

1938]

Commodity Stocks in the Trade Cycle

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I

IN this paper we endeavour to make use of the statistics of commodity stocks in order to throw some light upon the Trade Cycle and the issues arising from it.

Our main problem is: Do commodity stocks move in positive or inverse correlation with the Cycle? Important issues as to the momentum of the "cumulative process" hinge upon the answer to this question. For, in the case of positive correlation, investment in commodity stocks would be an important accelerating force in the mechanism of booms and depressions, tending to make any increase in investment activity somewhere in the economic system the impelling force of a cumulative process. By analogy, in the case of inverse correlation changes in the size of stocks would be a retarding force.

It would, of course, be most desirable to be able to make use of statistics of the stocks of finished as well as of unfinished goods. For then it might be possible to say something about the relative size of stocks at different stages of production in different phases of the Cycle, a very important problem to all those who, unyielding to the attractions of "macrodynamics", refuse to see in crises simply fluctuations in total investment. Unfortunately, we have at our disposal statistics of unfinished commodities only.¹ There is, however, reason to believe that the stocks of finished products move in positive correlation with the cycle, because they are kept by producers and merchants as a constant percentage of turnover.

We thus shall have to confine ourselves to the study of raw material stocks and try to find out what light they throw upon the Trade Cycle. So far, Mr. Keynes has been the only one to formulate a precise and logical theory of the cyclical fluctuations in commodity stocks.² According

¹ There are a few statistics of stocks of finished products, but they are not very satisfactory, e.g.: U.S.A., *Survey of Current Business*, Annual Supplement, 1936, p. 10.

S. Kuznets, *National Income and Capital Formation*, New York, 1937, p. 40, table 10, No. 2c "changes in business inventories", and p. 120 (for steel sheets).

Jan Tinbergen in *De Nederlandsche Conjunctuur*, March, 1933, pp. 11-20.

² J. M. Keynes, *A Treatise on Money*, Vol. II, ch. 29, "Liquid Capital". Also *General Theory of Employment, Interest and Money*, pp. 318-19.

to him, "surplus stocks" must be cleared before recovery is possible, and therefore the depletion of stocks during the depression is a subsidiary force of disinvestment. We shall have to examine this thesis in the light of the statistical facts. On the other hand, if it can be shown that stocks as a rule reach their lowest level immediately before the outbreak of the crisis, this may conceivably give some indication of the causes of the latter. It would purport to show that the point at which "surplus stocks" are exhausted is not the lower, but the upper turning point of the cycle.

II

We present below two tables of statistics of movements in stocks of certain raw materials and foodstuffs, the first referring to the pre-war period and the second to the years 1919-37.

TABLE I

End of Year	<i>Pig Iron</i> North of England ooo tons (2)	End of Year	<i>Pig Iron</i> North of England ooo tons (2)	<i>Copper</i> in in Europe U.S.A. ooo tons (1)		<i>Tin</i> ooo tons (3) (4)	<i>Wheat</i> ooo,ooo bushels (6)	<i>Cotton</i> oooo bales 1 Aug. (5)
1869	116	1885	517	—		16	—	134
1870	118	1886	652	47		14	—	144
1871	68	1887	637	56		19	—	147
1872	42	1888	473	35		19	—	129
1873	80	1889	262	96		17	—	132
1874	90	1890	256	95		14	126	108
1875	74	1891	263	62		16	175	174
1876	182	1892	164	53		19	194	282
1877	271	1893	163	52		20	206	226
1878	337	1894	216	43		30	200	213
1879	283	1895	306	51		36	186	320
1880	331	1896	163	43		40	151	193
1881	378	1897	97	31		35	126	192
1882	266	1898	138	27		24	113	324
1883	253	1899	71	22		21	160	400
1884	302	1900	44	28		21	163	246
		1901	139	22		26	169	267
		1902	121	16		17	142	267
		1903	97	13		17	133	292
		1904	199	16		17	146	277
		1905	707	13		16	140	504
		1906	537	17		16	151	418
		1907	89	20		15	127	569
		1908	132	57	57	23	132	458
		1909	385	109	66	23	96	568
		1910	519	84	55	20	132	473
		1911	526	57	41	19	185	484
		1912	241	40	48	14	—	681
		1913	230	21	41	16	—	636

TABLE II

End of Year	Copper		Tin	Zinc	Sugar	Wheat	Cotton	Rubber
	in Europe ooo tons (1)	in U.S.A. ooo tons (1)	ooo tons (3) (4)	ooo tons (3) (7)	ooo tons 1 Oct. (3)	ooo,ooo bushels (6)	ooo bales 1 Aug. (5)	ooo tons (3) (8) (9)
1919	18	546	20	61	—	347	675	—
1920	20	587	18	81	1338	317	634	281
1921	23	427	24	72	2039	238	968	296
1922	33	344	26	20	868	285	561	358
1923	37	409	21	34	791	339	338	306
1924	51	374	25	42	542	363	276	233
1925	65	322	18	9	2500	323	327	234
1926	48	358	16	20	1919	378	550	311
1927	14	330	16	38	1780	400	784	334
1928	10	315	25	42	1850	565	521	301
1929	12	439	28	75	4047	583	452	382
1930	12	585	42	144	5522	583	619	505
1931	34	722	51	130	7022	608	897	644
1932	48	747	45	125	7099	598	1326	641
1933	39	673	23	106	6264	539	1181	668
1934	69	567	13	120	5396	516	1070	724
1935	104	496	12	84	4128	487	909	637
1936	63	377	20	45	2983	318	696	473
1937	42	505	20	79	3102	346	624	496

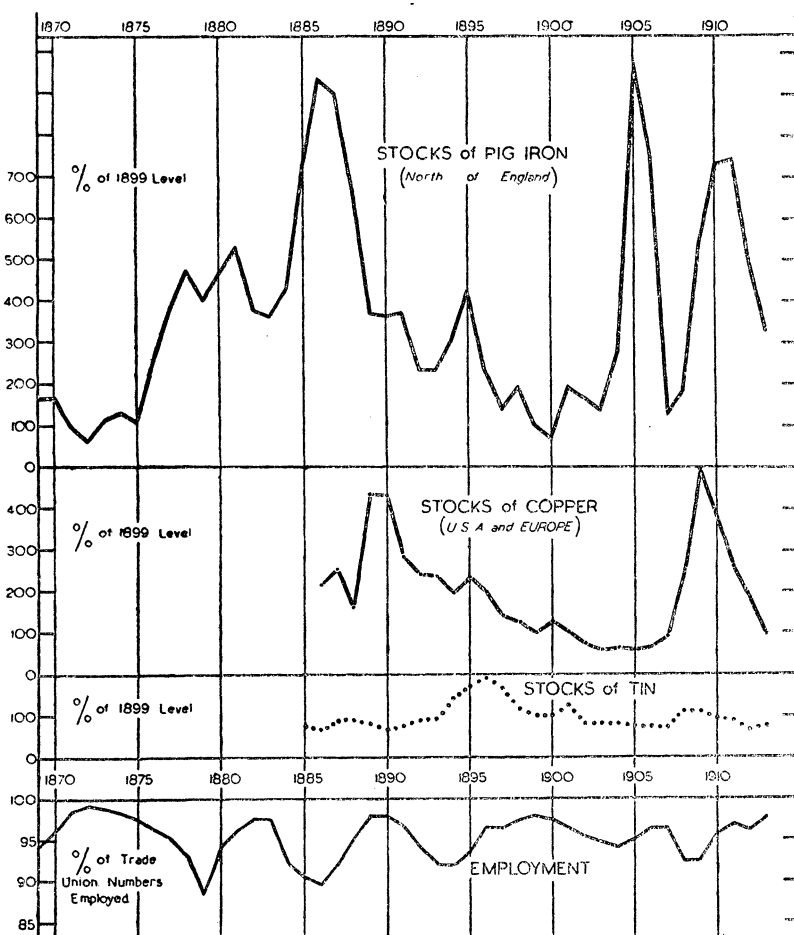
(1) *Year Books of the American Bureau of Metal Statistics.*(2) *Monthly Trade Supplement of the Economist.*(3) *Special Memoranda of the London and Cambridge Economic Service, Nos. 32 and 45.*(4) *World Tin Statistics, 1938.*(5) *Cotton Year Book of the New York Cotton Exchange, 1937.*(6) *Broomball's Corn Trade Year Books.*(7) *Statistische Zusammenstellungen der Metallgesellschaft.*(8) *London and Cambridge Economic Service, May Bulletin, 1938.*(9) *Special Memorandum No. 32, table on p. 19.*

III

Economists before the war assumed that Sauerbeck's Index Numbers were a fairly good barometer of the General Trade Cycle. Now there is reason to believe that for the period before the war this contention holds true, although we prefer a production index which is derived from the English unemployment figures. We do not need to explain why certainly after the war the American production index is greatly preferable.

The movements of agricultural raw materials require, however, a separate explanation. We observe that during the period 1873-1913, whereas the general trade cycle reaches its peak in 1881, 1891, 1900, 1907 and 1913, the index numbers of prices of foodstuffs behave somewhat

Chart I



differently. The peaks of this cycle are in the years 1877, 1891, 1900 and 1912. At first sight it may seem that agricultural production as a whole has a cycle of its own, which consists of two components: the general industrial cycle and changes in natural conditions. By natural conditions we mean all those atmospheric and climatic factors which influence the size of crops.¹ The absence of a production function in the strict sense, i.e., the fact that in agriculture

¹ Some writers have attributed these changes to sun spots. They believe that there is a sun spot cycle of about 11 years, which causes a cyclical fluctuation in the size of the crops. Among the outstanding writers who have taken this view are W. Stanley Jevons and Mr. S. de Wolff. The latter in his book, *Het Economisch Getij*, states that there is a longer cycle of 45 years too. Mr. D. H. Robertson (*A Study of Industrial Fluctuations*) mentions this theory without committing himself.

output quantities are not uniquely correlated with input quantities, makes the supply of agricultural produce a relatively independent variable at least in the short period, when acreage and methods of cultivation are given. Hence, if there are cyclical fluctuations in the size of output per acre this would be a sufficient condition for a separate agricultural cycle. So much for the supply side.

On the demand side, of course, the agricultural cycle is linked up with the general trade cycle. Industrial demand for agricultural raw materials depends, of course, on the state of trade. The demand for agricultural produce for consumption is governed by the level of income and employment unless the income elasticity of demand is very low. It is clear, e.g., that fluctuations in wheat (demand for which is very inelastic) will be entirely governed by the acreage and the output per acre, whereas demand for cotton will depend on factors partly germane to the industrial situation.

We may therefore conclude that the whole conception of an agricultural trade cycle is somewhat doubtful. However, there are very good reasons, as we have seen, to expect production and prices to deviate from the general trade cycle each in its own way. It would be useless, therefore, to correlate stocks of such commodities to the general trade cycle. We correlated the movements of cotton stocks with the price of cotton in the period 1885-1913, and we found an inverse correlation, after eliminating trend, of -82. Some economists will find this result very satisfactory, but we beg to differ. We prefer the simple method of graphical illustration to the dubious niceties of correlation analysis.

For the period 1928-1936 a recent inquiry has shown how the prices of different commodities like wheat, cotton, coffee, tea, rubber, silk and tin move inversely with their respective stocks.¹ Besides, a diagram is presented in which the total stocks of the commodities mentioned move inversely with their average price level. To this we added the American index of industrial production (chart III). It is, of course, well known that after the war the Trade Cycle was more intimately connected with investment in the production of raw materials, particularly in overseas countries.

¹ "Eenige Gegevens betreffende Grondstoffenmarkt" in *De Nederlandsche Conjunctuur*, February, 1937, pp. 14-20.

Chart III

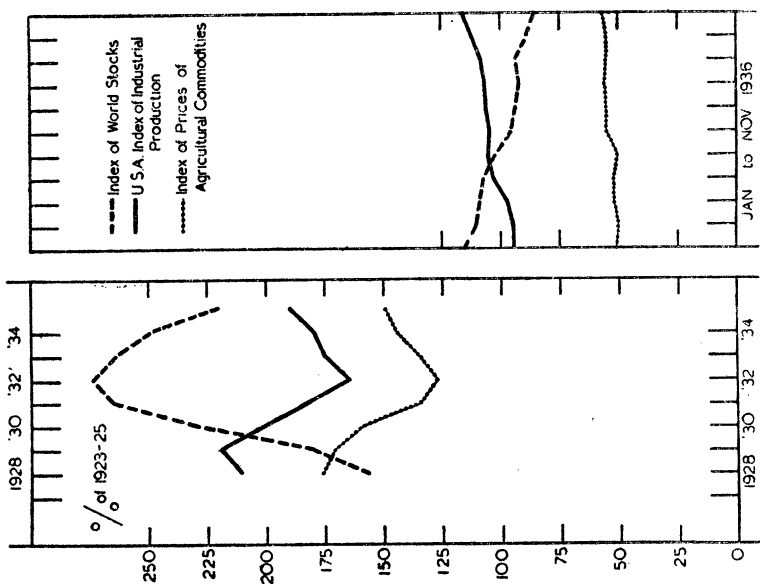
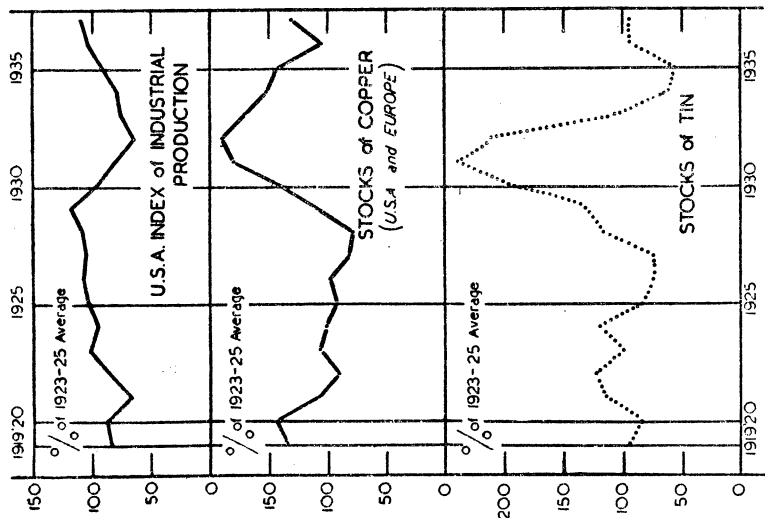


Chart II



Sugar shows a peak in 1925 (Table II, Col. 6). The explanation is given in a Special Memorandum of the London and Cambridge Economic Service.¹ The cause must be sought in the decision to increase the acreage of plantations in Cuba in 1923. We cannot deal here with all the very interesting questions with which that Memorandum deals. But in our opinion the inverted movement of sugar prices with the stocks in those years is perfectly clear.

The steady rise of stocks of cotton (Table II, Col. 8) from 1924-1927 is accompanied by a steady decline in price.² The fall in stocks in 1928 was due to a rise in price. The same holds true for the years 1921-1923, whereas the fall in price from 1920-1921 is again accompanied by a rise in stocks.

Stocks of wheat, as Mr. Keynes has told us,³ show maxima in 1896, 1899, 1907, 1923 and, we can add, 1933. But when we look at the prices we shall find them in these years at their minimum level, with the difference that with regard to the years 1907 and 1933 the price reaches its minimum one year earlier. When we examine those years which according to the *Stanford University Wheat Studies* (the statistics to which Mr. Keynes refers) are minimum years for stocks, they appear to be maximum years for prices; we have to add that since then Stanford University has compiled world stocks for the period 1922-1934.⁴ Moreover, Professor Tinbergen gives also Stocks for wheat for the period 1890-1911 which do not differ much from the Stanford Statistics.⁵

Finally it should be noticed that the stocks of wheat increase during the year 1937 (Table II, last line); the stocks of rubber and sugar do the same, and when we compare the year end stocks of cotton, we also see a rise⁶: from 6 million bales at the end of 1936 to 8.4 million bales at the end of 1937.

The stocks of pig iron, copper and tin before the war show the inverse correlation with the Cycle rather well as is seen from our chart 1.

Pig iron stocks after 1896 exclude makers' stocks⁷ (Table I,

¹ J. W. F. Rowe. *Special Memorandum No. 31, Sugar*, London and Cambridge Economic Service.

² *Cotton Year Book of the New York Cotton Exchange, 1937.*

³ *Treatise on Money*, Vol. II, p. 124n.

⁴ *Wheat Studies*, Vol. IV, p. 180, and Vol. X, p. 134.

⁵ Jan Tinbergen in *De Nederlandsche Conjunctuur*, March, 1933, pp. 11-20.

⁶ London and Cambridge Economic Service, *May Bulletin*, 1938, p. 207.

⁷ *The Economist*, Monthly Trade Supplement, December, 1896.

Col. 4). The sudden fall in 1878-9 (Col. 2)—otherwise a time of intense depression—was due to a coal strike in Durham, but it was slight owing to the attempts of ironmasters to raise prices.¹ The enormous increase in 1905 was due to heavy speculation in "Middlesboro' N. 3".² As will become clearer later on, it was a typical instance of the case where opinions differ widely and dealers were more "bullish" than either ironmasters or iron consumers.

Copper had a special overproduction crisis (Table I, Col. 5) in 1889.³ Afterwards stocks have a falling trend for about 17 years owing to the steady expansion of the electrical industries.

After the war (Table II) the stocks of copper, tin and zinc show great irregularities, but by 1929 we find them all having resumed the inverse movement to the Cycle. Copper and zinc stocks increased in 1937, tin (where production was most rigidly controlled) already in 1936.

It remains for us to discuss the influence of monopolistic restrictions on the size of stocks, taking the case of copper, stocks of which after the war show a very close inverse correlation with business activity, with a lead of one year. The period 1923-29 appears to be very suitable for this purpose. After 1929 the phenomenon is disturbed by the Great Depression.

A combine of copper producers was formed in 1926. Until March, 1929, although stocks remained very small throughout this period, this does not seem to have had much influence on the size of stocks. But then a speculative boom broke out. The combine, more interested in high prices than in the stabilisation of production, at first allowed stocks to reach a minimum level. After a month the boom collapsed, but the high prices had by then induced producers to increase output, and because of the American anti-trust laws the combine was unable to prevent this. They tried in vain to keep the price high by accumulating stocks. After 1930, however, the accumulation of stocks was no longer deliberate.

Between 1923 and 1929 there was a cartel which tried to restrict the output of spelter. Its efforts, however, were not very successful. Production rose from 960,000 tons in 1923 to 1,440,000 tons in 1929. Moreover, as far as we know, it took no measures to influence the size of stocks.

¹ *The Economist*, 1879, pp. 421 and 559.

² *Ibid.*, 1905, p. 1072.

³ *Ibid.*, September 12th, 1908, p. 481.

IV

We shall now have to examine the distribution of raw material stocks between different classes of holders. For this purpose we shall divide them into :

Producers (of raw materials) ;

Dealers (in raw materials) ;

Manufacturers (of finished commodities in so far as they are buyers of raw materials).

We would expect that because of the costs involved in the storing of commodities, everybody wants to keep his stocks as low as possible. Moreover, we know that entrepreneurs as a rule keep their stocks in a certain relation to their turn-over. We therefore have to find an explanation why the stocks of raw materials do not obey to that rule. The obvious reason is that in the case of sudden and unforeseen changes in demand, agricultural and mineral production can only be readjusted with a certain time-lag.

Sometimes another reason is mentioned : Speculation ; about this point we shall have to say more in a later section of this paper.

If our explanation of the inverted movement of the stocks of raw materials is correct, we shall expect producers to bear the burden of these surplus stocks, for the dealers and manufacturers, who wish to maintain their proportion between output and stocks, are not responsible for the production of raw materials.

In some cases, however, not the producers but the dealers and manufacturers hold these surplus stocks. Here the explanation has to be sought in the relative ease with which in different industries different classes of entrepreneurs can obtain credit. In some fields of production the producers have a relatively large reserve of capital available, or they may have an easy access to the credit market. In other fields of production producers do not enjoy these facilities and have always to sell to dealers. It is also conceivable that the dealers may be unable to provide enough capital and that they may have to sell a part of those stocks to the manufacturers. We thus can imagine the enormous extra fall in price when at a certain moment during the slump the capital reserves of a certain field of production are becoming insufficient to finance the growing surplus stocks.

Thus the stocks of sugar in Java were negligible before 1929. "For the crop was always sold forward in its entirety before the grinding season began", as we read in *Special Memorandum* No. 45 of the London and Cambridge Economic Service.¹ After 1929 the stocks in Java (and in Cuba) and in the hands of dealers move very strongly in an inverse relation to the trade cycle.

In the same *Memorandum* is an interesting table concerning the division of rubber stocks during that period.² We combined the stocks of U.K. public warehouses with the stocks of U.S. dealers and manufacturers. Then we subtracted these combined figures from the total amount.

STOCKS OF RUBBER AT THE END OF THE YEAR : (000 TONS).

Year	U.S. and U.K.	Total	Difference	On Estates in Malaya
1928	88	301	213	35
1929	192	382	190	28
1930	320	505	185	26
1931	449	644	195	20
1932	472	641	169	22
1933	457	668	214	21
1934	496	724	228	12
1935	476	634	158	23
1936	301	473	172	26

The conclusion is that in the depression the manufacturers and dealers in these commodities bear the brunt of the burden. It is interesting to observe how the stocks in the hands of producers (on estates in Malaya) move in opposite direction to the total of stocks. It should further be noticed how during the period total stocks of rubber moved inversely towards the Trade Cycle.

The division of the stocks of copper, on the other hand, presents entirely different features. Although there are no statistics of copper in the hands of manufacturers we know the stocks in the hands of producers (American smelters and refiners) and (European) dealers.

The stocks of copper are mostly in the hands of producers, but there is a tendency for dealers' stocks to move in the same direction. The reason obviously is that producers have to carry the bulk of these stocks in order to maintain prices. They are able to do it because of the credit facilities

¹ *Stocks of Staple Commodities*, by J. W. F. Rowe and others ; November, 1937, p. 24.

² *Ibid.*, p. 30, Table I.

they enjoy; they are supported by the Morgan group.¹ The dealers, as a rule, have some financial reserves and their stocks exercise a buffer function as regards changes in demand. At any rate, we are entitled to conclude that the stocks will be held in the strongest hands.

V

The main conclusion emerging from the statistics we have presented appears to be that our stocks are inversely correlated with the cycle. As a rule, they reach their lowest level very shortly before the outbreak of the crisis, while their peak level is to be found towards the end of the depression. If this reading of the facts is correct, it is difficult to accept Mr. Keynes' theory according to which surplus stocks must be exhausted before recovery can start. On the contrary, the conclusion that seems to suggest itself is that raw material stocks must have reached a certain size if they are to support a lasting recovery. This shows the highly artificial character of the division of stocks into "working capital" and "liquid capital" according to "the normal requirements" of production and illustrates the ambiguity of the concept of "surplus stocks"; for stocks that may have been surplus with regard to the level of activity at the trough of the depression may be insufficient to sustain a major recovery. It is here that the buffer function of stocks²—at least of those goods the supply of which can only be adjusted with a time-lag—comes out most clearly: without ample reserves of raw materials, recovery may soon be checked by all sorts of "bottlenecks".

On the other hand, our statistics seem to show that it is at least not impossible that prosperity should come to an end owing to the scarcity of certain factors of production. It is no doubt difficult to generalise from the material presented, because different commodities show different "leads" against the Trade Cycle, and it is, of course, by no means necessary that all the crises brought about by scarcity should be brought about by scarcity of the same factor. The coefficients of production being fixed in the short run, scarcity of *one* factor may suffice to stop *all*

¹ London and Cambridge Economic Service, *Special Memorandum No. 32, Stocks of Staple Commodities*, by J. M. Keynes, J. W. F. Rowe and G. L. Schwartz, pp. 10-11.

² Cf. L. M. Lachmann, "Commodity Stocks and Equilibrium," *Review of Econ. Studies*, Vol. III, n. 3, June, 1936.

investment activity. Moreover, as the Austrian Theory has shown, scarcity at one stage of production is quite consistent with unsaleable stocks at another stage. For these and similar reasons, until we have more accurate knowledge about the distribution of stocks between capital goods—and consumption goods industries in general, and of raw material stocks between producers, dealers, and manufacturers of finished commodities in particular, extreme caution in the cyclical interpretation of the low level of stocks seems advisable.

If the statistics presented are representative of the behaviour of stocks of unfinished goods in general, what conclusions have we to draw with regard to the theory of the Trade Cycle? If these stocks diminish during the upswing they evidently offer no scope for investment. It follows that for the source of that investment activity which characterises the upswing we have to look elsewhere, i.e., we probably have to seek it in investment in fixed capital. The obverse applies to the downswing, and we are therefore entitled to conclude that investment and disinvestment in staple commodities' stocks, so far from being secondary forces in the mechanism of the cumulative process, actually are retarding forces, offsetting to a certain extent the effects of investment in equipment.

This statement has to be qualified in several respects. In the first place, we have to remember that our statistics refer to unfinished goods only and that, as we said, there is reason to believe that stocks of finished commodities move in positive correlation with the cycle¹, i.e., that producers and merchants of consumption goods tend to keep their stocks in a certain proportion to their turnover. In so far as changes in raw material stocks merely offset opposite movements in the stocks and production of finished goods—owing to the lag with which raw material production is adjusted to changes in demand—raw material stocks serve as a kind of excess reserve for the industries producing finished commodities (buffer function).

Secondly, the size of stocks has a direct causal influence on the production of raw materials. Not only will output be restricted as long as stocks are accumulating—very much against the wishes of the producers who have to carry

¹ Ralph H. Blodgett, *Cyclical Fluctuations in Commodity Stocks* (University of Pennsylvania Press), Philadelphia, 1935, Appendix C, p. 171.

them—but even while they are falling it is unlikely to recover before, indeed, stocks have again reached a normal size. Thus, as long as stocks are large, an increase in demand will not immediately lead to an increase in supply; in this case the buffer function of stocks will check the cumulative process.

Another point to be considered in this connection is the relationship between the size of stocks and investment in the production of raw materials. To the extent to which the investment activity characteristic of periods of prosperity is due to investment in raw material production our inverse correlation may not hold. Unless demand grows more rapidly than supply is forthcoming stocks will increase and prices tend to fall. This need not cause a general collapse as long as investment in other parts of the economic system remains satisfactory; it may even stimulate expansion in raw material consuming industries. Still, it is true that investment in the production of raw materials undertaken in the expectation of a rise in demand which does not immediately occur will lead to a, perhaps temporary, increase in stocks. There is every reason to believe that the steady rise in raw material stocks between 1923 and 1929—in positive correlation with the Trade Cycle!—has to be ascribed to similar causes.

If it is true that in the past recovery has usually been preceded by an accumulation of stocks of industrial raw materials, it follows that all schemes aiming at a restriction of output by means of monopolistic control have to be regarded as potentially dangerous. One has, of course, to beware of the *post hoc ergo propter hoc* fallacy, and it follows by no means that accumulation of stocks of a definite size is a necessary condition of Recovery. It may well be that in the past Recovery would have occurred even with much smaller stocks. But we beg to submit that then it may have been much shorter. At any rate, the danger of “bottlenecks” being encountered would be greater.

For these reasons we are unable to follow Mr. Keynes in his advocacy of restriction schemes. It seems to us that such schemes are justifiable only where it is impossible for a price fall to lead to readjustment, i.e., where the following three conditions are fulfilled:

- (1) demand is very inelastic;
- (2) prime costs are either constant or falling;

- (3) all producers work under identical conditions so that there are no high cost and low cost producers.

Mr. Keynes argues that the present economic system offers no mechanism for the carrying of surplus stocks, hence the necessity of restriction schemes. The material we have presented seems to indicate that in spite of his contention that the holding of large stocks is too costly to be feasible such holding did and does in fact take place, and that stocks do exercise a buffer function.¹

VI

Out of the foregoing there arises the interesting problem of the scope and significance of commodity speculation during the Trade Cycle. From all we know from the reports and descriptions of contemporary observers of past booms, commodity speculation has always been a strong, and in some instances a decisive factor. But, if stocks of unfinished commodities actually diminish during the upswing, how is commodity speculation possible? The possibility of speculation in finished goods may be dismissed as it is obvious that because of their low "plasticity"² large speculative transactions in them are not feasible. Moreover, we know from experience that speculation is usually most intense on the big markets for staple commodities which offer speculators the greatest facilities. How, then, is the riddle to be solved?

A given change in price is not necessarily correlated with a given volume of transactions. From the financial press we all know instances where "the movement of prices was out of all proportion to the volume of dealing". The volume of transactions necessary to bring about a certain price movement is an indication of the division of opinions

¹ After this paper had been completed, Mr. Keynes once more took up the subject of commodity stocks in a paper read at the Cambridge meeting of the British Association in August, 1938 ("The Policy of Government Storage of Foodstuffs and Raw Materials," *Economic Journal*, September, 1938). While his diagnosis has remained essentially the same,—“The competitive system abhors the existence of stocks, with as strong a reflex as nature abhors a vacuum, because stocks yield a negative return in terms of themselves,” *op. cit.*, p. 449—his therapy is new. He seems to have grown sceptical of output restriction which “is apt to be objectionable in general, even when it is highly desirable for the particular purpose of meeting fluctuations, because it may be part and parcel of conditions of almost uncontrolled monopoly”. What he proposes is, briefly, a government subsidy for the carrying of stocks. To this we have no objection. But it still seems to us, in the light of the statistics we have presented, that his fears about insufficient stock-carrying in a competitive world are a little exaggerated. The whole issue has, however, now become a question of degree.

² H. Makower and J. Marschak. "Assets, Prices and Monetary Theory," *ECONOMICA*, August, 1938, pp. 280-1.

in the market. If everybody expects prices to rise, they will rise without any transactions taking place. Hence, the more "bullish" the market during the boom the less transactions are necessary in order to bring about a given price rise. In other words, commodity speculation during the boom will not lead to an accumulation of stocks, if sellers, buyers and consumers are all equally "bullish". It follows that stocks can increase only to the extent to which producers and speculators are more "bullish" than consumers.¹

Let us restate the same thing in the terminology of the forward market most appropriate where we have to deal with intertemporal price- and quantity-relations. Stocks can accumulate only if the forward price exceeds the spot price by more than the carrying costs, for only then it will be profitable to carry them. Hence, changes in stocks are determined by changes in the forward price relatively to the spot price. It follows that an increase in stocks during the boom can occur only in so far as the spot market tends to lag behind the forward market, i.e., to the extent to which operators in the spot market are less "bullish" than those in the forward market. Where there is no division of opinions between the two markets, and the spot price immediately follows every movement of the forward price, there can be no change in the size of stocks. Such changes are proportionate to the dispersion of opinions.

We have now seen why commodity speculation during the boom need not lead to an increase in stocks, if optimism is sufficiently widespread. But the inverse correlation between commodity stocks and the price level conceals even more interesting problems. We have found that in the upswing stocks of raw materials actually decrease, i.e., forward prices tend to fall relatively to spot prices. As we pointed out, this may be due to actual shortage of supply. Where production can only be adjusted with a time-lag, a situation may be reached in which present supply is short but future supply plentiful, and where therefore nobody will carry stocks. But the explanation of our inverse correlation in terms of increasing physical scarcity during the upswing is not the only possible one. It may be due to the superior skill of operators in the forward market who in this phase of the cycle already anticipate the next.

¹ Cf. above p. 442 about the 1905 boom in "Middlesboro' N. 3".

If a decrease in stocks indicates a tendency of the forward price to fall relatively to the spot price, this shows an increasing divergence of opinions. If this occurs during a boom, it means that forward market operators are less "bullish" than their colleagues in the spot market. In which case we shall reach the astonishing conclusion that the commodity speculation characteristic of the boom is just speculative activity of people who ordinarily do not "speculate", i.e., operators in the spot market, which drives up the spot price relatively to the forward price.

If this were true, it would be, in fact, a tribute to the superior foresight of the professional speculators operating in the forward markets, and it would, moreover, show why a free exchange economy with a well-developed system of intertemporal markets operated by specialists can weather many storms. We must not forget, however, that the relationship between the size of stocks and the difference between forward and spot price applies to covered stocks only.

This makes it extremely difficult to use our theorem for the depression. The large stocks characteristic of the downswing are, as we saw, mostly carried by producers very much against their own wishes and for the purpose of preventing a complete collapse of prices. They are probably "unhedged", since if they were sold forward they would affect prices. Therefore the accumulation of stocks in the depression cannot very well be ascribed to the superior foresight of speculators.

This is, of course, not to say that the existence of large uncovered stocks outside the market will not affect the latter. We know from experience that the existence of huge stocks kept outside the market will by forcing down the forward price cause the liquidation of "hedged" stocks.

In applying this theory to the tin market during the last 13 years we find that it is, on the whole, borne out by the facts.¹ Broadly speaking, boom periods are accompanied by a backwardation and falling stocks, depressions by a contango and stock accumulation.² In 1926, 1927 and 1928 visible supplies of tin were extremely scarce and did not reach 20,000 tons until October, 1928. Throughout this period there was a backwardation which in 1926 and 1927 averaged £6.16 and occasionally reached £10.

¹ The following figures are taken from *Tin* (annually published in London by the International Tin Producers' Association). Total visible supplies as estimated by W. H. Gartsen.

² In some markets *contango* and *backwardation* are called *premium* and *discount*.

From February, 1929, till the end of 1932 total visible supplies rose from 26,000 tons to 46,000 tons while the contango was never less than £1.

By February, 1934, stocks had fallen to 21,000 tons while spot and forward prices hardly deviated. This fall in stocks was due to the liquidation of the International Tin Pool.

In 1934, with an average backwardation of 19s. 2d., stocks fell to 12,600 tons. This must have been a minimum level, for whilst throughout 1935 and 1936 the backwardation was never less than £2, stocks remained at a little above 13,000 tons. In November–December, 1936, the backwardation disappeared and in January–February, 1937, gave way to a contango which by March had brought up stocks to about 20,000 tons.

Monopolistic interference with the tin market started in 1928: "During the year a syndicate which came to be known as 'The Group' was formed to hold tin off the market and the rise in price which began in August may mark the beginning of their operations."¹ Their activity would explain why stocks rose suddenly between August, 1928, and February, 1929, in spite of a large backwardation.

The International Tin Pool was formed in September, 1931, and by the end of January, 1932, had acquired 21,000 tons. Liquidation began in July, 1933, and lasted until the early months of 1934. There can be little doubt that but for its sales of spot tin the backwardation which did not exceed £1 before March, 1934, would have appeared earlier.

VII

At last we have to discuss what light, if any, is thrown by our investigations upon some modern trade cycle theories. Of course, how one expects commodity stocks in general and raw material stocks in particular to behave during the Trade Cycle depends on the type of theory one happens to hold. We have found that the cyclical behaviour of (industrial) raw material stocks conforms to a definite pattern which, it would seem at first sight, must rule out at least some theories.

In fact, however, practically all those theories which

¹ J. K. Eastham. "Rationalisation in the Tin Industry," *Review of Econ. Studies*, October, 1936, p. 20.

stress the importance of fluctuations in investment in fixed capital as the outstanding feature of the Trade Cycle are borne out by our material. The reason is that an increase in investment activity of this kind involves an increase in the demand for mineral products such as iron, copper, tin, the supply of which can only be adjusted with a time-lag. Hence, in the meantime stocks are bound to decrease as they are likely to augment in the case of a setback in investment activity. It follows that all over-investment theories are consistent with the results of our investigation. On the other hand, Recovery cannot possibly start in the raw material producing industries, hampered as they are by large and increasing stocks which have to be cleared before their production can recover.

Unfortunately we are not in a position to judge the relative merits of various over-investment theories. In particular, our statistics neither corroborate nor disprove the so-called "monetary over-investment theories" of the Austrian School, as we do not know enough about the distribution of stocks among the different stages of production. As we mentioned above, only two of our series include manufacturers' (rubber and cotton) stocks. Mr. Blodgett, however, has pointed out that stocks of raw materials in the hands of manufacturers tend, on the whole, to move in inverse correlation to the Trade Cycle.¹ What would be required in order to verify "monetary over-investment theories" is exact knowledge about the relative movements in the stocks of the manufacturers of capital and consumption goods respectively, but it is here that we are almost completely ignorant. Where the "over-investment" of the boom is due to investment in the production of raw materials, stocks may, of course, increase with production, and then their inverse correlation with the Trade Cycle will be broken. As we pointed out above, this actually was the case between 1923 and 1929 when all stocks were increasing rapidly.

With regard to Mr. Keynes' views on these and similar subjects we have to distinguish between his general trade cycle theory² and his thesis about the cyclical fluctuations in commodity stocks.³ Whereas the former may be described

¹ Blodgett, *op. cit.*, pp. 5-8.

² *General Theory of Employment, Interest and Money*, ch. 22 : "Notes on the Trade Cycle".

³ *Treatise on Money*, Vol. II, ch. 29 : "Liquid Capital".

as an over-investment theory the latter does not form a necessary part of it, i.e., the investment activity of the boom is mostly due to investment of fixed capital. The depletion of "liquid stocks" which in his opinion is a prerequisite of Recovery as well as the increase in "working capital" accompanying the phase of expansion are, on the whole, secondary forces in the mechanism of the cumulative process which originates from and centres in the investment in equipment. Thus, even if our statistics show that fluctuations in stocks so far from being secondary factors are actually retarding forces, this does not affect Mr. Keynes' argument. Moreover, we must not forget that our theory refers to strictly industrial raw materials only.

What are our conclusions to be with regard to under-consumption theories? It is well known that this doctrine cannot be disproved or proved by a mere comparison of total quantities like, e.g., investment and consumption. What is required in order to decide whether or not under-consumption was the cause of a crisis is a knowledge of events in their chronological order. In other words, what we would have to know is what increased first, stocks of finished consumption goods, of finished capital goods, or raw material stocks (the problem of "leads" and "lags").¹ Raw material stocks alone are an insufficient criterion.

There is, however, a version of under-consumption theory which has a direct bearing on the demand for industrial raw materials. In the "under-consumption cum acceleration" theory of Professor J. M. Clark and Mr. Harrod investment is linked up with the rate of increase of consumption. Hence, every slowing down in this rate of increase entails a setback in investment activity which explains the increase in the stock of mineral products. This version of under-consumption theory is therefore entirely consistent with the statistics we have presented.

The only trade cycle theory which, at first sight, it seems difficult to reconcile with the results of our investigation is that of Mr. Hawtrey, who emphasises investment in stocks as the impelling force of the Trade Cycle. But, since his theory refers to stocks of manufactured commodities only and not to agricultural and mineral products² it does not affect our argument. Moreover, it is highly probable

¹ Blodgett, *op. cit.*, p. 103.

² R. G. Hawtrey, *Capital and Employment*, London, 1937, pp. 116-17.

that stocks of finished commodities in the hands of wholesalers and retailers do move positively with the cycle. Still, if our statistical conclusions are correct, the forces released by Mr. Hawtrey's movements in finished commodity stocks are largely offset by the economic forces which we have endeavoured to describe.