parities computed from all commodity prices and from the cost of living to precede movements in the exchange rate. There was, in fact, a tendency for changes in the exchange rate to precede changes in these price ratios. This was particularly noticeable during the period of depreciation of the Canadian dollar from late 1931 to early 1933, when the purchasing-power parities for all commodities and for the cost of living declined slightly whereas the exchange rate dropped to an index of about 85.

Normally, the purchasing-power parities approximated the exchange rate. Purchasing-power parities in per cent of the exchange rate were rarely below 90 or above 110; and 90 per cent of the time, they were between 95 and 105 (figure 13). During the droughts of 1934 and 1936, the purchasing-power parities for 40 basic commodities and for all commodities were considerably higher than the exchange rate; but in most cases, the exchange rate and the equilibrium rate were in close adjustment.

Changes in the exchange rate were accompanied by differing degrees of

change in the purchasing-power parities, depending on the flexibility of the indexes from which the parities were computed. This was the case particularly during the period of relative depreciation of the Canadian dollar in the early thirties. During that period, the minimum purchasing power of the cost of living in the United States, in terms of the cost of living in Canada, was 94 per cent of the 1928 level; the minimum purchasing power of all commodities was 92 per cent; and that of 40 basic commodities was 84 per cent. The United States dollar price of the Canadian dollar was 84 per cent of the 1928 level. In other words, with the relative depreciation of the Canadian dollar, regardless of its cause, flexible prices in Canada rose, in relation to similar products in the United States, approximately in proportion to the amount of the depreciation; inflexible prices rose much less. Such unequal rises following the depression period tended to correct the disequilibria in Canada's price structure.

#### UNITED STATES AND UNITED KINGDOM

A similar study was made for the United States relatively to the United Kingdom, covering: (a) the purchasing power of 40 basic commodities for the United States in terms of similar products for the United Kingdom; (b) the purchasing power of all commodities in the United States as calculated by the federal Bureau of Labor Statistics, in terms of all commodities in the United Kingdom as calculated by the Board of Trade in London; and (c) the purchasing power of the cost of living in the United States in terms of the cost of living in the United Kingdom. These purchasing-power parities were computed by dividing United States indexes by United Kingdom indexes, and were compared with the dollar price of sterling, or the exchange rate (figure 14).

Prior to 1931, there was closer agreement between the purchasing-power parity computed from cost-of-living indexes and the exchange rate than between the parities computed from the other indexes and the exchange rate (figure 14). Following 1931, the situation was reversed.

From 1930 to 1932, movements in the purchasing-power parity for 40 basic commodities frequently *preceded* movements in the dollar price of sterling (figure 14). The movements were coincident from 1933 to 1934. In all other cases, movements in purchasing-power parities generally *followed* movements in the exchange rate.

The parities computed from price indexes of 40 basic commodities moved with or ahead of the exchange rate; those computed from indexes of lower flexibility moved later, and in less amount. With the depreciation of the pound, there was a rise in prices of products of high flexibility in the United Kingdom relatively to prices of similar products in the United States; this rise was almost in proportion to the decline in the value of the pound. Prices of products of low flexibility rose little or not at all. These differential rates of movements tended to correct the disequilibria in the United Kingdom price structure.

#### UNITED STATES AND FRANCE

##### *Prices of high flexibility*

The purchasing-power parities for products of high flexibility were based on 40 basic commodities for the United States in terms of similar

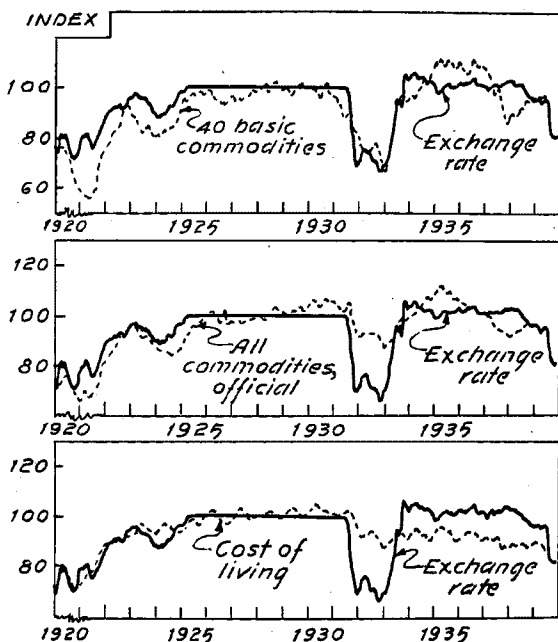


FIGURE 14. PURCHASING-POWER PARITIES BASED ON INDEXES OF PRICES OF 40 BASIC COMMODITIES AND OF ALL COMMODITIES, AND OF COST OF LIVING, COMPARED WITH THE EXCHANGE RATE, UNITED STATES RELATIVELY TO THE UNITED KINGDOM, 1920 TO 1938 (1928=100)

From 1920 to 1931, there was closer agreement between the exchange rate and the purchasing-power parities computed from indexes of the cost of living and of the prices of all commodities than between the exchange rate and the parities computed from indexes of prices of 40 basic commodities. From 1931 to 1938, the situation was reversed.

products for France. These purchasing-power parities, computed by dividing indexes for the United States by indexes for France, were compared with the dollar price of the franc, or the exchange rate.

In general, there was a fairly close relationship between movements in this purchasing-power parity and movements in the exchange rate (figure 15). The relationship was closer when the franc was depreciating in terms of the dollar than when the franc was appreciating.

During the period from 1930 to April 1933, the purchasing-power parity for products of high flexibility declined sharply to as much as 28 per cent below the exchange rate (figure 15). According to the purchasing-power-parity doctrine, this indicated that the dollar price of the franc should have declined. The next actual movement of the dollar price of the franc was upward, and the purchasing-power parity followed upward.

#### *Prices of average flexibility*

The purchasing-power parities for products of average flexibility were expressed in terms of all commodities for the two countries and were com-

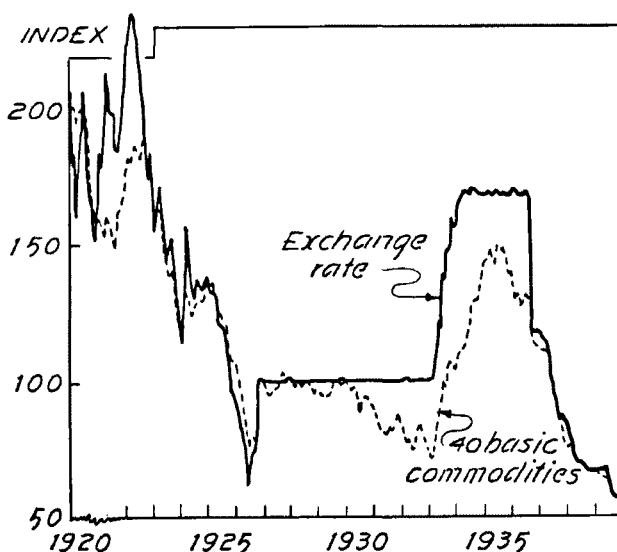


FIGURE 15. PURCHASING-POWER PARITIES FOR 40 BASIC COMMODITIES, COMPARED WITH THE EXCHANGE RATE, UNITED STATES RELATIVELY TO FRANCE, 1920 TO 1938 (1928=100)

In general, there was a fairly close relationship between fluctuations of purchasing-power parities calculated from prices of 40 basic commodities and fluctuations of the exchange rate

pared with the dollar price of the franc. Except for the period from April 1933 to September 1936, fluctuations in these purchasing-power parities, calculated by dividing the official index of all commodity prices for the United States by a similar index for France, were very similar to those in the exchange rate (figure 16). From 1933 to 1936, the parities did not rise so much as did the exchange rate.

The only period in which movements in the purchasing-power parities preceded movements in the exchange rate and in which the exchange rate followed in the same direction, was from late 1935 to September 1936. This may have been owing to anticipation, on the part of speculators and other traders, of the decline in the franc which actually occurred in September 1936.

#### *Prices of low flexibility*

A purchasing-power parity for the cost of living was compared with the dollar price of the franc. The fluctuations of this parity were similar to those of the exchange rate when the franc was depreciating; but when the franc was stabilized in 1926, the cost of living in France continued to rise relatively to the cost of living in the United States (figure 17). During the period from April 1933 to September 1936, when the dollar price of the franc was high relatively to its 1928 level, the cost of living rose much less for the United States relatively to France than the dollar depreciated.

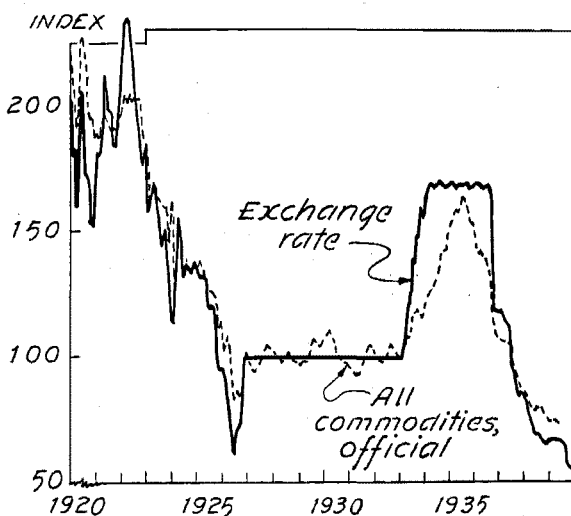


FIGURE 16. PURCHASING-POWER PARITIES IN TERMS OF ALL COMMODITIES, COMPARED WITH THE EXCHANGE RATE, UNITED STATES RELATIVELY TO FRANCE, 1920 TO 1938 (1928=100)

Except for the period from April 1933 to September 1936, fluctuations of purchasing-power parities for all commodities were similar to fluctuations of the exchange rate

### Summary

During the nineteen-year period 1920 to 1938, purchasing-power parities for 40 basic commodities, for all commodities, and for the cost of living, for the United States relatively to France, indicated that movements in the purchasing-power parities usually *followed* movements in the exchange rate. The only exception to this was for the eighteen-month period preceding the September 1936 decline in the dollar price of the franc.

When the exchange rate changed, purchasing-power parities computed from 40 basic commodities followed the exchange rate more closely than did parities computed from all commodity prices or from cost of living. This was particularly the case during the period of relative depreciation of the dollar from April 1933 to September 1936. During that period, prices of products of high and of average flexibility rose much more in the United States, relatively to France, than did prices of low flexibility and cost of living. Such price movements tended to correct the disequilibria in the price structure of the United States.

## CONCLUSIONS

### FACTORS RELATED TO PRICE FLEXIBILITY

Raw materials, in the four countries and during the period studied, were, in general, highly flexible as to price, semi-finished goods were less flexible, and finished goods were relatively inflexible. Durable goods were

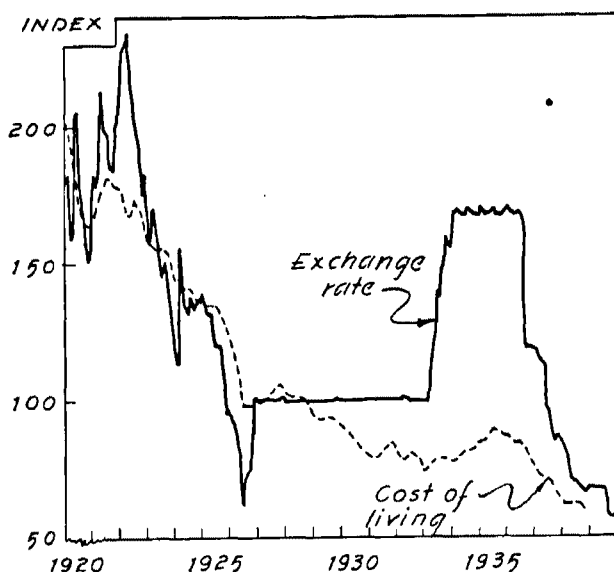


FIGURE 17. PURCHASING-POWER PARITIES COMPUTED FROM COST-OF-LIVING INDEXES, COMPARED WITH THE EXCHANGE RATE, UNITED STATES RELATIVELY TO FRANCE, 1920 TO 1938 (1928=100)

From 1933 to 1936, there was little tendency for the purchasing-power parities computed from the cost-of-living indexes to rise with the exchange rate

Indexes of cost of living were calculated by dividing United States cost of living by France cost of living. (United States cost of living: *Farm Economics*, Department of Agricultural Economics and Farm Management, Cornell University, No. 118, April 1940, page 2909, and original tabulations; converted to 1928 base. France cost of living: *Bulletin de la Statistique Générale de la France*, Paris, April-June 1939, page 337; converted to 1928 base)

more inflexible than non-durable goods, foods were more flexible than other products, and consumers' goods were more inflexible than producers' goods. When classified by the industry represented, agricultural products were more flexible than were forestry products, mining products ranked next, and manufactured products were the least flexible.

Apparently, importance in world trade had little or no effect on price flexibility.

Whether classified by stage of fabrication, durability, consumers' or producers' goods, or industry represented, products decreased in price flexibility more or less in proportion to the amount of labor and the tax, interest, transportation, and other inflexible costs that were necessary in their production. It is probable that the differences in price flexibility of commodities were primarily the result of the addition of labor, transportation, and other inflexible charges to an otherwise flexible raw-material price.

In general, similar products in different countries were found to have similar price flexibility. Likewise, the factors which are enumerated above and which affect price flexibility were similar for the four countries studied.

#### EFFECTS OF DIFFERENCES IN PRICE FLEXIBILITY

Differences in price flexibility were most important during periods of

rapidly declining prices. When prices declined, prices of raw materials and of other flexibly priced products declined much farther than did prices of finished goods. The disparity between the prices of these two types of products continued until prices rose. With a rise in prices, the disparity was corrected as a result of the same situation which caused it originally—flexible prices moving faster than inflexible prices. Apparently, deflation of the inflexible prices to the low level of the flexible prices has been impossible for modern society.

The wide price disparities set up during periods of price declines were probably an important factor in retarding business activity. Since the prices of raw materials declined much farther than did the prices of finished goods, the purchasing power of producers of raw materials declined rapidly. This occasioned a reduction in industrial production, because, in general, the producers of finished goods produced only what they were able to sell at a stated price which of necessity was high enough to cover at least operating costs. Although wage rates remained high, the actual purchasing power of labor declined, because, with the reduction in business activity, less hours of labor were needed, and labor's total income declined rapidly.

Improvement came with a more rapid rise in prices of raw materials than in prices of finished goods. With an improvement in the purchasing power of producers, more finished goods were produced and more hours of labor were required, and this in turn increased the income of labor. This was the normal adjustment accompanying a general price rise following a period of deflation. In France, however, wage rates rose very rapidly, and prices of finished goods rose faster than did prices of raw materials. Under such conditions the price disparity was not corrected, and industrial production did not receive much stimulus from the price rise.

#### PRICE FLEXIBILITY AND EXCHANGE RATES

Except for periods of rapid changes in exchange rates, prices of similar flexibility showed similar movements in each country.

Regardless of flexibility, the purchasing-power parities were, in general, in fairly close adjustment with the exchange rates. However, there was little or no evidence indicating that changes in the purchasing-power parities determined either the time or the amount of movements in the exchange rates.

Prior to the depreciations in the thirties, little or no disparity existed between prices of a given flexibility in one country and prices of similar flexibility in another. That is, prices adjusted for exchange were similar in all countries. This indicated that there was little or no overvaluation or undervaluation of currencies.<sup>7</sup>

With the rapid decline in commodity prices during the early thirties, wide disparities between prices of high and of low flexibility were set up in each country. These disparities caused the currencies of each country to become relatively overvalued in terms of raw products, and relatively

<sup>7</sup>A currency is *overvalued* relatively to other currencies when it *buys less at home* than abroad; that is, when prices at home are high relatively to prices in other countries. Similarly, *undervaluation* occurs when a currency *buys more at home* than abroad, or when prices at home are relatively low.



undervalued in terms of finished goods.<sup>8</sup> These internal overvaluations and undervaluations were probably much more important in causing depreciation than the very slight external overvaluations and undervaluations.

After the depreciations occurred, large differences in prices between countries appeared because prices did not react in proportion to the changes in the exchange rates. The size of the disparities in prices between countries depended on the flexibility of the prices considered. In the country which depreciated, flexible prices did not rise, relatively to similar prices in other countries, by the full amount of the depreciation.

A part of the disparity may have been due to lagging price adjustments, and a part to tariffs, quotas, export bounties, and other trade restrictions which were inaugurated in varying degrees by all countries during the thirties.

Flexible prices rose much more than did inflexible prices. With depreciation there was little or no rise in the indexes of inflexible wholesale prices of all commodities and of the cost of living for any individual country, relatively to similar indexes for other countries.

Although these different rates of rise caused disparities between prices of similar flexibility in different countries, they tended to correct the disparities which existed in the domestic price structures. The correction of these internal price disparities was probably the most important effect of exchange depreciation; it paved the way for increased industrial production and better business conditions.

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<sup>8</sup>For countries which produced primary commodities, the external and the internal disparities were similar.