The Demise of the High Fructose Corn Syrup Futures Contract: A Case Study

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INTRODUCTION

High fructose corn syrup-55 (HFCS-55) was developed in the late 1970s as an alternative liquid sweetener substitute for sugar. Due to its high fructose content (55%), perfect substitutability as a liquid nutritive sweetener, and lower costs of production, it was able to compete in the soft drink industry as a replacement for sugar. Today, HFCS-55 is used as the single nutritive sweetener by all major soft drink producers.[1] It is produced by six corn processing firms in the United States and used primarily by the two leading soft drink companies.

Between 1986 and 1987 the Minneapolis Grain Exchange (MGE) applied and received approval from the Commodity Futures Trading Commission (CFTC) for the HFCS-55 futures contract. The HFCS-55 futures contract was developed to provide a tool for pricing and price risk

[1]Polopolus explains how HFCS-55 entered and captured the sweetener market for beverages.

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TABLE I

Monthly Open Interest and Trade Volume in the Nearby HFCS-55 Contract, April 1987–December 1988

Contract	*Open Interest*	*Trade Volume*
April 1987	84	52
May 1987	190	75
June 1987	265	39
July 1987	190	11
August 1987	146	13
September 1987	20	9
October 1987	12	0
November 1987	12	4
December 1987	1	0
January 1988	1	0
February 1988	1	0
March 1988	0	0
July 1988[a]	9	4
August 1988	8	2
September 1988	1	0
October 1988	1	0
November 1988	1	0
December 1988	0	0

[a]The April, May, and June contracts were removed from the market.
Source: Minneapolis Grain Exchange (1987, 1988) Statistical Annual.

management to assist producers and buyers in their marketing activities. Also, other price risk management tools, such as the use of the corn futures market for cross-hedging, were largely ineffective. Advocates of the HFCS-55 futures contract argued that the contract would not only become a price basing tool, but also a means by which competitively determined prices could potentially stabilize prices in the cash market.

On April 6, 1987, the HFCS-55 futures contract began trading on the MGE. Table I lists the average monthly open interest in all contracts and trade volume in the nearby HFCS-55 futures contract during the contract's lifetime. The contract traded most "actively" during the first three months of its existence, up to the expiration of the first delivery month, July 1987, when 22 contracts were delivered upon. The deliveries represented approximately 20% of the total trade volume during the month of July.

After July 1987, the contract began to lose most of its volume and open interest. The contract remained on the market until the end of March 1988 when it was removed from the market for contract specification adjustments. Trading in the HFCS-55 futures contract resumed again at the beginning of July 1988 but it failed to gain significant volume

or open interest. Trading ceased at the end of December 1988 when the HFCS-55 futures contract was permanently delisted.

Soon after the July 1987 contract expiration, a number of long speculators claimed that the Exchange as well as short sellers did not provide accurate information about the HFCS-55 contract and industry marketing practices. Two long speculators sued the Exchange and a producing firm for misrepresentation in the market.[2] The experiences of and action by these two speculators, who were large traders in the market, may have influenced the eventual failure of the contract by inhibiting other traders from entering the market.

This article focuses on the HFCS-55 industry and pricing practices, and the principal factors causing the demise of the HFCS-55 futures contract. Consideration is given to factors that promote and inhibit the success of a futures contract. Results from a survey of producers and commercial users of HFCS-55 are presented. HFCS-55 cash and futures market data also are analyzed to identify the reasons for the failure of the contract. The findings provide information useful for future contract development.

Characteristics and Determinants of a Successful Futures Contract

Success of a futures contract relies heavily on the characteristics of the commodity and the design of the contract. Leuthold et al. (1989) list and describe common attributes of successfully traded commodities as: (1) homogeneity of product, or at least a product that is not identified with a producer or manufacturer; (2) capability of standardization and grading; (3) variability or uncertainty of prices; (4) centralized cash market(s); (5) active and large commercial markets and interested participants; (6) availability of public information; and (7) accurate contract design. Similarly, Carlton (1984) suggests that commodities involved in successful futures markets are characterized by freely determined prices and absence of regulation, large values of transactions, large numbers of buyers and sellers, and correlated prices for slightly differing products. Black (1986) provides a review of the literature on the success and failure of futures contracts. She also develops an empirical model to explain success of futures contracts. Her results provide evidence that the presence or absence of an efficient cross hedge for the underlying commodity also influences the success of a futures contract.

[2]The lawsuit was settled out of court. The outcome of the lawsuit is unknown.

As both Carlton and Leuthold et al. indicate, a key reason for futures markets is uncertainty surrounding prices for a specific commodity. With uncertainty about prices, buyers or sellers with fixed quantity commitments may use futures markets as a hedging tool. Other participants in the market with varying price expectations may speculate in the market, providing the market with added liquidity.

Gray (1960, 1978) identifies the importance of contract design in influencing the success of a contract. The contract must be equally fair to both buyer and seller. Gray argues that a contract must reflect commercial movement of the commodity so that price distortions are not a result of specifications in the contract. To warrant hedging, the contract must be as close a substitute for the cash commodity as possible. Powers (1967) documents the importance of contract provisions which closely correspond with trade practices in attracting hedging. Pirrong et al. (1991) argue that if the contract is improperly specified, it will not attract buyers and sellers into the market, and will not succeed. Explicit delivery locations should reflect common centralized delivery areas, and specified maturity months usually correspond to existing trade and production schedules. Johnston and McConnell (1989) document the demise of the GNMR CDR contract which appears to have failed because of contract design. In particular, value of the contract's delivery options reduced the contract's hedging effectiveness.

A futures market also must be liquid enough to allow participants to enter and exit the market without significantly affecting prices. To accomplish this, the market must attract sufficient amounts of hedgers and speculators. Gray argues that the success or failure of a futures contract relies heavily upon attraction of speculation to the market. If sufficient speculative buying is not attracted to offset selling positions by hedgers, futures prices will be biased downward.

In thin markets where there are few buyers and sellers, a lack of liquidity reduces the ease of entry and exit, and speculators find it difficult to realize profits due to high transactions costs. Because speculation is less prevalent in thin markets, arbitrage, which helps generate accurate prices, is less common, and the market may not succeed. Though there are successfully traded futures contracts for documented thin cash markets, such as the sugar and cocoa futures markets, a thin cash market for a commodity can limit the success and efficient performance of a futures contract for that commodity [e.g., coffee, see Thompson (1986)].

Duffie and Jackson (1990) examine the choice of futures contracts by exchanges seeking to maximize their transaction volumes. They find that for a new contract to be volume-maximizing, it must provide an "in-

novation" (hedging ability not available on other existing markets) that is perfectly correlated with the unspanned portion of the difference between the endowments on the long and short sides of the market. They do not consider the role of liquidity in contract design. Cuny (1993) develops a model of optimal design of new futures contracts for exchanges which compete among each other for hedging volume. In his model, which explicitly considers the role of liquidity, the exchange optimizes in two ways: (1) choosing a contract to fill hedging demand not met by other exchanges, and (2) using the resulting monopoly power to limit speculator entry, keeping exchange fees high.

Gray also identifies the important effect that "market power" can have on the success of futures contracts. If a bias towards one side of the market exists within the cash market or forward contracting agreement process, then the development of a futures contract for that commodity will have to compete against the resistance or reluctance of those who hold "market power." Firms in control of the market wish to maintain their position of authority within the scope of the forward contracting agreement process. The futures market would, if successful, reduce that control and provide for a more competitive market. Or, firms with market power who can/or do regulate prices could use the futures market to their advantage through market manipulation, both in the cash and futures markets. This could discourage other potential traders from using the futures market.

When there is market power involved within the cash or forward contracting market for a commodity, price discrimination often occurs which can limit the success of a futures contract. Producers profiting from price discrimination will not be interested in trading in a futures market. In this context, specifying one adequate delivery point for a specific futures contract in a market for a commodity which has, or is used to, many different delivery points at different price levels, may prove impossible because there are likely to be low spatial price correlations. Low spatial price correlations also will limit the success of a contract due to high basis risk across different delivery areas for the product.

INDUSTRY DESCRIPTION

Increased world sugar prices during the late 1970s and early 1980s promoted HFCS usage, but the U.S. domestic sugar program itself, especially the 1981 Agriculture and Food Act, protected the 1982 to 1985 crops from imports. This policy, which guaranteed minimum market stabilization prices for sugar and set standards for future domestic sugar

TABLE II

HFCS Processing Capacity of Largest Four Firms, 1988

Firms[a]	*Capacity*[b]	*Percent of Industry Capacity*
ADM	1380	34.6
Staley	1069	26.8
Cargill	530	13.3
CPC	474	11.9
Total	3453	86.6

[a]HFCS-55 also was produced by American Maize and Hubinger.
[b]Capacity in 1000 short tons, dry basis.
Source: Polopolus (1990), and Greer (1990).

protection, sheltered HFCS prices from lower world sugar prices. Under this "umbrella" protection, HFCS prices followed domestic sugar prices, but always at a discount, allowing for large profits and increased investment in the wet milling industry during periods of high competition in the sweetener industry in the early 1980s [Barry (1990)]. Between 1981 to 1991, average HFCS prices were discounted 20.5% relative to sugar.

Production of HFCS-55 rose from 1.2 billion pounds in 1980, increasing steadily to 7.6 billion pounds in 1991. During the onset of market infiltration of HFCS-55 in the early 1980s, the HFCS-55 industry realized yearly growth rates of 20% to 30%. During the mid to late 1980s, industry growth rates decreased to only 3% and 5%. HFCS-55 growth continued at these levels corresponding to increased growth and expansion in the soft drink industry. [*Chemical Marketing Reporter* (1987)].

Demand for HFCS-55 follows the highly seasonal demand for soft drinks, with excess capacity experienced during low periods of beverage demand. The soft drink bottling industry uses approximately 91% of all HFCS-55 produced in the United States, with limited use in other products such as confectionery, bakery, cereal, dairy, and other processed foods.

The sweetener market for HFCS-55 appears oligopolistic. Though data are not available concerning specific per firm production, estimates on production capacities are available, and have been highly correlated with market share for each firm. These data are shown in Table II for the four largest production firms in 1988. The production of HFCS is highly concentrated with just six corn refiners producing all HFCS in the U.S.; the largest four of these firms control nearly 90% of all production. The product is not highly differentiated. Economies of scale for corn wet-millers limit the number of participants in the industry and maintain the

small number of firms. Periods of excess capacity and increased capital costs, combined with stable demand for soft drinks effectively limit market entry.[3]

The soft drink bottling industry is dominated by two large soft drink producers, PepsiCo^{R} and Coca-Cola^{R}, that own and control many smaller bottling firms. There are also many local independent bottlers and bottlers who license the product name from the parent company under franchise agreements [CFTC (1987)]. Sweeteners are the highest valued purchased input in soft drink products. Under most bottling agreements in which a bottler uses a parent company's brand name and concentrate, the bottler must receive approval from the parent company for the source of HFCS-55. This requirement reflects the parent company's concern with the taste and consistency of their soft drinks. In some instances the parent company produces the syrup completely (the flavor concentrate and sweetener mixture) and delivers it to the bottler. More often the bottler purchases HFCS-55 on its own, through forward contracting agreements in the cash market.

Because HFCS-55 is a bulky and liquid commodity, most bottlers do not maintain adequate tank storage facilities to store large quantities of the product. Transference of product from plant to truck or tanker, or from tank truck to rail tankers, or vice versa, must be conducted under sterile conditions, using stainless steel pipes and tubing to prevent contamination. Although industry sources at the producer level indicate that HFCS-55 can be stored as long as a year, HFCS-55 users prefer the product fresh and not held long in storage because of quality concerns.

HFCS-55 is transported in stainless steel tank trucks, rail cars, or jumbo rail cars. Small bottlers sometimes purchase only one tank truck of HFCS-55 (48,000 pounds per truck) every other week to cover production demands. Larger bottlers may demand several jumbo rail cars of HFCS-55 (198,000 pounds per car) to meet their weekly needs. One major company only purchases HFCS-55 on the basis of tank truck delivery because they believe this mode ensures superior product quality.

[3]Greer attempted to estimate production costs for HFCS-55. There appear to be no other publicly available authoritative data on HFCS production costs. Greer developed price-cost-margins (PCM) to evaluate performance of the HFCS-55 industry. A PCM substantially above zero suggests performance which is not perfectly competitive. Greer found PCMs ranging between 40% and 63% since the beginning of the HFCS-55 industry. These values do not suggest competitive performance. According to Greer, an industry such as this is not likely to be "competed back" to pricing on a cost basis with the entry of new competitors because economies of scale and scope form significant barriers to entry.

HFCS-55 Procurement Practices and Pricing

HFCS-55 is typically purchased through quarterly forward contracting agreements, although spot purchases often occur during peak and unexpectedly high soft drink production periods. HFCS-55 producers build inventories to smooth production over periods of peak and slack demand. Inventories build in the late fall and winter months to prepare for the strong demand and contract arrangements in the spring and summer quarters. Corn refiners market nearly 80% of their first and fourth quarter production, and almost 90% of their second and third quarter production through quarterly and/or long-term forward contracting agreements. The remaining production is sold on a spot basis or kept as inventories to meet spring and summer demand [CFTC (1987)].

HFCS-55 producers set the pricing and forward contracting schedules for their product. List prices for HFCS-55 both on a dry and commercial (wet) basis are printed in *Milling and Baking News* on a weekly basis, and producers offer daily HFCS-55 price quotations. Buyers of HFCS-55 prefer the product quoted on a dry basis equivalent to the weighing system used for refined sugar, though it is delivered as a liquid form.

Published prices for HFCS-55 do not necessarily represent spot transaction prices. Private and individual discounting occurs between producers and buyers, especially during the off-season. At peak production times and periods of increased demand, the published prices may reflect actual buyer cost. Most marketing departments for HFCS-55 are small; the sales process for the product is basically announcing discounts to buyers and waiting for buyers to call [Greer (1990)]. Data are not publicly available on actual discounted prices.

Prices include the product, on a delivered-to-buyer basis, from producer-determined zones in the U.S. (Midwest, West, Northeast, Southwest, Southeast, and Florida). Little information exists concerning geographic spatial price integration, but prices are not highly spatially correlated and may reflect price discrimination among users. This is because zone prices do not generally differ by the cost of transportation between regions. Polopolus suggests that a multiple point price basing system, similar to the system used for refined sugar, is used for HFCS since most of the product is priced based on a delivered basis including a prepaid transportation cost plus a regional base price. Some quarterly f.o.b. pricing occurs, but not much in comparison to the prepaid delivery amounts [Greer (1990)].[4]

[4]With f.o.b. pricing, producers offer a uniform price from a certain destination, and the buyer pays

Until 1985, forward contracts typically were established on a one-year forward basis. Buyers and sellers arranged for deliveries of the product throughout the year at prices determined at the time of the agreement. This protected and assured buyers of lower HFCS-55 prices during peak production times for soft drinks, which led to few spot and short-term purchases in the HFCS-55 market. During the spring of 1985, Archer Daniels Midland (ADM) announced that it would sell HFCS-55 only on a three-month, quarterly-fixed basis to reduce the buyer's market advantage [Greer (1990)]. Most producers followed this schedule. When prices were announced by ADM for the next quarter, at higher prices than the previous year's quarter, most producers followed suit, with little discounting observed in the market. This action began the current practice of one producer (ADM) offering a price and others following suit.

The HFCS-55 Futures Contract

The HFCS-55 futures contract provided for delivery of 48,000 pounds commercial (wet) basis of bulk HFCS-55 in tank truck, standard rail car, or jumbo rail car, meeting specified quality standards. Delivery months were March, May, July, September, and December and the following two contract months in this same cycle up to 18 months in the future. Delivery was authorized via the use of shipping certificates offered by MGE certified HFCS-55 producers. A shipping certificate is different from most delivery mechanisms used for commodity futures contracts. A typical delivery method for commodity futures contracts involves warehouse receipts, which are claims on the product in storage. A shipping certificate is used instead of warehouse receipts when the product is not stored for appreciable lengths of time; the shipping certificate is a call on production for the specific commodity [CFTC (1987)].

While most shipping certificates have an unlimited life, the HFCS-55 delivery instrument had a life of 30 days beyond the last trading day of the month. The HFCS-55 shipping certificate was more than a call on production, it was also a "call on transportation capacity" [CFTC (1987)]. The delivery mechanism required the short not only to produce the re-

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the true costs of transportation from the destination to their own location. Under multiple basing point pricing, all firms in a market agree upon delivered prices based on published prices at particular locations, called basing points, which include freight from those areas, called prepay. Firms charge prices which may be accurate for transportation to buyers at greater distances, but charge the same price to buyers located near the firm. This allows the firm to accrue profits when delivering the product to nearby buyers by earning "phantom freight." Within a pure multiple basing point pricing system, no f.o.b. pricing is permitted and buyers are not given the choice of providing their own transportation.

quired amount of product, but also to deliver the product to the designated delivery points.

Designated delivery areas for the HFCS-55 futures contract were the Exchange approved break stations in Chicago, Illinois, which was defined to include the Intrastate Industrial, Commercial, and Terminal Area of Chicago, Illinois, and including the city of Gary, Indiana. All freight costs to break stations were to be paid by the seller. The Exchange proposed these delivery points because Chicago is one of the largest metropolitan soft drink markets. It contains seven bottling firms operating a total of 13 bottling plants. In their contract proposal, the Exchange stated that approximately 7% of all HFCS-55 produced in the United States is sold in the Chicago area, mostly to soft drink bottlers, and that an additional 15% to 20% of all HFCS moves through Chicago. According to trade sources at the time, and reports obtained by the CFTC, HFCS-55 shipments for locations other than the Chicago area were likely to be established based on Chicago prices [CFTC (1987)].

Bottlers in the Chicago area prefer shipment by tank truck rather than by rail car. Producers usually load the product into tank trucks and ship them to the designated user plants. Some producers load HFCS-55 into rail cars, shipping the product to Chicago break stations, and then transferring it to tank trucks. The break stations approved by the MGE represent the major rail or truck transport points for the delivery of HFCS-55 in the Chicago area.

HFCS-55 producers authorized for contract deliveries were ADM Corn Sweeteners, A.E. Staley Manufacturing, Cargill, Hubinger, CPC International, American Maize-Products Company, and Coors Biotech (the Coors Biotech plant is managed by Hubinger) [CFTC (1987); Greer (1990)]. These seven producers (or six, counting Coors Biotech with Hubinger) represented all producers of HFCS-55 at the time of the contract. Sixteen of the 17 HFCS-55 producing plants in the United States were registered to these producers (there was no information as to why the 17th plant was not registered, nor what company operated the plant), but only eight of these plants operated by five firms actually served the Chicago area. Therefore, in terms of analyzing the potential supply of shipping certificates and concentration of issuable certificates for delivery purposes, only these five firms and eight plants were considered. These five producers had the capacity to issue certificates representing a total of 175,110,000 pounds of HFCS-55, converting to 3648 futures contracts at 48,000 lbs each. This production capacity accounts for the position limits set by the Exchange. Based on producer data acquired by the MGE, total capacity and capacity concentration were comparable with

the soybean meal futures contract which also employs shipping certificates.

Exchange estimates of potential deliverable supplies for the proposed contract months ranged from lows in September of 2398 contracts to a high of 4130 contracts in March. March supplies incorporated winter build-up of inventories; September lows reflected depletion of stocks [CFTC (1987)]. May and July estimates of delivery supplies were 2860 contracts per delivery month. The December estimate of 3380 contracts reflects the high availability of product in the late fall.

Deliverable supply estimates justified speculative position limits of 600 contracts net long or short in all futures markets combined, or limits of 450 contracts, net short or long in any one month except the spot month, when there were no more than 300 contracts allowed per position. Hedging positions were limited to quantities determined by the Exchange at the time the Exchange authorized the position as a "bona fide" hedge.

During the period when the contract was off the market, March to July 1988, revisions were made in terms of units of trading and market trading time. The major change was contract weight. The unit of trading was changed from 48,000 pounds commercial (wet) basis, to 37,000 pounds dry basis, or multiples thereof. Dry weight was used instead of commercial wet weight in the contract because dry weight is the weight published and used for pricing in the HFCS-55 cash market. Changing to dry weight made the contract more consistent with cash market transactions.

SURVEY OF HFCS-55 PRODUCERS AND USERS

To gain information concerning pricing policies for HFCS-55 and the demise of HFCS-55 futures contract, a telephone survey of producers and users was conducted. A telephone survey was chosen because of the higher accuracy and response rates to telephone surveys in comparison to mail surveys. The survey instrument was developed after preliminary telephone interviews with companies involved in both the user and producer side of the HFCS-55 industry.[5] A trip to the MGE also was made to interview exchange personnel and traders involved with the HFCS-55 contract.

The survey sample included both producers and users of HFCS-55. Major producers of HFCS-55 and soft drink concentrate were inter-

[5]A copy of the survey instrument is available from the authors upon request.

viewed because their interest in trading the contract was necessary to attract other market participants, particularly bottlers, to use the contract. Producers of HFCS-55, the major corn wet-millers in the United States, were located through the use of periodicals such as *Beverage World* (various issues) which provided addresses and phone numbers for all HFCS producers. Addresses of soft drink producers also were published in *Beverage World.*

The HFCS-55 producers listed in *Beverage World* at the time of the survey were Cargill Incorporated, Archer Daniels Midland Corn Processing, A.E. Staley, American Maize-Products Co., Corn Products (CPC), and Hubinger.[6] Of the six producers, all except Archer Daniels Midland participated in the survey. ADM has a policy not to participate in these type of surveys.

There were 35 listed soft drink concentrate producers in the United States. It was determined from producer and market interviews that 2 firms, Coca-Cola USA and PepsiCo, dominate the HFCS-55 user market and account for almost 80% of the market. Only three of the 35 companies contacted had any knowledge of the HFCS-55 futures contract. None of the other 32 companies contacted had formal HFCS-55 procurement offices or participants that could sufficiently participate in the survey. All said that purchases of HFCS-55 largely were managed by their individual bottlers through yearly or quarterly forward contracts or on a spot cash basis when needed.

Most respondents were willing to discuss the HFCS-55 futures contract on the basis of anonymity. Most HFCS producers were open to discussion of purchasing practices for HFCS. Most users, as expected due to the nature of the industry, were quite vague as to their specific procurement policies.

Summary of Survey Results

Use of Futures Markets and Procurement Practices

Producers and users of HFCS-55 were asked to indicate whether they use existing futures markets for pricing or to manage HFCS-55 price risks. The commercial users of HFCS-55 said that they do not use the corn futures market to hedge their HFCS purchases. All users stated that

[6]Most HFCS-55 is produced and consumed by U.S. firms, except for Staley which is owned by Tate and Lyle but headquartered in the U.S. The main users of HFCS-55 buy and use the product in the United States, or produce the syrup concentrate in the U.S. to ship to foreign countries, so foreign competition is not a factor in this survey.

corn was such a small percentage of the actual HFCS-55 product cost (only 15% to 20% of the actual finished cost of HFCS-55) that effective hedging was not possible. Most users said that they had discovered that hedging directly against corn does not provide accurate price protection or a means for locking in prices for HFCS-55. Most users instead develop tolling agreements with producers. Tolling agreements are forward contracts in which provisions are made that hedge the direct commodity costs against the price risks for HFCS-55.

Commercial HFCS users were vague about what specific practices they use to protect against price risks and lock in prices. All three users stated that once HFCS-55 production plants were certified, all HFCS-55 was basically the same. All three said that they use quarterly and yearly fixed flat-price contracts, using a combination of all HFCS producers, and spot purchases when necessary. The lack of specificity in these responses was expected because of the private nature and structure of the industry. Price risks faced by commercial users of the product are primarily those relating to unexpected changes in seasonal consumer demand for soft drinks, consumption changes in substitutes for soft drinks, and changes in the price level of HFCS-55 when the forward contracts expire. Two commercial users of the product noted that HFCS-55 costs are lowest in the first and fourth quarters of the year, and highest in the second and third quarters. This corresponds to the seasonality in soft drink consumption, where demand is highest in the second and third quarters relating to spring and summer months, and lowest in the first and fourth quarters which relate to fall and winter months. Most users were not concerned about HFCS price risk since the product is forward contracted quarters or even years ahead of use.

Producers, major corn wet-millers, do use the corn futures market as a hedging and pricing tool, but only to hedge their corn input purchases. One producer said that he can only successfully hedge the raw product and not the by-products, due to the added processing involved with HFCS-55. One smaller producer said that he places pure hedges in corn against their sales of HFCS-55 to hedge the raw product, within five days of any sale, and without the use of speculation. One larger HFCS-55 producer stated that he really did not use the corn futures market in any relation to HFCS-55. He said that they do not participate extensively in corn hedging, though they might try it now and then to hedge the raw product. Larger producers also mentioned that they can switch out of HFCS-55 production during times of decreased demand for HFCS-55. Two producers surveyed said that they have the ability to change produc-

tion to ethanol or other starch related products in times of low demand and prices.

Factors affecting the price and sales received by producers of HFCS-55 are those similar to those given by HFCS-55 commercial users. One producer noted that variations in supply and demand are assumed risks. This producer stated that though soft drink seasonality is a factor in influencing HFCS-55 prices, corn prices, in his case, have more leverage on the price of HFCS-55. Increased prices for corn can bring about increased prices for HFCS-55 and vice versa. Even though larger plants can switch production capacities, two of the producers surveyed stated that they take their losses or gains when the differences between the current cash price and forward contract prices are high. One producer stated that times of high prices often result in large profits. Times of lower prices, or decreased demand, can result sometimes in a loss, which the company absorbs during a bad year, and makes up during a good year.

Trading of the HFCS-55 Contract and Factors Affecting its Failure

The use of the HFCS-55 contract by commercial users and producers of the product was very limited. All firms interviewed indicated that there were no business-related constraints which prevented them from trading the contract. However, none of the three commercial users, and only two of the five producers indicated that they had traded the contract. Most of the users indicated that they were waiting to see if the market would attract sufficient trading volume before entering the market. One commercial user said that there was confusion and lack of knowledge surrounding the contract after trading started that prevented its use. One of the producers which used the contract indicated that they just "dabbled" in the HFCS-55 futures market to keep in touch with market activities. Its trading activities had no importance in its marketing strategies, and provided no incentive to use the contract on a regular basis. The other user of the contract sold them because there were speculators on the Exchange that were offering to buy them. According to this firm, it continued selling contracts speculatively because of the attractive price, not because they were good hedging tools nor pricing mechanisms. The firm indicated that it sold the contracts with the intention for delivery on the contract, and that it could not and did not buy back the contracts.[7]

[7]Recall that during the first delivery month of the contract, according to *Milling and Baking News*, 22 contracts were delivered upon. It also was determined during this interview that the long speculators who had bought the contracts sued the Exchange and the company involved on the short side for misrepresentation after the delivery month expired. The longs who sued the company apparently were not familiar with the product or its market, and had not read the specifications of the HFCS-55 futures contract.

TABLE III

Scoring of Factors Affecting the Failure of the HFCS-55 Futures Contract by Survey Respondents

	Producers						*Users*				
Limiting Factors	*P1*	*P2*	*P3*	*P4*	*P5*	*Total Producers*	*C1*	*C2*	*C3*	*Total Users*	*Total Producers and Users*
Delivery specs.	15	90	30	0	10	145	20	30	10	60	205
Industry concentration	60	10	0	60	60	190	10	20	20	50	240
Quality specs.	25	0	50	0	20	95	20	30	0	50	145
Lack of cash price variation	0	0	0	0	10	10	0	10	0	10	20
Lack speculation/market liquidity	0	0	10	10	0	20	50	10	60	120	140
Lack of correlation between futures and cash price	0	0	10	30	0	40	0	0	10	10	50
Total	100	100	100	100	100	500	100	100	100	300	800

To identify the factors which affected the demise of the HFCS-55 contract producers and users were asked open-ended questions and also were asked to allocate 100 points to rank the magnitude of the effects of various factors on the failure of the contract. The results of the allocation are presented in Table III, and are consistent with the open-ended responses.

HFCS-55 users and producers expressed a variety of reasons for the limited use of the contract and for its subsequent demise. Nevertheless, a recurring theme was that the contract was not useful as a price discovery nor hedging mechanism (due to the limited correlation between cash and futures prices), and that it did not satisfy any commercial need. More specifically, HFCS-55 users were satisfied that forward contracting and purchases in the spot market, when necessary, were adequate procedures to establish price. Out of the three users, two indicated that the lack of market liquidity and speculation was the main reason that the contract failed.

Concerns about the contract's quality and delivery specifications also were important issues among users. One participant stated that delivery was a major problem when transferring from rail to tank trucks at holding terminals. One user only receives HFCS by rail delivery and never takes delivery by truck. Other users were skeptical of the quality of the product due to the unknown identity of the source plant of the product. The transferring of HFCS must be done under proper conditions of sterility and product containment which is expensive and difficult to monitor.

While HFCS-55 is considered homogeneous, the specific producer and plant source of the product are important to HFCS-55 users. Though quality specifications were identified in the contract specifications, they were perceived to be inadequate. Users also felt that limiting the delivery to just the Chicago area cut off bottlers and production plants in other parts of the country.

Producers of HFCS-55 expressed mixed views about the main factors which contributed to the contract failure. Most frequently identified reasons were industry concentration, contract delivery and quality specifications, and the ineffectiveness of the contract as a pricing tool. Three of the five producers thought that industry concentration was the major factor contributing to the contract's failure. Since there were only two major players on the user side, and five on the producer side, the cash market was too thin and consequently the futures market for HFCS-55 was too thin also. This concentration suggests that producers (or users) in the industry may have a significant degree of market power and control of the pricing structure for HFCS-55, making the effective functioning of a futures market difficult. Due to this reason and lack of public information and understanding about prices, the market was thought to be not liquid nor active enough to attract trading interest. This was complicated by the fact, as expressed by one producer, that the contract was developed on the basis that daily cash price quotations were available. However, these quotations were not representative or meaningful for most producers and users because HFCS-55 is largely sold on a quarterly or yearly fixed basis, rather than as spot market transactions based on daily price quotations.

Most producers agreed with commercial users of the product that delivery locations were an important limiting factor because plants in other major producing areas of the country were limited in the extent to which they could participate in the market. Since prices are quoted on a zone delivered basis for each recognized delivery zone of the U.S., there was, according to one producer, no correlation between other delivery zone prices and the Chicago–Midwest f.o.b. price. Producers commented that the contract's Midwest–f.o.b. price and the Chicago–Midwest delivered price were not representative prices in the spot market which is consistent with the idea that prices in different zones did not differ by the cost of transportation.[8]

Three of the producers also suggested that concerns over product quality and plant characteristics affected the success of the contract. As-

[8]The degree of spatial correlation of HFCS-55 prices is unknown due to a lack of data.

surances of common quality characteristics were insufficient. The two major commercial users must approve every producer and plant through rigorous testing procedures which provide assurances of quality specifications.

Several producers stated that the contract was ineffective for contracting cash prices due to the lack of correlation between futures and cash prices, and because of the precision and adequacy of forward contracting practices. Producers stated that pricing for HFCS-55 is a process of offering prices based on past quarterly or yearly prices, and waiting for customers to call for delivery. As previously noted, prices in the cash market also may be influenced by the dominant producing firm in the industry, ADM.

EMPIRICAL ANALYSIS OF HFCS-55 CASH AND FUTURES MARKET DATA

To assess the performance of the HFCS-55 contract, cash–futures price relationships and trader concentration levels are analyzed. Cash–futures price relationships for HFCS-55 are investigated by studying basis relationships and carrying charge levels for the contract. This permits an assessment of the contract's potential usefulness in price discovery and whether or not basis patterns were established that promoted the success of the contract. Carrying charges for the contract, which can be indicators of hedging opportunities, are also examined across differing contract months. Commitment of trader reports identifying concentration levels in the HFCS-55 contract are examined for the three most active trading months and compared to levels for other more successfully traded commodity future contracts.

Cash–Futures Price Relationships

Cash–futures price relationships for HFCS-55 are analyzed for the period when the contract was traded, April 1987 through December 1988. Cash and nearby futures prices are plotted in Figure 1 for the period the contract was most heavily traded (April 1987 to December 1987). Weekly futures prices are calculated by taking weekly averages of daily closing prices of the nearby futures contract. Gaps in the plot represent missing or unusable data for the HFCS-55 futures contract. Unusable data represent "nominal" prices that the MGE reported when trader quotes were not available. Weekly prices are used due to lack of information on daily prices for cash HFCS-55. As mentioned earlier, delivery months for the

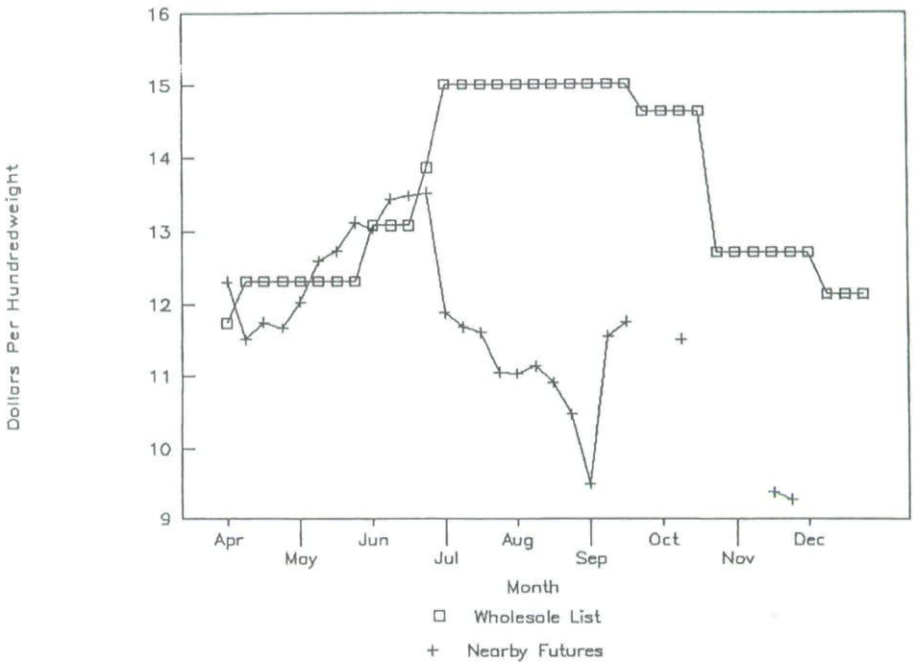

FIGURE 1
HFCS-55 cash and nearby futures price. Source: The Minneapolis Grain Exchange Statistical Annual 1987, and *Milling and Baking News*.

HFCS-55 futures contract at the onset of trade were July 1987, September 1987, December 1987, and March 1988.

Figure 1 suggests that the July 1987 nearby futures contract and cash price moved together relatively closely for the first three and a half months the contract traded, with the cash price and the futures prices fluctuating within $1.00 of each other. After the July expiration, which included the delivery of 22 contracts and a lawsuit brought by long speculators receiving delivery, the contract price never closely followed the cash price. The correspondence between cash and futures prices diminished markedly, with the nearby futures price falling to $3.00 to $6.00 dollars under the cash price.

Cash and nearby futures prices are plotted in Figure 2 for the rest of the contract life, January 1988 through December 1988. The gap in futures price observations between March and July of 1988 is due to the removal of the contract from the market for revisions after the March expiration. The revised contract was reintroduced on July 11, 1988. It also failed to produce much trade volume. While it is difficult to draw conclusions based on so few observations, these plots suggest a lack of close association between cash and futures price movements. In fact,

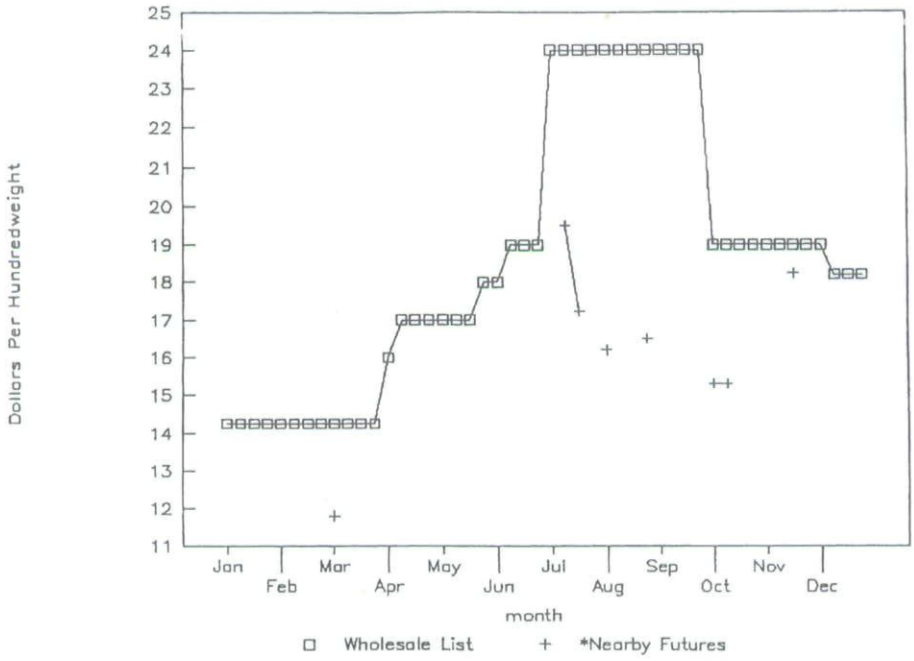

FIGURE 2
HFCS-55 cash and nearby futures price. Source: The Minneapolis Grain Exchange Statistical Annual 1988, and *Milling and Baking News*.

these plots indicate that the futures market scarcely existed for risk management purposes.

A factor not mentioned in the survey that could have limited the success of the contract was the timing of the contract's introduction. The contract began trading in April 1987, when, following industry practices, most producers and users had already forward contracted their demand for the upcoming months. This limited the potential use of the contract during the early months because most producer/users had no reason to hedge HFCS-55 at this time. Also, the contract months following July represented those in which seasonal demand for the product decreases. If there is lessened demand for the product during this period, then presumably, there would be limited demand for the use of the HFCS-55 futures contract.

The effects of seasonality are evident in the carrying charges for the HFCS-55 futures contract. Carrying charges relating to the HFCS-55 futures contract are shown in Figure 3 for the period when the contract most heavily traded, the September to July 1987 carrying charges and the December to September 1987 carrying charges. Carrying charges represent the difference between prices of the two nearest futures contracts.

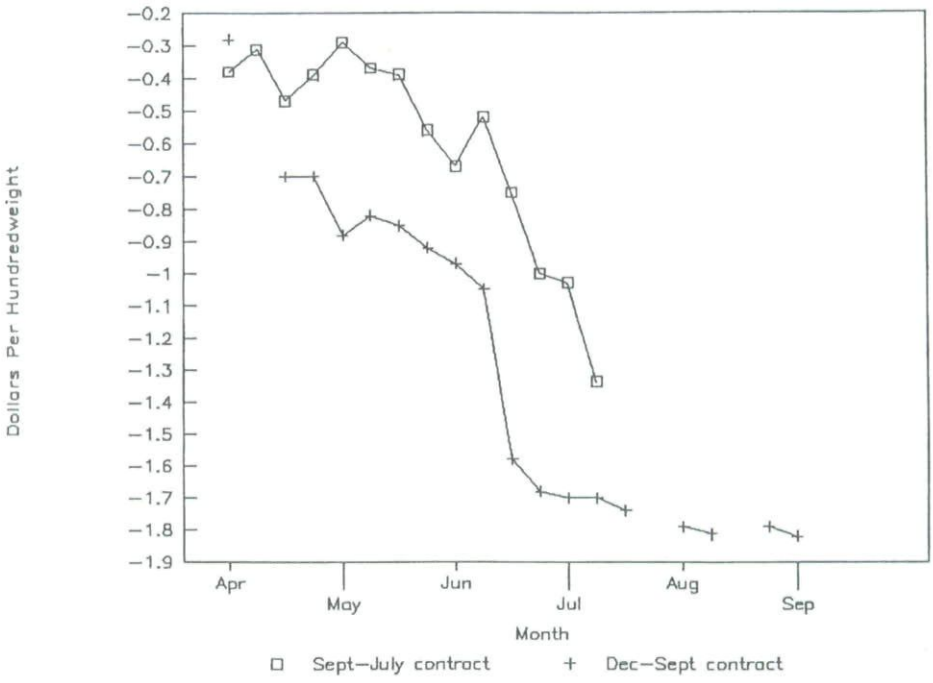

FIGURE 3
HFCS-55 carrying charges. Source: The Minneapolis Grain Exchange Statistical Annual 1987.

The graph shows that carrying charges were largely negative throughout the life of the contract. Inverse carrying charges are indicators of current shortage of supply and provide no incentive to hedge stocks in storage. There may, however, still be an opportunity to forward price using the futures market. Working (1977) found that hedging does continue and is possible with markets that have inverse carrying charges. He states that, ". . . the conclusion may be applicable to all important futures markets since it requires only that hedging continue in spite of inverse carrying charges, I think that it likely that no futures market can persist without the continuous presence of a substantial amount of hedging" (p. 35).

In this case, inverse carrying charges observed in the contract could be expected due to the highly seasonal nature of HFCS-55 prices. Inverse carrying charges suggest and are consistent with price declines in the future due to the seasonal behavior of prices. One could expect July prices to be higher than September, and September higher than December.

If the March and July 1988 HFCS-55 futures contracts had developed, positive carrying charges may have been realized. March to Decem-

ber and July to March carrying charges would have represented periods in which demand for the product begins to increase. In this instance, prices for March would have been higher in comparison to those in December, and those in July higher than those in March due to seasonality in demand; HFCS-55 is demanded more during the late spring and summer months. Positive carrying charges would signify the increase in demand and price for these periods.

Comparison of Commitment of Trader Levels

Commitment of trader levels for commodity futures are reported monthly by the Commodity Futures Trading Commission. This report includes a breakdown of the month-end open interest for markets in which five or more traders hold positions equal or above reporting levels for each commodity. The commitment of trader reports show: (1) open interest divided between reportable and nonreportable positions; (2) reportable commercial and noncommercial holdings; (3) open interest involved in spreading; (4) numbers of traders; and (5) gross and net position concentration ratios—the combined open interest shares of the four (or eight) largest traders. "Net position" concentration ratios are derived by offsetting each trader's equal long and short positions. "Gross position" ratios are based on the total positions of the four (or eight) largest traders.

Concentration ratios for HFCS-55 from the commitment of trader reports for the period during which the contract was most heavily traded, May to July 1987, are presented and compared to ratios for more successful commodity futures markets. Reportable trader positions for HFCS-55 were 25 contracts. The commodities used for comparison are corn, oats, domestic sugar, and soybean meal. The corn futures market was chosen as an example of a successful agricultural futures contract. Oats futures were compared because the oats market is a thin market with a fairly successful futures contract. Domestic sugar was chosen as a sweetener futures market that trades as a thin, yet successful, market which is also a substitute for HFCS-55. Soybean meal was chosen because it is most similar to the HFCS-55 futures contract both in contract design and product characteristics. Soybean meal trades actively as a futures contract using a shipping certificate as a mode of delivery similar to that specified in HFCS-55 futures contract. The soybean processing industry in the United States is also quite concentrated.

Tables IV, V, and VI present commitments of traders for HFCS-55 in May, June, and July 1987, respectively. These tables report both reportable and nonreportable positions in number of contracts, commercial

TABLE IV

Commitments of Traders for HFCS-55, May 1987

	Reportable Positions (Number of Contracts)							
	Noncommercial							
	Long/Short Only		*Spreading*		*Commercial*		*Totals*	
Total Open Interest	*Long*	*Short*	*Long*	*Short*	*Long*	*Short*	*Long*	*Short*
325	114	214	0	0	0	0	114	214
Percent of open interest	35.1	65.8	0.0	0.0	0.0	0.0	35.1	65.8
Number of traders	4	1	0	0	0	0	4	1
	Concentration Ratios							
	Gross Position				*Net Position*			
	Top 4 traders		*Top 8 traders*		*Top 4 traders*		*Top 8 traders*	
	Long	*Short*	*Long*	*Short*	*Long*	*Short*	*Long*	*Short*
	35.1	65.8	35.1	65.8	35.1	65.8	35.1	65.8

Source: CFTC, 1987b.

and noncommercial positions, number of traders in each category, and percentage of open interest held by each category. Long and short nonreportable positions are derived by subtracting reported positions from the total open interest. For nonreportable positions, number of traders involved and commercial/noncommercial classifications are unknown.[9] Table VII presents commitments of traders for the commodities other than HFCS-55 in June 1987. This month is representative of the activity in these markets during the May to July, 1987 period. Only the number of traders, open interest, and concentration levels for gross and net positions of the top four traders are reported in this table.

The concentration tables for the HFCS-55 market indicate that during the month of May there were five reportable traders in the market. These were all noncommercial users of the product (speculators). Since there were no reportable commercial users involved in the market, there may have been little hedging taking place. No definite conclusions can be made concerning the amount of hedgers because there could have

[9]Reports of the commitment of trader levels in the HFCS-55 futures contract cease after July 1987. Therefore, after the July futures contract expired there were fewer than five traders left in the market.

TABLE V

Commitments of Traders for HFCS-55, June 1987

	Reportable Positions (Number of Contracts)							
	Noncommercial							
	Long/Short Only		*Spreading*		*Commercial*		*Totals*	
Total Open Interest	*Long*	*Short*	*Long*	*Short*	*Long*	*Short*	*Long*	*Short*
514	279	4	77	77	0	347	356	428
Percent of open interest	54.3	0.8	15.0	15.0	0.0	67.5	69.3	83.3
Number of traders	4	1	2	2	0	1	5	3
	Concentration Ratios							
	Gross Position				*Net Position*			
	Top 4 traders		*Top 8 traders*		*Top 4 traders*		*Top 8 traders*	
	Long	*Short*	*Long*	*Short*	*Long*	*Short*	*Long*	*Short*
	61.7	83.3	69.3	83.3	54.3	68.3	54.3	68.3

Source: CFTC, 1987b.

been commercial participants holding nonreportable positions. According to the survey, commercials were using the contract mostly to "keep in touch with the contract." One firm stated that they traded contracts because there was an opportunity to profit by selling contracts.

In June, one commercial trader entered the market with a reportable short position.[10] Discussion with this reportable commercial confirmed that the commercial user was not using the market to hedge. The firm stated that they were short because there was a significant profit incentive for selling contracts at the contract prices. The commercial participant continued selling the contracts because there were speculators in the market purchasing the contracts at profitable prices to the seller.

In July, one of the reportable noncommercial longs departed the market. The market lost a significant amount of open interest in July, dropping from 514 contracts in June, to a low of 264 at the end of July. Following this month, open interest continued to drop and remained at low levels during the rest of the year.

[10]Reportable positions for HFCS-55 below 25 contracts in June and July 1987 are assumed to be held by traders with gross positions which totaled more than 25 contracts.

TABLE VI

Commitments of Traders for HFCS-55, July 1987

	Reportable Positions (Number of Contracts)							
	Noncommercial							
	Long/Short Only		*Spreading*		*Commercial*		*Totals*	
Total Open Interest	*Long*	*Short*	*Long*	*Short*	*Long*	*Short*	*Long*	*Short*
264	98	9	98	98	0	132	196	239
Percent of open interest	37.1	3.4	37.1	37.1	0.0	50.0	74.2	90.5
Number of traders	3	1	2	2	0	1	4	3
	Concentration Ratios							
	Gross Position				*Net Position*			
	Top 4 traders		*Top 8 traders*		*Top 4 traders*		*Top 8 traders*	
	Long	*Short*	*Long*	*Short*	*Long*	*Short*	*Long*	*Short*
	73.8	38.1	81.3	55.8	60.9	38.0	63.1	52.2

Source: CFTC, 1987b.

TABLE VII

Commitment of Trader Concentration Ratios for Corn, Oats, Domestic Sugar No. 14, and Soybean Meal, June 1987

Commodity	*No. of Traders*	*Total Open Interest*	*Gross Position Top 4 Traders*		*Net Position Top 4 Traders*	
			Long	*Short*	*Long*	*Short*
Corn (CBOT)	237	593,675	14.9	16.2	13.6	14.1
Oats (CBOT)	13	24,465	38.5	38.8	28.4	30.9
Sugar no. 14 (NYCSCE)	15	5,915	70.4	50.7	65.1	50.7
Soybean meal (CBOT)	89	60,709	24.1	23.6	12.0	16.2

Source: CFTC, 1987b.

Concentration ratios for the HFCS-55 contract were very high in relation to other commodity futures contracts. Open interest was significantly lower that any of the other commodities, even considering the number of traders. Based on commitments of trader reports (not shown), the other commodities also seemed to show a more balanced mix of po-

tential hedgers and speculators, and less of an opportunity for one or two firms to control the market. The HFCS-55 futures contract was also unusual because speculators, or noncommercial users of the market, were the dominant participants in the market. Recall that the survey indicated that only two producers traded the contract. Part of the explanation for the larger number of traders and open interest in other futures contracts could be that there are a larger number of uses of many of the commodities considered.

The quick demise of the contract following the first contract expiration and lack of spot user involvement in the HFCS-55 futures market might have been due to the prevalence of uninformed speculative traders [Stein (1986)]. Speculators were the dominant participants in the HFCS-55 futures market; they might have been uninformed about HFCS-55 and their actions may have forced spot users out of the market. The absence of commercial users suggests that they knew something about the pricing of HFCS-55 that the uninformed speculators did not know until after the first contract expiration.

SUMMARY AND CONCLUSIONS

A survey of HFCS-55 producers and consumers was conducted to investigate attitudes toward the HFCS-55 futures contract as well as to ascertain industry pricing practices. Respondents indicated that the problems associated with the futures contract were primarily industry concentration on both the producer and user sides, contract quality and delivery specifications, and poor HFCS-55 futures contract performance. The procurement process, which consists of privately negotiated quarterly and yearly forward contracts, seemed to provide producers and users with individualized set price schedules. Although the Exchange attempted to specify thorough quality control for a homogeneous product, users of the product did not trust the contract's quality specifications. Producers and users stated that the use of the Chicago market for delivery limited contract use by out-of-position production plants and bottlers not within the delivery area. Finally, users and producers stated that the market did not attract the necessary market liquidity. Most respondents argued that the cash market was too thin to attract hedgers and speculators that could sustain the contract. The HFCS-55 futures contract was ineffective as a price discovery mechanism due to a lack of correspondence between cash and futures prices, both intertemporally and spatially.

An analysis of HFCS-55 cash and futures market data was conducted to determine whether the performance of the contract was consistent

with survey results suggesting that the futures market was thin and ineffective for price discovery and risk management. Cash–futures price relationships for HFCS-55 suggest that contract prices appeared to follow published cash prices until the first contract expiration when large deliveries were made on the contract. Speculators involved in delivery initiated a law suit claiming that the Exchange and the commercial users involved misrepresented prices and distorted industry practices. This suit likely limited further use of the contract. This episode also suggests that published cash prices, upon which speculators based their trading decisions, were not representative of actual transaction prices for HFCS-55. Speculative participants in the market apparently had incomplete understanding of the HFCS-55 industry.

The timing of the contract's introduction could have further limited its success. The contract was introduced at a time when most producers and users had already forward contracted the product for spring and summer use. There was no need to use the futures market if producers and users felt secure with these agreements.

Inverse carrying charges were observed between contracts at the time of the contract's introduction. These inversions were consistent with the seasonality in HFCS-55 cash prices. However, inverse carrying charges provided no returns to storage during this time, and could have limited hedging opportunities for those users wanting to lock-in a carrying charge for the product. Despite inversions, if contract prices had been more representative of expected transaction prices, there would have been an opportunity to lock-in forward prices for HFCS-55. If later maturities had traded, positive carrying charges would have been expected due to seasonality in the demand and prices for HFCS-55.

Consistent with survey results on the reasons for the contract's failure, commitment of trader levels for the HFCS-55 futures contract indicate that trading in the HFCS-55 futures contract was thin and highly concentrated. The market never attracted more than six reportable traders during the period it was most actively traded. Most appear to have been noncommercial users (speculators). At any one time, four or fewer traders accounted for 65% to 90% of the total open interest. The HFCS-55 futures market was traded too thinly to survive. The other markets considered in comparison had greater numbers of traders and open interest, in part, reflecting greater demand for the use of the contract.

In sum, the results of the study indicate that there was no real or perceived need for the HFCS-55 futures contract. Producers and users were satisfied with conventional forward contracting procedures. Concentration within the HFCS-55 industry and lack of accurate publicly

available information limited the interest and efficacy of potential participants in the futures market. HFCS-55 as a commodity was not a good candidate for a futures contract, contract design was inadequate to commercial needs, and there was a basic lack of interest in and understanding of the market. Thus the HFCS-55 futures market failed.

The rapid demise of the contract suggests that if a contract is not well designed, or if there is little commercial demand for it, these failings will be quickly revealed in the futures market. Unless traders—commercials and speculators—benefit from futures trading, the contract will not be traded for long, if ever. If there are no private benefits to futures trading, society will not receive the public benefits (i.e., price discovery, improved resource allocation, and price stabilization). Exchanges must carefully research industry pricing practices and market structure before introducing a new contract to determine optimal contract design and demand for the contract as a pricing and risk management instrument. A flawed contract probably will not gain sufficient trading volume or open interest to survive long enough to be fine-tuned.

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