is usually the case. It was not of sufficiently good quality to be used for edible purposes.

The characteristics of the oil are shown in Table I.

The amounts of soluble or volatile fatty acids are negligible, as shown by the low Reichert-Meissl and Polenske numbers: the same is true of the hydroxy acids or mono- or diglycerides—as shown by the low acetyl value: a similar statement can be made regarding high unsaturated acids—indicated by the iodine value.

The various acids were determined in the oil by the Gusseron-Varrentrapp lead-salt-ether method as used by Baughman and Jamieson[4] in their work on Soya Bean and Sunflower-seed oil, which enables the separation of the saturated and unsaturated fatty acids. The nature of the latter was determined by their bromine addition derivatives. The nature of the saturated acids was determined by their methyl esters, their molecular weights and their melting points, also as detailed by the above-mentioned authors. The method has been now so thoroughly worked out by them that detailed figures seem a waste of space. From our investigations, the chemical composition of Mowrah-seed oil would seem to indicate the glycerides of the following acids:

	%
Clupanodonic	trace
Linolic	13.3
Oleic	40.2
Stearic	2.0
Palmitic	26.6
Myristic	16.1
Unsaponifiable matter	0.8

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FUTURE TRADING AS INSURANCE IN THE COTTON SEED OIL INDUSTRY

BY CARL L. ALSBERG

The manufacturer who faces violent fluctuations in the price of his raw materials may be ruined by such fluctuations, be he ever so efficient in manufacturing. The greatest conceivable manufacturing efficiency and skill may be unavailing if fluctuations in price of raw materials unforeseen by the manufacturer occur. To keep out of the bankruptcy courts he must be a shrewd buyer, often virtually a gambler in raw material as well as a legitimate manufacturer. If he manufactures to order for future delivery a sharp rise in raw material may ruin him. If he manufactures for sale on the open market, a drop in price of raw materials coming after

[4] *J. Am. Chem. Soc.*, **44**, 2947–2957 (1922).

he has made his purchases may keep his production costs above those of his competitors who have bought raw materials later so that he may have to take a loss. Even if he has bought wisely, he may have difficulty in disposing of his wares at a profit if there has been overproduction in his line or if the relative purchasing power of his customers has declined. Low purchasing power may result from lack of prosperity due to causes far remote from those that affect his own line of business, or it may be due to the fact that his goods, because of high production costs, are so high in price that his customers curtail consumption. Such high prices will usually depend, at least in part, upon high cost of raw materials, so that a good part of a manufacturer's selling difficulties will be tied up with fluctuation in price of raw materials. It is clear that fluctuation in price of raw materials is one of the very serious speculative risks a manufacturer has to face.

Now speculation and manufacturing require quite different types of mind, quite different orders of ability, quite different temperaments. One could almost believe that the traits of character which make a successful speculator preclude their possessor having at the same time the traits to make him a successful manufacturer. If this idea is sound, one would expect manufacturers to take advantage of any known method of insurance against fluctuation in price of raw material. Yet in many industries such insurance is either not employed at all or only inadequately. The cotton oil industry is such a one. In this regard it differs sharply from the cotton industry. This difference in the practice of the two industries is, I believe, responsible to an important degree for the different fate the two industries suffered in the post-war deflation period. The form of insurance to which I refer is future trading.

Before attempting to analyze the use of future trading by the two groups of industries, let us consider how future trading is used as a method of insurance against loss from fluctuation in the price of raw materials. Let us use as an illustration the milling industry in which future buying and selling is very general and the operations are relatively simple.

If a miller is asked to quote a price for flour to be delivered at some time in the future, he turns at once to the quotations on wheat for future delivery to learn the price of the future for the month closest to the one in which the flour is to be delivered. This is the basis upon which he calculates his price. If he receives the contract, he at once buys futures for wheat in an amount sufficient to furnish the raw material for the flour he has contracted to deliver. Thereafter fluctuations in the price of wheat worry him not at all. As fast as he buys wheat for the manufacture of the contract flour, he closes out a corresponding portion of his future trade. If in the meanwhile wheat has dropped in price, he secures the actual wheat for grinding for less than he expected; but he is not the gainer

thereby since he loses a corresponding amount on his future trade. If, on the contrary, wheat has in the meanwhile risen in price, he pays more for the actual wheat he requires than he expected, but he is not the loser thereby, since he gains a corresponding amount on his future trade. He renounces the hope of speculative gains but avoids speculative losses. He has insured himself against the hazard of fluctuation in the price of his raw material, and may reasonably count upon the profit which his manufacturing enterprise as such may warrant.[1]

If a miller is unable to sell his output in advance but must rely upon selling it on the open market as it is produced, he buys wheat from day to day to keep his mill in operation and sells each day a corresponding amount of future wheat. Then as fast as he sells flour, he buys in a corresponding amount of his future sales of wheat. If, between the time of the purchase of the wheat and the sale of the flour made from it, the price of wheat has dropped, the price of flour will ordinarily have dropped proportionately. However, the miller suffers no loss because what he loses in the sale of the flour he gains back in the closing of his future trade. Conversely, if the price of wheat has risen and with it the price of flour, he gains nothing thereby, for what he might have gained in the sale of the flour he loses in closing out his future trade. His operations have been insured. This practice is known in the trade as "hedging."

Economists who wanted to evaluate the role of future trading and speculation in the national economy have often endeavored to determine whether the fluctuations in price of commodities in which there is an extensive future market is less then the fluctuation in price of commodities without such a market.[2] It has been assumed at times that only if future trading narrows the range of price fluctuations, can future trading be justified. This view, however, presents but one phase of the question. The farmer, who is not so situated that he can hedge against his crop, may be benefited if future trading narrows the range of price fluctuation and injured if the range is increased. On the other hand, to the manufacturer using the farmer's crop and hedging, price fluctuations are in the

[1] It is illuminating to realize that of the flour mills in this country those have fared worst in the deflation period that are located in that section of the country where there is no future market for wheat and where it is not possible for the miller to hedge, because in that locality the spot price does not fluctuate in accordance with the future price at Chicago. I refer to the Pacific Coast. There the flour mills in the period of deflation suffered severely, while their competitors east of the Rocky Mountains suffered from overexpansion of milling capacity rather than from the violent fluctuations in the price of wheat, since the millers east of the Rockies were able to hedge. There were cases on the Pacific Coast in which mills had on hand large stocks of grain bought at the high war prices and had to sell the flour produced from this grain on the basis of the low wheat prices that followed deflation.

[2] Cf. H. H. Brace: "The Value of Organized Speculation," page 55. New York, Houghton Mifflin, 1913.

main a matter of indifference. He is insured against them. He is interested of course in not having the price of his raw materials at so high a level as to raise the price of the finished product to such a degree as to reduce consumption. Looked at from this angle, future trading done for hedging purposes is of service to the manufacturer whether or not price fluctuations are widened or narrowed thereby.

If we wish to evaluate future trading from this point of view, we should compare the profits and losses of two groups of manufacturers, of which one practices hedging, while the other does not. Two such groups of manufacturers would be cotton spinners as compared with cottonseed crushers, cotton oil refiners and soap manufacturers. Anyone at all familiar with these industries knows that there have been enormous losses among cotton crushers, cotton oil refiners and soap manufacturers; that some of them, indeed, have had to go to the wall during the post-war period. On the other hand, no such widespread complete disaster has hit cotton spinners as a class. To be sure, cotton spinners have had bad years since the war and have not always paid their customary dividends. It is also true that in some sections the outlook is discouraging. This, however, is not the result of fluctuations in the price of cotton but is rather due to other causes such as a shift of the center of the industry southward and westward in response to the economic development of the country. It is also true that the industry as a whole has suffered from the high level of prices and the consequent curtailment of consumption. The fact remains that the cotton spinning industry is not strewn with wreckage as is the cotton oil industry. This is particularly evident if one examines the balance sheets of the two groups of corporations and notes especially the shrinkages of inventories. These have been enormous in the cotton oil and soap industry; they have been relatively small in the textile industry. The situation is very well put by one large producer and user of cotton oil in the following language: "During recent years the cottonseed oil business has become increasingly speculative, hazardous and unprofitable. Market prices have been subject to violent fluctuations. This fact coupled with the high price levels which have prevailed creates a risk many times greater than that which prevailed during the earlier period. Under such conditions, price fluctuations completely overshadow any legitimate manufacturing profit which can normally be expected." The enormous shrinkage of inventories in the cotton oil industry was due in large measure to the sudden great drop in price of fats and oils. The corresponding drop in price of cotton did not injure spinners to the same degree, for most of them do not customarily carry large stocks of cotton whereas cotton oil producers and users commonly do so. There is even some evidence that cotton oil users carried larger stocks than normal, as the peak of prices approached. This is but the natural psychological

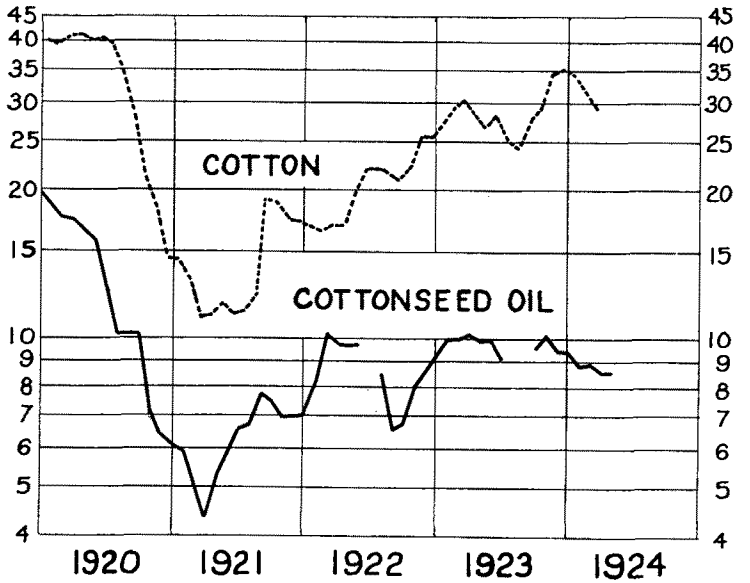
reaction to the upward trend of prices. Manufacturers fearing still higher price levels, and perhaps also hoping for speculative gains, not unnaturally pyramid and accumulate larger stocks than in normal times.

The contrast between the cotton and the cotton oil industries in regard to stocks carried depends in part upon the contrasting practices of the two industries with reference to future trading. In the case of a commodity like cotton or wheat, in which there is a very large speculative market and a large volume of future trading, there has developed a group of traders who specialize in risk taking just as much as an insurance company, but they also, as a necessary part of taking the risk, carry the commodity, that is to say, buy it at the time of surplus production and store it against future need in the hope of making a profit thereby. In the absence of a large future market, the bulk of a commodity must be carried by producers, manufacturers and consumers. Thus we see that the bulk of the cotton oil produced is actually held and owned by manufacturers, whether they be crushers or refiners or ultimate users like soap and oleomargarine manufacturers. The cotton spinner, because a large proportion of the cotton crop is soon in second and third hands, knows that it is unnecessary for him to pile up in his warehouses large quantities of his raw material. He can get it from month to month from these second and third hands, the specialists in the taking of risks in connection with the cotton trade. The soap manufacturer has no such large reservoir to call upon. He cannot so readily buy from month to month. He carries large stocks and takes the risk when he is not, and should not be, a specialist in risk taking. The consequence is that in times of rapid drop in prices the shrinkage in value of his inventories may be enormous. Since the cotton spinner need not carry large stocks of raw material, his losses at such times need not be heavy.

The flour miller is in much the same position as the cotton spinner. He is not usually at the same time an elevator man and a grain merchant. He lets the elevator man and the grain merchant, who are specialists in their respective fields, take the risks of handling and holding wheat. He keeps in his mill only a limited supply, knowing that because of the high specialization in the wheat trade he can get what he needs as he needs it. Millers who for any reason are compelled to carry considerable stocks of grain without hedging have greater hazards to face than millers who hedge. It may lead to severe losses, as was indicated above in the case of the millers of the Pacific Coast. And this is exactly the case of many of the cotton oil refiners soap concerns and others handling fats and oils. They have either not hedged at all or have hedged to a very limited extent, or have used the future market for speculation rather than for hedging. They have had to be gamblers in raw materials before they could manufacture. They have been amateurs as gamblers, however efficient they may have been as manufacturers, and they have been shorn like any other lamb.

Having made it clear how future trading may serve as insurance, let us apply the thoughts developed to the cotton oil and the cotton industry. That we may visualize the difference in the fate of the two industries, let us consider the course of prices in the post-war period. Prices for both cotton oil and cotton rose greatly during the war. They reached their peak in 1919–1920. The appended chart depicts the course of prices from 1920 onward. It shows that beginning in 1920 there was a sharp drop in prices which continued into 1921. Thereupon recovery began. Ever

Monthly prices of cotton (middling upland at New Orleans) and crude cottonseed oil (New York) 1920–24.*
(*Cents per pound.*)



* Source: Cotton, Federal Reserve Board; Cottonseed Oil, Oil Paint and Drug Reporter, first of each month.

since the trend of cotton prices has continued upward with fluctuations, until a level has been reached not very far below that of the war period. On the other hand, the recovery of cotton oil prices continued only into the early months of 1922. Since then the trend has been slightly downward. The price level attained is far below that of the war period.

If we search for reasons for the behavior of the two commodities, we are driven to the conclusion that cotton prices behaved as they did because there has been no permanent overproduction of cotton as a result of the war and that the probabilities point to no overproduction in the near future. Quite the reverse of overproduction has prevailed—practically a shortage of raw cotton and limited output of finished product.

If this had not been the case, if the war had expanded cotton production materially beyond the world's demands, prices could not have rebounded so rapidly nor could they now be so high. In the case of cotton oil, on the other hand, we are driven to the opposite conclusion, namely, that there is either an overproduction of cotton oil in itself or, what amounts to the same thing, that there has been expansion in the production of commodities which can be substituted for it and which are produced under conditions favorable enough to maintain their production to an extent sufficient to affect greatly, cotton oil prices. It is difficult, if not impossible, to account for the course of cotton oil prices in the post-war period in any other manner.

The competition which it would seem cotton oil has to face is not solely the result of war-time stimulation of production of competing commodities. War-time stimulation, especially of tropical fat and oil production, is responsible in part, but only in part, for the competition. The revolution which has been going on for more than a decade in fat and oil technology is also responsible in large measure. Modern processes of refining oils and hardening them by hydrogenation account to no small degree for the situation. These improvements in manufacturing methods are permanent factors that will continue to exert their influence long after the effects of war have disappeared. Hydrogenation has made the non-drying oils more or less interchangeable for certain purposes. Some inedible fats and oils can be made edible; oils can be given the consistency of butter, of lard or of tallow. The chemist has only begun his work in this field and we may with confidence look forward to very extensive interchangeability in the not too distant future. The effect in some respects is, even today, equivalent to increasing the supply of the more highly prized oils like cotton oil. Cotton oil must feel such competition especially keenly, for it is a by-product. The quantities produced will not vary greatly with the demand, since they are determined by the size of the cotton crop. Seed is produced so long as cotton is grown. The supply of cotton seed, therefore, can be restricted only by destroying it or using it as fertilizer or feed. Since, as we have seen, there is no propsect of a restriction in the production of cotton, there can be no deliberate reduction in the production of cotton seed.

Before the war probably no one had any definite ideas concerning the capacity of the world, under pressure, to expand the production of different commodities. Without such prevision it was impossible to foresee the course of prices after the war. The events that occurred in the business world following the war show clearly how difficult it is for even the most experienced to foresee trends of prices when unusual occurrences take place. They emphasize the importance to manufacturers of some form of insurance against price fluctuations.

In the face of the hazards growing out of price fluctuations manufac-

turers who use cotton and cotton seed or cotton oil, respectively, have been in very different positions. The former have not had to be gamblers in raw materials; the latter have been compelled to be. The reason for the difference between the two groups is that it is easy and safe for the cotton spinner to insure himself against the risk of violent fluctuations in the price of his raw material. He does so by buying or selling cotton for future delivery, that is, by hedging. He is able to hedge effectively because a world market for cotton exists, with world quotations and an active trade in cotton for future delivery. The user of fats and oils, for example, the soap boiler or the producer of cotton oil, the crusher, does not find it equally safe to protect himself by hedging because the future market for fats and oils is relatively undeveloped. There is, to be sure, a future market on the Chicago Board of Trade for lard; and there is also a future market on the New York Produce Exchange for cotton oil where in 1921, 4,162,600 and in 1920, 4,331,200 barrels were sold for future delivery. This is little more than the annual production. During the last two years the volume of trading has been a trifle less than twice the production of cotton oil, a relatively small volume of future trading as compared with the future sales of cotton which amount to many times the crop. The market is narrow and under present conditions any extensive operations have a very marked effect upon it. To the extent therefore that greater volume of future sales causes the future price to represent more exactly the spot price plus carrying charges, the protection the spinner might secure by hedging is more perfect than that open to the cotton seed crusher, the cotton oil refiner, or the soap manufacturer. Moreover, there is no certainty that the prices of a variety of oils, for example, soya bean, cotton, peanut or coconut, will fluctuate to the same degree together. There is no future market for them.

A wide future market for fats and oils in general is today more feasible than ever because, as has been pointed out, improvements in methods of refining and the introduction of hydrogenation have made certain fats and oils mutually more interchangeable than formerly. The result is that we are tending toward a condition in which the different fats and oils ought naturally to fluctuate together and to bear to each other fairly constant price ratios. Even fats devoted to special uses, such as lard, for example, are coming to behave in this way, owing to the fact that hydrogenation has made so many different fats and oils interchangeable. However, while we are tending toward a condition of free interchangeability, it must be admitted that we have not yet reached it. Something still remains to be done in the modification of fats and oils by chemical treatment, but more remains to be done in the education of users. Moreover, in the United States the tariff structure creates differentials not based on the intrinsic properties of the materials.

If all this be true, the time has come when it ought to be possible to create a more perfect future market in the fat and oil industry than now exists. Today certain oils are apparently more perfectly interchangeable than different varieties and grades of wheat, and they are more easily graded. Yet, despite the very real difficulties in establishing grades and standards for wheat, a broad future market for wheat exists. Fats and oils, because they are more easily graded and standardized, are much more suitable for future trading than wheat. Nothing in the nature of the commodity itself stands in the way of a broad future market. However, such a fat and oil future market cannot be developed unless the industries using and producing fats and oils extensively practice hedging and trade in futures. This is not the place to discuss the ethics of future trading by amateurs; nor the abuses that have developed at various times and places. Our purpose is to point out that future trading has a very legitimate use for the merchant and the manufacturer. It allows him to avoid gambling in his raw materials and to confine himself to his proper sphere, manufacturing or merchandising. This is the legitimate function of hedging in the flour milling and the spinning industry.

While it was difficult before the introduction of hydrogenation to create a future market for more than one or two products such as cotton oil and lard, it should be possible at the present time to create a wider future market because of the greater interchangeability of fats and oils. When this is done, manufacturers will be able to protect themselves, as millers and spinners do today, by hedging, and the industry will never again have to face the conditions which have resulted so disastrously for it. The public must come to look upon trading in futures, legitimately done for purposes of hedging, not as gambling, but as insurance against the risk of violent fluctuation, indeed as a method of avoiding gambling. Some form of insurance is necessary for users of such raw materials as fats and oils. Perhaps some day someone will invent a method better than hedging. Up to the present time no such method applicable to our existing economic system has been devised. Until it has been, we shall have to countenance future trading despite some evils that attend it, because it is the only practical method of insurance hitherto developed.

The growth of a broad international future market for fats and oils in general will not be a simple matter nor one that can be accomplished over night. The existence of different tariffs in different countries greatly confuses the situation. The methods and technique of other future markets, grain, cotton, stocks, may not prove suitable in all respects for fats and oils. Whether a broad future market for tallow and lard could be developed at present is doubtful. Whether the market should recognize only crude or only refined oils or both is a further question. However, an efficient future market for vegetable oils seems possible. In such a

market cottonseed, peanut, corn, soy bean, palm and palm kernel oils all oils that through hydrogenation and refining are largely substitutable, would have to be deliverable with an appropriate range of premiums and discounts. Otherwise no breadth could be attained in the market.

It may be urged that these oils are not perfectly interchangeable. True, but neither are different kinds of wheat. Yet the wheat trade has met the situation in the following manner: When a wheat future is closed out, with the seller rests the choice of the grade or class in which he wishes to make delivery. This is adjusted to the contract grade by a system of premiums or discounts, as the case may be, usually discounts. The range of premiums and discounts is variable from year to year. For example, the Liverpool contract is fulfillable ordinarily by No. 2 hard winter and No. 3 Manitoba, but it is fulfillable with any wheat above or below, on the basis of a premium or discount adjustment, which is fixed by a committee from year to year and may vary rather widely.

Experience will have to show how the practices of other commodity markets need to be adapted to the peculiar conditions that prevail in the world trade in fats and oils. It is believed, however, that the difficulties are not insuperable, for fats and oils possess in a high degree the properties that are essential for future trading. The market for them is world wide; they are not very perishable; they can be graded and standardized easily and exactly. These are the characteristics that make deliveries on future contracts possible.

Let not the manufacturer expect that with the development of such a market all he has to do to insure himself against risk is to hedge. He will not himself be competent to practice hedging and also direct his manufacturing operations. He will have to employ or consult specialists for this purpose as has been found necessary in other industries, for example milling. Great mills employ their own corps of specialists; smaller ones consult with their grain brokers. No doubt the time will come, even in the fat and oil trade, when manufacturers will consult with and operate through specialists in the matter of the purchase of raw material just as they already depend upon lawyers for advice on matters of law and bankers for advice on matters of finance. Speculation and the talent for speculation are very different from manufacturing and the talent for manufacturing. Rarely will the same brain combine both kinds of talent.

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