Grain Futures Trading During the Interwar Period: Introducing a New Dataset and Evidence*

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Abstract

This paper retraces the origins of modern futures trading by creating a new dataset, and provides new evidence to an open question in economic history, whether the assumed negative impact of speculation, which generated several regulatory and institutional changes, is reflected in interwar futures trading. The new dataset consists of daily information on grain futures contracts traded at the most dominant futures exchange in the 20^{th} century, the Chicago Board of Trade. We first devote attention to the regulatory changes of the period since these continue to influence market activities today. We then analyse econometrically the drivers of interwar speculative behaviour and the impact of speculators' position changes on the volatility of grain prices. Our findings reveal that speculators significantly adjust their trading positions according to past price and returns movements, but follow different trading strategies before and after the onset of Great Depression. Nevertheless, we do not find any evidence of speculative activity amplifying the volatility of grain prices in early futures markets.

Keywords: Interwar Period, Regulation, Speculation, Grain Futures Markets, Returns Volatility

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1 Introduction

Organized commodity futures trading in the United States dates back to the founding of the most famous, and still extant, futures exchange, the Chicago Board of Trade (CBoT), in 1848[1]. During this time, with the completion of the Illinois and Michigan Canal, railroad infrastructure and telegraph connection, Chicago became an important hub for grain trade, enabling a central market for agricultural producers and consumers. This development also led to the rapid development of grain futures markets in Chicago throughout the 19^{th} and 20^{th} centuries.[2] In this context, the period after WWI ended is particularly noteworthy because unprecedented price volatility led to a surge in speculative interest in grain futures trading. Indeed, examining the volume of grains traded over the last century one observes a relatively high level of activity during the 1920s, comparable in scale to levels reached only again during the 1970s (Hieronymus, 1977).

The interwar years also tell the story of the development and establishment of many key institutional and regulatory characteristics that still affect modern futures markets today.[3] More specifically, the two decades following WWI witnessed a profound transformation of the regulatory regime of grain futures markets, from one of self-regulation to federal regulation. Between 1921 and 1939, the U.S. government passed important pieces of legislation, particularly with regard to speculative trading, to regulate the grains futures market for the first time in history. This was in response to the severe agricultural market disruptions (i.e., unprecedented heightened volatility and depressed prices, Dust Bowl, Great Depression etc.)

[1] Around the world, earlier documented cases of exchange-based trading of contracts for the delivery of pre-specified quantities at an agreed-upon price and quality, future delivery date and specific location can be found: for example, for the rice futures trading at the Dojima exchange in Osaka in the 18^{th} century, see Schaede (1989); Wakita (2001), and for the Baltic grain trade in Amsterdam in the late 16^{th} century, see van Tielhof (2002). However, none of these were as dominant as the Board of Trade in Chicago.

[2] Futures markets have two important functions: they facilitate standardized transactions for commodities and the transfer of risk associated with future price fluctuations from producers (hedgers) to speculators. For analyses of the early grain futures markets in Chicago, see Santos (2002, 2009, 2013).

[3] Saleuddin (2018) provides an exceptional study about how interwar futures market regulation is the backbone of current futures market regulation.

and a boom in speculation on organized commodity markets. In this context, the question arises whether speculation in commodity futures markets can actually be so harmful that extensive regulatory provisions are needed to curb this perceived negative impact. However, this question is not only of particular importance in the historical context of the 1920s and the regulatory and intentional changes of that time. More recently, the heightened volatility in food commodity prices, most noticeable in 2007/8, and again in 2011, renewed discussions about regulatory failures, market efficiency, and the legitimacy of speculative trading in commodity futures (e.g., Sanders et al., 2010; Irwin and Sanders, 2012; Kim, 2015; Manera et al., 2016; Brunetti et al., 2016). Certainly, the discussion about futures prices, their significance, and implications for market behaviour and efficiency, as well as about the role and impact of futures traders continues. Only more evidence can eventually settle outstanding questions.

This is where this paper makes its most important contribution, by providing empirical evidence to an open question in economic history, namely whether the assumed negative impact of speculation, the basis for several regulatory and institutional changes, is reflected in interwar futures trading.[4] More precisely, we have collected a new dataset of daily information on futures contracts for wheat and corn through the interwar period. We then employ the newly collected data to empirically investigate the driving forces of interwar speculative trading activity in the Chicago grains futures markets, and analyse the consequences with respect to the instability of commodity prices.

Economists have long debated whether futures market speculation had a destabilizing or stabilizing effect on grain futures markets in the interwar period (Keynes, 1923; Friedman, 1953). Evidence from the contemporary literature on the consequences of speculation in early futures markets is, however, mixed. On the one hand, researchers during the interwar years, especially statistical analysts at the newly formed regulatory agencies, provide evidence in favour of the long held view that speculators are "evil" traders who cause excessive

[4]In general, public sentiment is hostile towards speculators, and can be traced back to even before the rise of organized commodity exchanges in the 19^{th} Century (see, Jacks, 2007). Nevertheless, the regulatory and institutional setting of U.S. futures markets remained unaffected.

movements in early grain prices and, accordingly, recommended limitations on positions taken by speculators to reduce futures prices volatility (see, for example, U.S. Secretary of Agriculture, 1926; Duvel and Hoffman, 1927, 1928; Petzel, 1981). On the other hand, in a series of papers (Working, 1933, 1934, 1937, 1953, 1958, 1961), Holbrook Working, one of the most influential academic analysts of early agricultural futures markets, argued that speculators, who tend to follow the hedging demand, represent an essential components of early futures markets, as their trading may lead futures prices to more faithfully economic fundamentals.[5]

Nevertheless, empirical evidence from the large early literature that asks whether speculators have a deleterious impact on early futures markets is based on rather short sample periods and, more often than not, on simple correlation analysis or graphical inspection, which were the best available tools for scholars at that time. A closer and more systematic look at the early agricultural futures markets using more modern techniques and high frequency data may shed significant new light on the impact of speculative activities on the volatility of grain prices.

This paper fills a significant gap in the literature by creating a unique dataset comprised of daily trading observations on grain futures contracts traded at the Chicago Board of Trade that were hand-collected for the interwar years of 1921-1939. We focus on wheat and corn futures markets, which represent two of the most traded and regulated commodities throughout the interwar period. Together they represent the most important grain futures markets in terms of volume and monetary value of trading that survived to the present.[6] In addition to futures price quotations, trading volume and open interest, we also collect detailed information on different classes of futures traders. Using these data, we construct futures continuous time series and speculation measures for selected interwar sub-periods.

[5]See Berdell and Choi (2018), for the debate over the impact of speculation on early futures markets between the regulatory agency and Holbrook Working during the interwar period.

[6]During the interwar years, wheat and corn futures at the CBoT were of high importance for the functioning of world markets, as markets in Liverpool, London, Winnipeg, Buenos Aires, and elsewhere, set their prices for grain transactions usually based on the Chicago's futures prices (Irwin, 1932).

The new dataset cannot address all the outstanding issues regarding the interwar grains futures markets, but it is a significant step forward. Descriptively, the data allows us to better understand the functioning and regulation of trading in early futures markets. Empirically, it allows us to test the drivers of interwar speculative decisions and to analyse to what extent interwar speculative behaviour affects the volatility of grain futures prices utilizing a more modern econometric technique, namely a generalized autoregressive conditional heteroskedasticity (GARCH) framework (Bollerslev, 1986). Interestingly, our findings suggest that speculators significantly adjust their trading positions according to past price and returns movements, but follow different trading strategies before and after the onset of the Great Depression. Perhaps most important, we do not find any evidence of speculative activity amplifying the volatility of grain prices in early futures markets.

Our study contributes to the existing literature in three ways: First, we assemble a new dataset by digitizing daily information on interwar grain futures trading at one of the most dominant commodity exchanges in the United States, the Chicago Board of Trade. This high frequency data, collected for almost the entirety of interwar period, is arguably the missing link that is required to empirically answer the longstanding question about whether speculative trading activity is a destabilizing force for the early grain futures markets. Second, we contribute to current efforts at constructing long historic futures continuation prices series (see, Levine et al., 2018; Bhardwaj et al., 2019; Zhang, 2021), by prolonging the available data on wheat and corn futures prices. Third, our empirical findings offer new evidence dealing with the unsettled question whether futures speculators, in particular during the interwar years, destabilize grain markets, by heightening the volatility of prices. As was the case with the structural change in grain futures markets during the interwar period, the futures regulatory authority continues to blame (large) speculative trading for the recent spikes in grain prices observed since 2004 (Masters, 2009). Yet, the central question in the academic literature regarding the consequences of speculative trading behaviour in modern futures markets remains, exactly as before, unanswered. Our results contribute therefore

to the ongoing academic debate (see, for example, Brunetti and Büyükşahin, 2009; Irwin et al., 2009; Robles et al., 2009; Stoll and Whaley, 2010; Manera et al., 2016) by providing new insights and evidence into the origins of modern futures trading. To the best of our knowledge, we are the first to digitize some of the oldest evidence of grain futures markets, and empirically analyse such high frequency data covering most of the U.S. interwar period.

The remainder of this paper is organized as follows: Chapter 2 describes the regulatory and institutional background of the grain futures markets during the interwar period. Chapter 3 introduces the new assembled dataset and presents a thorough description of the data on grain futures prices and traders. Subsequently, we explain the econometric methodologies and key results of this paper in Chapter 4. Finally, Chapter 5 concludes.

2 Historical Background

2.1 Regulatory Framework

Initially, the Chicago exchange was self-regulated, with little oversight from public authorities, and none from the federal government. The precipitous decline in food prices that occurred at the end of WWI[7] paved the way for the interwar federal legislation designed to provide regulatory controls over the commodity futures markets. As a result of a Federal Trading Commission study and increasing public outrage regarding the economic repercussions of the "grain gamblers activities",[8] Congress approved on 24^{th} August, 1921, the 'Futures Trading Act' (FTA), the first legislation to create federal government oversight of organized futures trading in grain. Essentially, the FTA authorized the Secretary of Agriculture to designate exchanges as "contract markets". Off-exchange grain futures trades, i.e., futures contracts that were not traded on the exchanges licensed by the federal gov-

[7]The great farm commodity price collapse between 1920 and the end of 1921 is identified as one of the most violent crashes of prices and wages in the United States history, even more severe than the Great Depression of 1929-1933 (Grant, 2014; Soule, 1947).

[8]Senator Arthur Capper publicly stated his opinion that "the grain gamblers have made the exchange building in Chicago the world's greatest gambling house. Monte Carlo or the Casino at Havana are not to be compared with it" (U.S. Congress, Senate, 1921, p. 4763).

ernment, were subject to a heavy 20 cents/bushel tax. The FTA was soon struck down, as the Supreme Court ruled in May 1922 that it was an unconstitutional exercise of Congress' taxing power. However, shortly thereafter, the 'Grain Futures Act' (GFA) was hastily introduced and passed by the Congress with large majorities on September 21, 1922.[9] This Act required commodity exchanges to be designated by the federal authorities as "contract markets", as did its predecessor, the FTA, but also to take measures and act against price manipulation and dissemination of false market information, and to this end, to keep records of its transactions. Although the 'Grain Futures Act' of 1922 was replaced by the 'Commodity Exchange Act' in 1936, as it will be further discussed, it nonetheless constitutes the core of norms, ideas and regulations that govern modern futures markets today (Keaveny, 2004; Saleuddin, 2018). The Act led to the creation of the 'Grain Futures Administration' (GFAD) within the U.S. Department of Agriculture (USDA). The GFAD was given day-to-day control over regulation of the futures markets, in particular to observe and investigate practices at the exchange, while futures trading was regulated by the exchanges, themselves. Indeed, one of the main contributions of the 1922 GFA to the futures markets was the information gathering mandate and the consequent release of the data, at the expense of which a comprehensive understanding of the truly function and development of futures markets was finally made possible (Saleuddin, 2018).

Beginning on 22^{nd} of June 1923, in an effort to boost surveillance, the GFAD began to collect daily reports from the clearing members of the CBoT exchange, detailing the market open positions of its customers exceeding a specified amount – over 500,000 bushels in daily open interest. Such accounts were called "special accounts". Based on this newly collected information, the GFAD has soon suspected fraud and market manipulation, and as a result of the large grain price fluctuations in the following years (1924 to 1926),[10] it undertook a thorough investigation of trading in grain futures, shifting its focus towards alleged 'excess'

[9]For a detailed description of the Grain Futures Acts of 1921 and 1922, please visit: https://www.cftc.gov/About/HistoryoftheCFTC/history_precftc.html.

[10]The development of wheat and corn prices is depicted in Figure 1 in Section 3 of this paper.

speculation. The amount of resources dedicated to the examination of this highly volatile market environment was enormous. More specifically, it resulted in three substantial reports, which purported to reveal several major problems with agricultural futures trading at that time.[11] One of the finding was that while the grain prices were decreasing, the speculators holding long positions became net sellers of the futures contracts. Indeed, this turned to be perhaps one of the most important allegations levelled against speculators at that time, as it was argued that the large-scale buying and selling operations had caused the large daily fluctuations in grain prices. However, even though the findings of the Secretary's investigations uncovered some criminal practices and exposed important deficiencies in the institutional structure of commodity futures trading at the Chicago exchange, the GFAD was powerless in prosecuting under the GFA of 1922. Facing the risk of losing their "contract market" license, the CBoT has adopted several key institutional changes in response to the GFAD reports. These included, among others, the adoption of modern clearing systems in 1926, the establishment of a Business Conduct Committee (BCC) with broad enforcement powers over its members' transactions in order to address manipulation identified by the GFAD,[12] as well as the adoption of rules regarding the limitation of daily food price fluctuations in emergency situations (U.S. Secretary of Agriculture, 1926; Markham, 1987; Saleuddin, 2018).[13]

At the same time the GFAD was conducting its analyses of the trading in grain futures markets, "propaganda" within the exchanges has evolved. The exchange community blamed the GFAD's mandate to collect daily trading reports from the members of CBoT for the decrease in trading volumes and hence in grain prices, contending that it was discouraging

[11] *Fluctuations in Wheat Futures*, U.S. Secretary of Agriculture (1926), *Speculative transactions in the 1926 May wheat future*, Duvel and Hoffman (1927) and *Major transactions in the 1926 December wheat future*, Duvel and Hoffman (1928).

[12] The BCC was an obvious institutional reaction to the so-called "Cutten Corner" volatility in 1925 and the GFAD's lack of direct power and influence on the futures markets during such market anomalies. Arthur Cutten, one of the members of the CBoT, was believed to be one of the worst abusers of the grain futures markets, in particularly, charged of being responsible for the sharp increase in wheat prices between 1924 and 1925. See, Markham (1987) and Saleuddin (2018) for more details on the "Cutten Corner".

[13] See next section for the interwar institutional changes.

bullish speculators to enter the futures markets.[14] As a result, the GFAD suspended its requirement of reports for the "special accounts" during several months in 1927, but it shortly thereafter concluded that its reports did not have any effect of frightening away large speculative buyers (Markham, 1987).

On the 29^{th} October of 1929, stock prices plunged dramatically and marked the beginning of a roller-coaster decrease in economic activity, known today as the Great Depression (Cowing, 1965). In an effort to stabilize the grain prices, President Hoover established the Federal Farm Board (FFB). The FFB's main tasks were to reduce speculative trading, prevent crop oversupplies, and stabilize grain prices. However, despite its efforts to keep the grain prices stable, these continued their decline, and the main problem was that the FFB could neither control nor limit the amount of commodity surpluses. Aiming to restore the American economy from the ravages of the Great Depression, which by that time was experiencing its most severe depths, in 1932, newly elected President, Roosevelt, immediately introduced the "New Deal" – a series of federal programs, economic reliefs, public projects, reforms in financial, agricultural and industrial sectors, that have fundamentally impacted the U.S. government with respect to its size and role in the economy.[15]

At the same time, events led to a presidential call for heavier government oversight of the futures exchanges, which were often made responsible for the low commodity markets (Markham, 2002). President F.D. Roosevelt stated his belief in February of 1934, "that exchanges for dealing in securities and commodities are necessary and of definite value to [America's] commercial and agricultural life. Nevertheless, it should be our national policy to restrict, as far as possible, the use of these exchanges for purely speculative operations. I therefore recommend to the Congress the enactment of legislation providing for the regulation

[14]Prior to 1923, the CBoT fought hard to keep trading data of its members private, since it was aware that public knowledge about the volume of grains traded there, which was so much higher than the entire agricultural harvest, could become a matter of criticism (Saleuddin, 2018).

[15]There is a large strand of literature concerning the economic impact of the FDR's New Deal. The classical consensus, however, is best illustrated by biographers and historians like Burns (1956), Schlesinger (1957) and Leuchtenburg (1963).

by the Federal Government of the operations of exchanges [...] for the elimination of unnecessary, unwise, and destructive speculation" (U.S. Congress, House, 1935, p. 2, as cited in Markham, 1987). Yet, it was not until 1936 that a new bill concerning trading in futures contracts was passed into law. The onset of Great Depression clearly shifted the government's priorities with respect to the evolution of futures market regulation.

On the 15^{th} of June 1936, after a decade of debate and unsuccessful legislative attempts, Congress approved the 'Commodity Exchange Act' (CEA), in response to the political and public complaints about the practices and economic consequences of futures trading on the exchanges. The enactment of the CEA led to the creation of the 'Commodity Exchange Administration' (CEAD) to replace the former GFAD, and introduced several fundamental changes in the regulation of futures markets. Like its predecessor, the GFA of 1922, the CEA required commodity exchanges to be licensed by the federal authorities as "contract markets". It now regulated further agricultural commodities such as butter, eggs, rice, Irish potatoes, mill feeds and cotton, in addition to the grains commodities (wheat, corn, oats, rye, barley, grain sorghum), which were previously subject to regulation[16]. The Act of 1936 was fundamentally designed to, "insure fair practice and honest dealing on the commodity exchanges, and to provide some measure of control over those forms of speculative activity which so often disrupt the markets to the damage of producers and consumers and even the exchanges themselves" (U.S. Congress, House, 1934, p. 1, as cited in Markham, 1987), and it was a legislative reaction to the Congress's investigations and ensuing conclusion that, "the exchanges had failed utterly in their efforts to achieve self-regulation in the commodity market" (U.S. Congress, House, 1934, p. 1, as cited in Markham, 1987). The CEA prohibited manipulation and further sought to break the fraudulent transactions on the exchanges, such as wash trades, fictitious sales, misleading statements and accommodation trades. The new regulatory agency, CEAD, was now authorized to set "position limits", i.e., to restrict the

[16]Other commodities that were subject of futures trading, but have not been regulated under the CEA: fats, oils, cocoa, coffee, cheese, cottonseed meal, cottonseed, peanuts, soybeans, and soybean meal. These were added to the list of regulated commodities in 1940 (Markham, 1987; CFTC, 2021b).

daily trading in futures contracts per speculator, or the maximum position that a speculator could hold or control in any one maturity month (Campbell, 1957; Markham, 1987, 2002; CFTC, 2021b).

Following the creation of the CEA in 1936, agricultural prices remained highly volatile and the commodity futures markets were not freed from problems. In an effort to curb 'excessive' speculation, 1936, the first speculative position limits for futures contracts in grains were imposed by the government at the end of 1938. These limited the maximum open position per speculator in any grain futures to 2,000,000 bushels. This restriction did not apply to the positions which were held with hedging purposes. The CEAD argued that, "The purpose of such limitations is to eliminate drastic price changes brought about by the operations of large speculators. [...] It is therefore of the utmost importance that limitations should be established only after the most thorough investigation and when every aspect of the effect of such limitations has been contemplated" (U.S. Department of Agriculture, 1938, p. 14, as cited in Markham, 1987). Based on their investigation and issued report, the CEAD has further advised the commodity futures exchanges to demand minimum margin requirements for speculators,[17] suggesting that such rules, "tended to insure the fair competition between commission firms and would tend to protect customers who, in the absence of substantial margin requirements, might be inclined to take a larger position in the market than their means would justify" (U.S. Department of Agriculture, 1938, p. 15, as cited in Markham, 1987). Subsequently, the CBoT, among other exchanges, has followed the federal advice and imposed minimum margin rules to its speculative traders (Markham, 1987, 2002).

The interwar period witnessed fundamental changes in the practice of commodity futures trading, producing a regulatory framework that survives to this day. Although the regulatory agency created under the GFA of 1922 lacked direct power and influence on the futures

[17]Under the CEA, the CEAD did not have the power to impose such minimum margin rules for the members of the exchanges.

markets, it gathered information and issued an enormous number of reports[18] that eventually led to a better understanding of the truly functioning of the markets at that time. Furthermore, based on the collection of daily trading data from the exchanges, the federal government was informed about the efficiency, or lack thereof, of futures trading, and hence regulatory changes that needed to be carried out in the creation of the CEA of 1936. Indeed, the substance, rules and key aspects of the earlier Acts enacted during the interwar period are reflected in the current legislation of commodity futures trading supervised by the Commodity Futures Trading Commission (CFTC), the CEAD's successor agency founded in 1974. In fact, from 1936 till 1980 the federal government has "never edited the core text, which was hastily contrived in 1922 from the tattered remnants of [the] 1921 [Futures Trading Act]" (Stassen, 1982, p.636). As such, the interwar years' futures regulation played a crucial role to the development and creation of modern futures markets today.

2.2 Institutional Framework

The fundamental purpose of organized commodity exchanges was to establish the machinery and facilities through which their members could engage in profitable trading activities. By the time of its establishment in 1848, the CBoT began as a club for businessmen,[19] but has rapidly grown in prominence and institutional stature, such that it became a non-profit self-regulatory organization by the beginning of the 20^{th} century (Baer and Saxon, 1949; Markham, 1987).

An average trading session, which always took place on the floors of the commodity exchange, also known as the "trading pit", involved hundreds of operators (i.e., members of the exchange) all selling and buying futures contracts at the same time in accordance with the Board's rules and regulations (Stewart, 1949). Based on their trading motives, the "pit" operators were be classified into four types: (a) scalpers - small speculators, who hold their

[18] Between 1923 – 1934, the federal agency has issued a number of ca. 25 publications and mimeographs (Saleuddin, 2018).

[19] Taylor (1917) provides a comprehensive overview of the early history of the CBoT.

position only for a short time during a trading session; (b) speculative traders – those who make profits through the correct anticipation of price changes; (c) hedgers – those who want to transfer the risk of future price movements; and (d) brokers – those operating for non-members hedgers or speculators (CFTC, 2021a; Saleuddin, 2018). Trading was done by means of private contracts – between a buyer and a seller – that could easily be substituted for each other, and were transacted exclusively for future delivery. The prices at which such contracts were traded, known as the "Board of Trade quotations" were communicated to non-local market participants by telegraph and later on, by telephone, from the "trading pit" (Morgan, 1979). It should be noted that the purpose of a typical futures trader was neither to make nor to take delivery of the commodity itself, but to offset all contracts by cash payments. Indeed, the defining characteristic of the futures market is that all profits are balanced by losses. If prices increased, the trader who has bought (i.e., who went "long") at a lower price but liquidated at the higher price, made a profit. Conversely, the "short", who sold at a lower price and bought at the increased price, suffered a loss. Clearly, if prices went down, the profit and loss situations are reversed (Stewart, 1949; Baer and Saxon, 1949).

By 1926, the institutional framework of the Chicago exchange has changed considerably, as discussed in the previous section, primarily because it adopted the modern clearing house and the BCC, two institutional characteristics, which are considered to be fundamental to the functioning of commodity futures markets (Peck, 1985). The new clearinghouse became the central counterparty of a trade, i.e. the seller and the buyer of each futures contract, after two parties have agreed on a transaction. As such, the performance of each cleared contract was now guaranteed by the clearinghouse, which ensured delivery to the buyer in the specified month, and payment of the traded price to the seller; even if at time of delivery, the commodity prices were lower or higher than the contract price agreed upon, both parties of the futures contract were nevertheless protected from the risk of default through the clearinghouse (Markham, 2002; Baer and Saxon, 1949). Importantly, the new system of modern clearinghouse marked the end of "biased" trading, i.e. favouring transactions with

the more prestigious counterparty, since it anonymised the futures trades, and furthermore reduced the default risk for trading counterparties, thereby increasing price and market efficiency.[20]

In addition, the CBoT had certain rules concerning the features of a contract. More specifically, the grain futures contracts were 'standardized', to the extent that the technical terms were the same for a typical agricultural commodity, except as to price and time of delivery. The contract size was fixed to 5,000 bushels, the quality of grade was one of the pre-established grades, while the traded prices, also known as the "quotations of the Board of Trade" were denominated in U.S. cents/bushel (Hoffman, 1932). Generally, the exchange required that after the closure of each transaction that the quantity sold, the price as well as the delivery month are reported to the designated staff members. With respect to the delivery month, the grain futures contracts permitted delivery usually in mainly four calendar months, due to the harvesting and marketing conditions of the commodity called for. Active trading in wheat and corn futures on the CBoT was thus maintained in the following four principal futures: May, July, September, and December. For a limited time, March futures were added, but it was not given equal standing to any one of the other four contracts (Baer and Saxon, 1949).

Trading at the Chicago exchange took place mostly six days per week, excluding public holidays, Sundays, and days on which trading was prohibited by the directors of the CBoT but also by orders enacted by the Secretary of Agriculture, who was given authority over the exchanges under the GFA and CEA.[21] Moreover, the Chicago exchange had fixed hours for

[20]Over the course of time, the modern clearinghouse has proved to be a robust system in reducing the bilateral default risk, even during periods of economic crises, such as the Great Depression or the global financial crisis of 2008-2010 (Saleuddin, 2018).

[21]For example, trading at the CBoT was suspended from March 4 to March 15, 1933, due to a bank holiday declared by President Roosevelt. In the same year, following a dramatic decline in grain prices on July 19 and 20, the CBoT closed its doors for futures trading on July 21 and July 22 (U.S. CEAD, 1937a,b). Trading in grain futures was again suspended on $18th$ of February 1935, "owing to the gold-clause decisions by the Supreme Court" (U.S. CEAD, 1937a, p.54). In addition, the CBoT amended internal rules which prohibited trading during the last 3 (starting with 1^{st} of December, 1935) or 7 (starting with 1^{st} of June, 1938) business days of the delivery month (U.S. CEAD, 1941, 1940)

trading. A trading session usually started at 9:30 a.m. and ended at 1:15 p.m., except on Saturdays, when the market closed at 12 noon. The reason for the limited trading day was simply the prevention of price manipulation (Baer and Saxon, 1949). Another rule on the CBoT was the restriction on daily price fluctuations. The exchanges set such price limits in emergency situations in order to prevent excessive daily volatilities in the grain futures market. When prices during any trading day increased or dropped above or below the closing prices of the preceding business day to the full extent of the adopted limit, no further trading in futures contracts was allowed for that day, except at prices that were within the limit. Throughout the entirety of the interwar period, on the Chicago exchange, several internal regulations placed limitations on the market prices of grains for future delivery. These ranged from 3 to 8 cents, and were chosen according to the market condition at the time of the amendment to the rules.[22]

Table B.1 in Appendix provides a chronological summary of the interwar years with respect to the grain market anomalies, the regulatory and institutional reactions that followed, which have been discussed throughout this section.

3 A New Dataset

The newly formed regulatory agency created under the Grain Futures Act of 1922 started gathering daily trading information from the exchanges, which it then published in several statistical bulletins. We utilized these early reports and digitized the available data for most of the interwar period in order to facilitate the empirical analysis of the causes and consequences of interwar speculative behaviour in grain futures markets. It is also important to add that the dataset can be combined with other existing datasets to create long series

[22]Generally, the CBoT allowed a price fluctuation within 5 cents. However, the CBoT amended a rule to permit an advance or decline of 8 cents from the previous closing price, for example during 2 business days after the bank holiday (on March 16 and 17) and for a whole week following the dramatic collapse in grain prices in July 1933. In addition, starting with August 31 1936, the Chicago exchange placed a limit on price fluctuations of 8 cents on all transactions in grain futures contracts which have maturity dates in the same month (U.S. CEAD, 1937a, 1941, 1937b, 1940).

to investigate other questions beyond the scope of this paper.

We hand-collected daily futures trading data from the reports published by the Commodity Exchange Administration, formerly the Grain Futures Administration. The newly collected dataset consists of daily price quotations, trading volume, open interest, and classes of traders. These reports have been compiled by the regulatory agencies with data supplemented by clearing members, clearing associations of the exchange and, in some instances, by information obtained from brokers.[23] Although the reports are available as scanned documents, the data collection process could not be automated, due to the poor quality and the specific text format of the bulletins.[24] The new assembled dataset covers a period of 19 years, from January 3, 1921, till December 30, 1939, and consists of daily observations on futures trading in wheat and corn at the Chicago Board of Trade, which represent two of the most important grain futures markets in terms of volume and monetary value of trading that have survived into the present day. For a more thorough description of the data sources, the collection process, and a more ample discussion of the various series and their attributes, see the online Appendix.

3.1 Grain Futures Prices

The collected price observations represent the official quotations of the CBoT, and resemble daily information about the opening, highest, lowest, and closing prices traded for the wheat and corn futures contracts with delivery month in March, May, July, September or December.

One of the characteristics of the futures market is that it enables the simultaneous trading of different futures contracts of finite lifetime that is limited by their maturity. As in the new assembled dataset there is not only one futures price quotation, this "raw" data on historical futures unsuitable for any econometric analysis. Therefore, to qualitatively evaluate the

[23] In the early life of a futures, few trades took place that did not come to the attention of the exchange quotation department. Since these prices were not recorded in the official quotations, they have been obtained from the brokerage houses and included in the reports (U.S. GFAD, 1930, 1931).

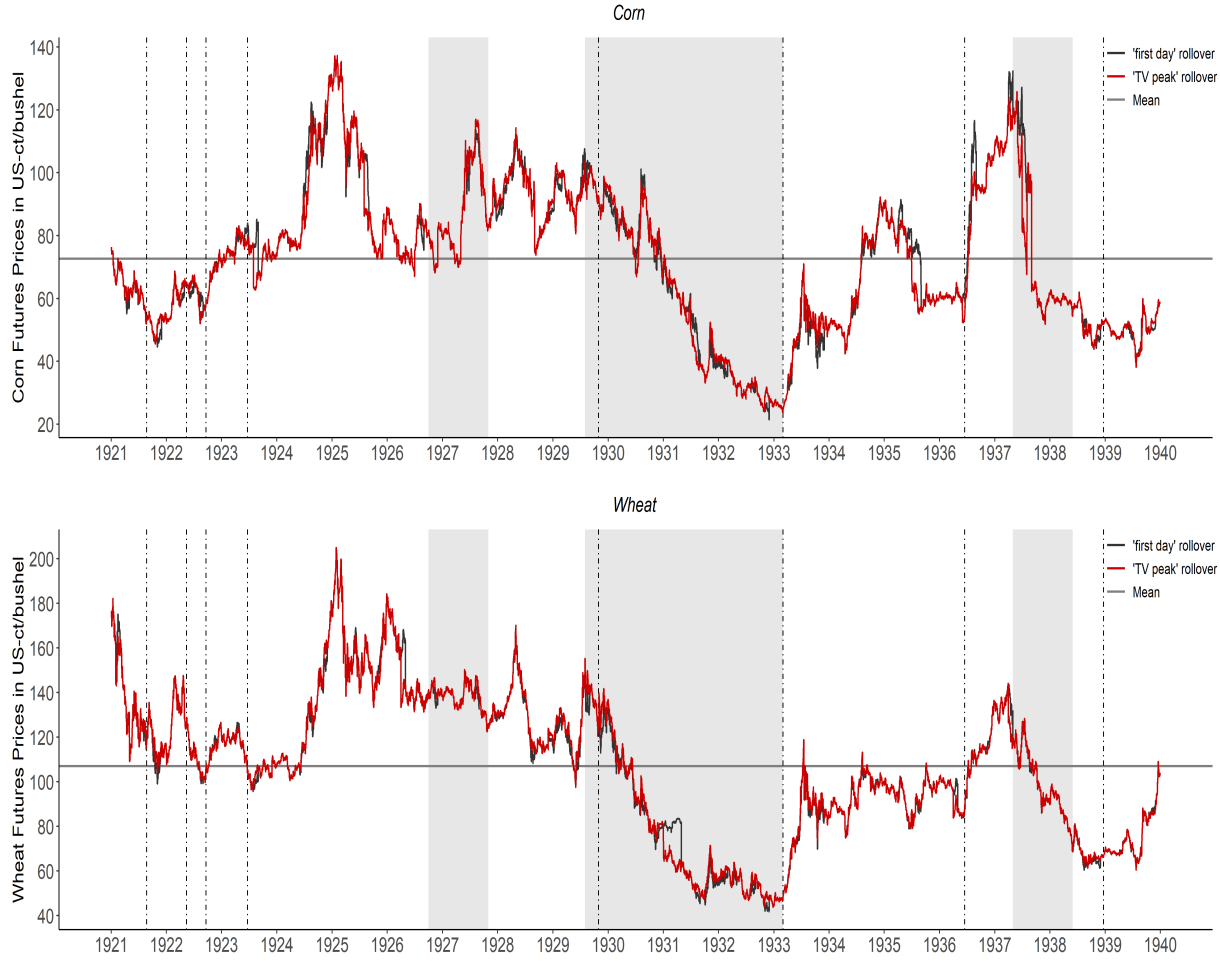
[24] See the online collection at: https://www.hathitrust.org/.

underlying futures markets, we further need to combine the gathered price data on the different futures contracts of various maturities to create continuous futures prices time series (CS) based on a rolling strategy. The rollover date basically denotes the time point when we switch from the nearest contract series to the next one. For robustness purposes, we construct two continuous series for each futures market under scrutiny and rely on a contract month criterion ("first day" rolling) and on a trading volume criterion ("trading volume peak" rolling). For further information about the rolling strategies and construction of the CS, see the online Appendix A.1.

Figure 1 shows the development of the constructed futures continuation price series for corn and wheat over the interwar period. Both criteria used to create the CS generate, with small exceptions, almost identical grain price series, yet with small exceptions. Corn and wheat futures prices at the CBoT were highly volatile over the observed period while fluctuating in a similar manner around their means. While traded prices for corn futures centered near \$0.73/bushel, the average wheat price was approximately \$1.07/bushel. Over the first three interwar years, corn (wheat) futures prices fluctuated under (over) their mean and, once the Grain Futures Act was enacted in 1922 (represented by the third vertical black dashed line), prices began to increase moderately. Interestingly, the data gathering mandate of the regulatory agency, effective from June 1923, kept grain futures prices close to their interwar mean. It should be recalled that the volatile environment observed between 1924-1926 generated the thorough investigations of trading in grain futures by the GFAD mentioned in Section 2 of this paper. Interestingly, following the GFA reports suspension, which lasted for most of 1927, the prices trended downward.

The large shaded area in Figure 1 highlights the second recessionary phase within the interwar period, according to the NBER´s recession chronology and associated with the Great Depression. Curiously, wheat and corn futures prices started their "roller-coaster" decrease in August 1929, when the recession began. This was almost three months before the stock market dramatically crashed in late October 1929, event highlighted by the 5^{th}

Figure 1: Grain futures prices (both CS).



Note: Vertical black lines highlight important events: 1921-08-24, FTA is enacted; 1922-05-15, FTA is declared unconstitutional; 1922-09-21, GFA is enacted; 1923-06-22, regulatory agency starts gathering data from exchanges; 1929-10-29, stock market crash; 1933-03-03, FDR is inaugurated as President; 1936-06-15; CEA is enacted; 1938-12-22, first speculative position limits are imposed on grains futures. The shaded gray area indicates NBER recessions.

vertical black dashed line in Figure 1. Undoubtedly, over the entire duration of this dramatic period in U.S. economic history, the observed futures prices for corn and wheat followed a downward trend, which eventually resulted in historically low levels by 1933. The end of the recession, i.e. 1^{st} of March 1933, which corresponds to three days before the inauguration of Franklin D. Roosevelt as President, marks the reversal of the decreasing trend in grain futures prices. These started to increase rapidly reaching levels close to their interwar averages, but

then fell again by the end of 1933.

Subsequently, grain futures prices at the CBoT were nothing but stable. Traded prices for wheat and corn futures began to increase precipitously immediately after the Commodity Exchange Act was passed by Congress in June 1936 (see penultimate vertical dashed black line on the plot), and the Chicago exchange has increased the limitation on price fluctuations.[25] However, by the summer of 1937, grain futures prices dramatically plunged and remained at depressed levels during the last recessionary phase of the interwar years, as shown by the third shaded area on the plot.

Interestingly, there was no sizeable reaction of grain futures prices in response to the adoption of the first Federal position limits imposed on speculative activities which occurred on December 22^{nd}, 1938 (see last vertical line on the plot). Indeed, the traded prices at the Chicago exchange remained at relatively low levels as before. Finally, toward the end of 1939, a sharp rise in corn as well as wheat futures prices is visible, and, as the federal reports suggest (see, U.S. CEAD, 1941, p.9), it can be attributed to Germany's invasion of Poland, an event that marked the beginning of the second World War.

Finally, given the price data and with the aim of analyzing the impact of speculation on the volatility of grain futures prices and returns during the interwar years, we construct a further variable, namely futures returns, defined as the logarithmic price differences, i.e. $R_t = ln(P_t) - ln(P_{t-1})$, where P_t and P_{t-1} represent the prices at day t and $t-1$, respectively. Note that, even though the continuous price series rolls over and tracks prices of different principal futures, the returns are always constructed using prices from futures contracts with same maturity only. This ensures an accurate empirical analysis of the underlying data.

3.2 Grain Futures Traders

In addition to the data on volume of trading, open commitments and daily traded prices, the CEAD (and GFAD) also furnished data of all daily sales and purchases of grain futures

[25] Note that, in addition to grain futures prices, these regulatory and institutional changes directly affected the volumes of trading at the CBoT. See Appendix A.1.

at the Chicago exchange, as well as open contracts for all traders coming within the reporting requirements, i.e. for all traders holding commitments equalling or exceeding 500,000 bushels (starting 1923), or 200,000 bushels (beginning with the end of 1933). The federal regulatory agencies reported in various statistical bulletins the amount of daily long and short commitments, by classes of traders. We collected data for corn futures covering nine interwar years (divided into two interwar sub-periods), namely October 1924 – September 1928, and January 1935 – December 1939, while for wheat futures, trading data have been found only for a period of five interwar years, spanning from January 1935 to December 1939.[26]

The publicly available reports detail the aggregate short and long positions of corn and wheat futures market participants by trader type, for each trading day as follows: reporting speculators and hedgers, and nonreporting traders.[27] The long and short positions for the latter class are obtained by subtracting the amount of daily long and short positions of reporting traders from the total open interest. Accordingly, the class of nonreportable traders is simply divided into long or short, but unfortunately, the classification into any of the two trading categories, i.e. speculators or hedgers, is unknown (Hoffman, 1930; U.S. CEAD, 1937a,b, 1940, 1941).

A detailed view of position size as a percentage of total open commitments for each trader category is provided in Table 1. As indicated, the relative size of each trader's class varies through time. One explanation for this could stem from the changes in reporting requirements and procedures of the federal agencies (reduced from 500,000 bushels in 1923 to 200,000 bushels by the end of 1933), as well from the legislation regarding speculative position limits that was amended in 1938. More specifically, during the first investigated

[26]For more details on the collection of these data, see section A.2 from Appendix.

[27]For each sub-period, the reports provide daily information about a further class of traders, namely clearing firms (1924-1928), and spreaders between round lots and job lots (1935-1939). However, since these trader types represent "small speculators", as outlined by the Hoffman (1930) and U.S. CEAD (1937a,b, 1940, 1941), long and short positions of each class are aggregated to the reporting long and short speculative positions, respectively. See the online Appendix for more details.

Table 1: Percent of the total open interest held by trader class.

	Corn 1924-1928	Corn 1935-1939	Wheat 1935-1939
Hedgers	12.71% (Long: 9.94%; Short: 90.06%)	32.86% (Long: 32.42%; Short: 67.58%)	31.68% (Long: 12.92%; Short: 87.08%)
Speculators	25.94% (Long: 68.63%; Short: 31.37%)	17.60% (Long: 59.21%; Short: 40.79%)	17.22% (Long: 55.37%; Short: 44.63%)
Nonreportables	61.35% (Long: 50.42%; Short: 49.58%)	49.54% (Long: 58.38%; Short: 41.62%)	51.10% (Long: 71.17%; Short: 28.83%)

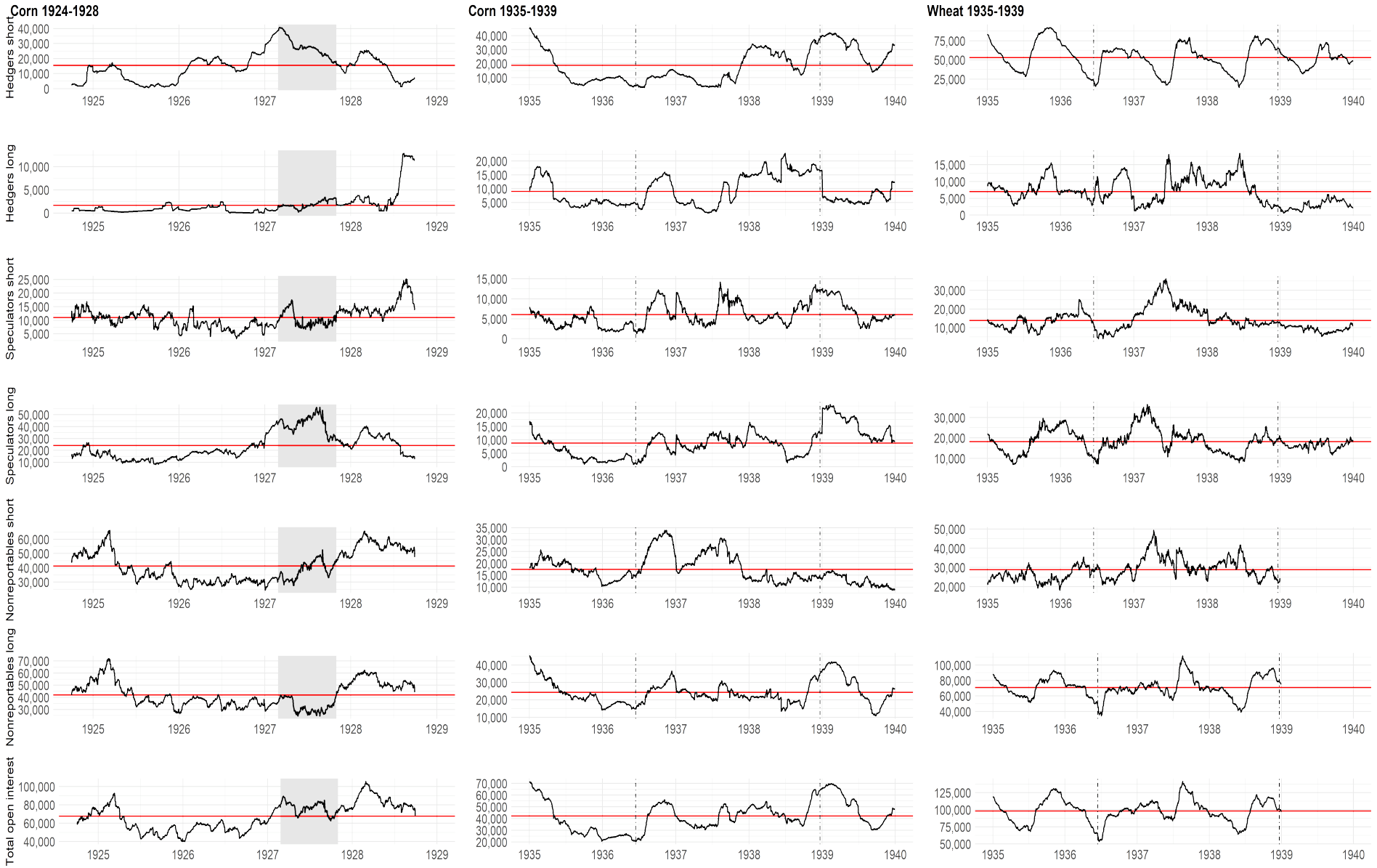
Note: Average percent of the market's total open interest held by each class of futures traders. The values in parentheses denote the percentage share of long (buy) and short (sell) positions within each trader category.

interwar sub-period (1924-1928), speculators held twice as many positions as hedgers in corn futures markets, whereas between 1935 and 1939, they make up for only 17% of this market, while hedgers represent 33% of the traders. Nonreported positions in corn futures were not insignificant, accounting for 61% and 50% of the total open interest during the first and second interwar sub-period, respectively. With respect to wheat futures, the ratio of traders is similar to that obtained for the corn futures for the 1935-1939 period. Table 1 provides further insights on the percentage of long and short positions held by each trader class. Importantly, hedgers were not only short, as predicted by the theory of normal backwardation,[28] especially in corn futures for the later five interwar years (32.42%). Speculators, on the other hand, held, on average, long positions in grain futures contracts, but their short positions were also of significant size (31% and 41% in corn; 45% in wheat). Lastly, the nonreportable traders engaged in equally distributed buying and selling activities in the wheat and corn futures markets.

The development of the aggregated long and short speculative, hedging and nonreporting

[28]Briefly, postulated by Keynes (1923) and Hicks (1941), the theory of normal backwardation suggests that speculators are rewarded with a risk premium for their willingness to absorb the price risk from hedgers in commodity futures markets. Central assumptions of the theory are that the aggregate futures position of hedgers is net short, and that speculators can, on average, earn positive returns for absorbing the hedgers' risk of commodity price fluctuations as long as the futures price is set at a discount relative to the expected future spot price. This situation is referred to as normal backwardation.

Figure 2: Commitment of traders.



Note: The shaded gray area represents the period when the regulatory agency suspended its reporting requirements. Vertical black lines highlight important regulatory events: 1936-06-15; CEA is enacted; 1938-12-22, first speculative position limits are imposed on grains futures. The horizontal red line depicts the mean of each series.

positions, as well as the total open interest over the observed interwar sub-periods are depicted in Figure 2. Three key aspects regarding interwar futures trading activities emerge from this illustration. First, it is evident that the fluctuations of the aggregate hedging short positions in wheat futures were seasonal. More specifically, year by year, hedgers gradually increased their short positions from the beginning of July until the middle of November, and subsequently reduced these until about the end of June. One explanation for the seasonal cycles is that hedgers who seek insurance against future grain price fluctuations start to trade their approaching winter and spring crops far in advance, i.e. with the begin of the second half of the year. The short hedging tendencies, however, are much less regular in corn futures, especially during the first analysed period (1924-1928). Second, by looking at the traders' positions in corn futures over the period before the onset of the Great Depression, it may be argued that the reporting requirements of the GFAD (regulatory agency at that time) were discouraging bullish speculators to enter the futures markets, as the CBoT's members charged. In particular, the shaded area on the plot (see left panel) highlights the period when the GFAD suspended its reporting requirements in response to the voiced allegations. Interestingly, it may be seen from Figure 2 that the long speculative positions as well as short nonreporting positions ("small speculators") have significantly increased during that time. Lastly, perhaps the most interesting aspect that emerges from Figure 2, is the development of the long positions held by speculators in wheat and corn futures contracts, which shows a high degree of similarity with that of the traded prices (recall Figure 1), although there are some minor differences.

4 Do Speculators Drive Volatility in Futures Prices?

Based on the newly collected data, we aim to further offer a comprehensive answer to an open question in futures trading history: Are speculative activities the main drivers of grain futures price volatility in the early period? To answer this, we utilize a more recent empirical method, and model the newly constructed futures returns data and their conditional volatil-

ity according to a GARCH(1,1) specification. We first discuss the determinants of interwar speculative trading decisions in grain futures markets prior to reporting volatility estimation results.

4.1 Drivers of Interwar Speculative Behaviour

Traditionally, there are two views of speculators' behaviour in futures markets. According to Keynes (1923), speculators "irrationally" anticipate market prices and engage in futures trading activities - they buy when prices are high and sell when prices are low - which destabilizes commodity markets and prices and contributes to increasing price volatility. In contrast, Friedman (1953) argues that speculators are "rational" traders who stabilize futures markets - they buy when prices are low and sell when prices are high thus limiting price volatility. Stated somewhat differently, traders who purchase futures (i.e., take the "long" side of the contract) following price increases or sell futures (i.e., are on the "short" side of the contract) following price declines may be momentum traders, trend followers or feedback traders. In contrast, traders who buy (sell) following price decreases (increases) may be contrarians.

To account for changes in speculators' positions, we follow Kang et al. (2020) and compute the net trading speculative variable for each futures market under scrutiny as follows:

$$QS_{i,t} = \frac{Netlong\ positions\ speculators_{i,t} - Netlong\ position\ speculators_{i,t-1}}{OI_{i,t-1}} \tag{1}$$

More specifically, i = *corn (1924-1928); corn (1935-1939); wheat (1935-1938)*, $OI_{i,t-1}$ denotes the total open interest on day *t-1*, and the numerator from the equation above calculates the change in net long positions between two consecutive trading days *t-1* and *t*.[29]

To give the reader a sense of the behaviour of the variables during the scrutinized interwar sub-periods included in this empirical section, namely the speculative net trading, grain

[29]Please note that, for empirical purposes, in this section we assume nonreportables to be strongly dominated by speculators, and therefore we allocate a substantial fraction of 80% to speculative positions and the remaining 20% to hedging positions. See, Appendix A.2 for further details.

Table 2: Descriptive statistics for net trading measure, $QS_{i,t}$

Variable	Obs.	Min	Max	Mean	Std. Dev.	Prob(>0)	ADF test
Speculative net trading variable, $QS_{i,t}$							
Corn (1924-1928)	1,190	-0.044	0.054	0	0.007	0.504	-18.02***
Corn (1935-1939)	1,352	-0.152	0.148	0	0.013	0.489	-24.89***
Wheat (1935-1938)	1,199	-0.053	0.062	0	0.011	0.427	-13.66***
Futures returns, $R_{i,t}$							
Corn (1924-1928)	1,190	-0.072	0.106	0	0.015	0.466	-26.81***
Corn (1935-1939)	1,352	-0.079	0.088	0	0.015	0.455	-24.57***
Wheat (1935-1938)	1,199	-0.061	0.059	0	0.014	0.474	-25.88***
Control variables							
Period 1: 1924-1928							
$Basis_{i,t}$	1,190	-0.085	0.053	0.008	0.024	0.857	-2.97***
Neg_t	1,190	0.003	0.037	0.018	0.005	1	-3.59***
DJR_t	1,190	-0.038	0.043	0	0.008	0.587	-26.33***
Period 2: 1935-1939							
$Basis_{i,t}$	1,352	-0.330	0.021	-0.011	0.032	0.539	-4.31***
Neg_t	1,352	0.007	0.040	0.022	0.005	1	-3.08***
DJR_t	1,352	-0.081	0.070	0	0.012	0.530	-25.83***

*Note: Approach nonreportables: 80% speculators, 20% hedgers. ***, ** and * denote statistical significance at the 1%, 5% and 10% level of significance, respectively. Variables Neg_t and DJR_t refer to the negative media content and Dow Jones returns, respectively. The stationarity property of the series is tested by means of the ADF test, which assumes a unit root in the null hypothesis. A rejection of the H_0 implies that the series are stationary. Optimal number of lag length for the ADF test is based on the AIC.*

futures returns, and control factors, Table 2 reports summary statistics of the corresponding time series. All series are stationary. The relationship between net speculative position changes, lagged grain futures returns and control variables is estimated in a simple OLS framework based on the following regression specification:

$$QS_{i,t} = \beta_0 + \beta_1 R_{i,t-1} + \underbrace{\beta_2 Basis_{i,t-1} + \beta_3 Neg_t + \beta_4 DJR_{t-1}}_{Controls} + \beta_5 QS_{i,t-1} + \upsilon_{i,t} \qquad (2)$$

where $QS_{i,t}$ represents the change of net long speculative positions between trading days t and $t-1$, and $R_{i,t-1}$ is the previous day futures return in futures market i. The set of control variables consists of three external factors: First, we include the log basis to account for the

commodity futures risk premium.[30] Second, we control how market sentiment, especially the daily negative media content Neg_t, influences interwar speculative trading decisions.[31] Note that this variable represents the media content from the news market participants read on day t, but it is assumed to be conditional on market information from previous day $t-1$. Lastly, to control for the idiosyncratic priced risk in commodity futures, we include the Dow Jones returns, which capture the effects of the overall economic growth.[32] Finally, the $\upsilon_{i,t}$ term denotes the error term.

Table 3: Daily position changes, past returns and controls.

	Dependent variable: QS_t		
	Corn (1924-1928)	Corn (1935-1939)	Wheat (1935-1938)
R_{t-1}	0.039***	−0.034	−0.130***
	(0.013)	(0.025)	(0.020)
$Basis_{t-1}$	0.017**	0.026**	0.042***
	(0.008)	(0.011)	(0.011)
Neg_t	−0.013	−0.136*	−0.100*
	(0.037)	(0.077)	(0.058)
DJ_{t-1}	−0.018	−0.006	−0.006
	(0.022)	(0.030)	(0.023)
QS_{t-1}	0.188***	−0.021	0.437***
	(0.036)	(0.027)	(0.026)
Observations	1,189	1,351	1,198

*Note: Approach nonreportables: 80% speculators, 20% hedgers. ***, ** and * denote statistical significance at the 1%, 5% and 10% level of significance, respectively. Heteroskedasticity robust standard errors are in parentheses.*

The slope coefficients and their robust standard errors from estimating Equation (2) are shown in Table 3. With respect to the control variables, the parameter estimates of the

[30] Numerous examples can be found in the empirical literature that link the basis to the commodity futures risk premium - as a compensation for speculators who take the price risk from hedgers (see, among others, Fama and French, 1987; Gorton and Rouwenhorst, 2006; Erb and Harvey, 2006). We follow Kang et al. (2020) and compute the log basis variable as follows: $Basis_{i,t} = \frac{ln(F(t,T_2))-ln(F(t,T_1))}{T_2-T_1}$.

[31] To this end, we use the dataset provided by Garcia (2013) and calculate the percentage of daily negative words as: $Neg_{i,t} = No.\ of\ negative\ words_t / No.\ of\ total\ words_t$.

[32] Data on this variable are retrieved from the Global Financial Database. Returns are computed as logarithmic price differences of two consecutive days, i.e. $DJR_t = ln(DJ_t) - ln(DJ_{t-1})$.

log basis are positive and highly significant, indicating that, if speculators are rewarded with positive profits in form of a risk premium, they are more willing to buy grain futures contracts.[33] Moreover, stock market returns do not seem to have an impact on speculative position changes in any of the scrutinized markets and periods. It is worth noting that the negative media content significantly impacts speculators decisions to reduce their long positions in grain futures markets only during the second period of investigation, namely after the 1929 Crash. Neg_t is not significant for the period 1924-1928 and might indicate that, during the bull market of the 1920s, futures traders apparently ignored the daily negative financial market news. This would suggest that irrational and optimistic elements of market valuations were present during that time. With respect to the estimated coefficients on $R_{i,t-1}$, the obtained values, highly significant at 1% level, suggest that speculators are positive feedback traders in corn futures markets over the first sub-sample (1924-1928), while in wheat futures markets (1935-1939), they are contrarians. For the corn market during the 1935-1939 period, speculators appear neutral.[34]

4.2 Conditional Volatility of Returns

The findings reported above would appear to indicate that interwar speculators – trading as positive feedback traders (contrarians) – destabilize (stabilize) the corn (wheat) futures market, by increasing (decreasing) the volatility of prices. To test this hypothesis more formally, and in common with the relevant literature, we estimate a univariate GARCH(1,1) model to examine to which extent does this speculative behaviour affect the volatility of interwar grain futures returns. The conditional mean equation is defined as:

$$R_{i,t} = \beta_0 + \beta_1 R_{i,t-1} + \sum_{n=2}^{4} \beta_n Controls_{n,t-1} + \beta_5 QS_{i,t-1} + \varepsilon_{i,t} \tag{3}$$

[33] This could be interpreted as a somewhat weak evidence in favour of Keynes' theory of normal backwardation.

[34] Results are consistent when estimating Equation (2) with other approaches regarding the allocation of nonreporting traders. See Appendix C for further details.

Here, the wheat and corn futures returns $R_{i,t}$ are explained by an AR(1) term, i.e. past period return, the set of control variables from Equation (2), and the lagged speculative factor, $QS_{i,t-1}$. Note that, we include lagged regressors in the specification to avoid the endogeneity problem due to simultaneity. Lastly, the serially uncorrelated errors (innovations) $\varepsilon_{i,t}$ are assumed to be normally distributed with mean zero and conditional variance $\sigma^2_{i,t}$, i.e. $\varepsilon_{i,t} \sim N(0, \sigma^2_{i,t})$. The volatility of corn and wheat returns is measured by the conditional variance of $\varepsilon_{i,t}$, which reads the following formula:

$$\sigma^2_{i,t} = \gamma_0 + \gamma_1 \varepsilon^2_{i,t-1} + \gamma_2 \sigma^2_{i,t-1} + \gamma_3 QS_{i,t-1} \tag{4}$$

where $\varepsilon^2_{i,t-1}$ is the previous value of the squared regression disturbances, and $\sigma^2_{i,t-1}$ represents the one period lagged forecast error variance. Parameter γ_1 describes the ARCH effect, that is, how strongly the conditional variance responds to new information arriving in the futures market, whereas γ_2 denotes the GARCH effect, measuring the volatility shock persistence. Moreover, it is assumed that γ_0, γ_1, and γ_2 are positive, and that the sum of GARCH and ARCH effects is smaller than one ($\gamma_1 + \gamma_2 < 1$), thereby ensuring covariance stationarity and non-negative conditional variance. Next, the speculative variable – net trading $QS_{i,t-1}$ - is additionally considered as exogenous regressor in the variance equation of the GARCH model. Finally, the interpretation of the coefficient of interest, γ_3, is straightforward. A stabilizing impact of speculative activity on grain price volatility is indicated by a negative significant estimate of γ_3. Instead, if a positive parameter estimate is obtained for γ_3, speculation has a destabilizing influence on grains prices, by increasing returns and their volatility, such that changes in prices become more severe.

Table 4 presents the estimation results. Neither the log basis nor negative media content variables significantly impact mean returns. There is also no evidence of returns persistence. Dow Jones returns are found to have significantly negative effects on the corn futures returns, but only for the period between 1935 and 1939. With respect to the speculative variable, the estimated parameters are generally negative but not significant at conventional significance

levels, indicating that the net trading activity of speculators does not significantly affect interwar grain futures returns.

Table 4: GARCH(1,1) results.

	Sample period		
	Corn (1924-1928)	Corn (1935-1939)	Wheat (1935-1938)
Mean equation: $R_{i,t} = \beta_0 + \beta_1 R_{i,t-1} + \sum_{n=2}^{4} \beta_n Controls_{n,t-1} + \beta_5 QS_{i,t-1} + \varepsilon_{i,t}$			
$AR(1)$	-0.038	0.048	-0.022
	(0.029)	(0.035)	(0.026)
$Basis_{t-1}$	0.003	0.017	0.003
	(0.016)	(0.019)	(0.013)
Neg_t	-0.043	-0.065	-0.092
	(0.074)	(0.071)	(0.070)
DJ_{t-1}	-0.032	-0.045**	-0.044
	(0.056)	(0.022)	(0.031)
QS_{t-1}	-0.003	0.031	-0.058
	(0.055)	(0.032)	(0.042)
Conditional variance equation: $\sigma^2_{i,t} = \gamma_0 + \gamma_1 \varepsilon^2_{i,t-1} + \gamma_2 \sigma^2_{i,t-1} + \gamma_3 QS_{i,t-1}$			
ARCH(1)	0.101***	0.122***	0.082***
	(0.012)	(0.026)	(0.015)
GARCH(1)	0.833***	0.856***	0.897***
	(0.027)	(0.113)	(0.045)
QS_{t-1}	0	0	0
	(0)	(0)	(0)
$\gamma_1 + \gamma_2$	0.934	0.978	0.979
LM Test	0.019	0.145	0.328

*Note: Approach nonreportables: 80% speculators, 20% hedgers. ***, ** and * denote statistical significance at the 1%, 5% and 10% level of significance, respectively. Heteroskedasticity robust standard errors are in parentheses.*

The variance equation shows that the ARCH (γ_1) and GARCH (γ_2) terms are always positive and highly statistically significant. While estimates for the former are close to zero, the GARCH estimates are rather high and close to unity, indicating strong volatility clusters in corn futures daily returns. Looking at the last row of Table 4, the very small ARCH-LM test statistics provide an indication that there is no conditional heteroskedasticity in the error terms, hence the AR(1)-GARCH(1,1) model specification is indeed a good fit for the investigated data. Moreover, the covariance stationarity and non-negative variance

constraints are met in all three specifications (γ_0, γ_1, $\gamma_2 \geqslant 0$, and $\gamma_1+\gamma_2 < 1$). Importantly, the estimates obtained for the speculative factor in the variance equation are all equal to zero, suggesting that speculative position changes do not contribute to greater uncertainty with respect to short-term futures return dynamics in the form of volatility clusters. The results imply therefore that speculators are not are not the main drivers of daily volatility of the interwar grain futures markets, and hence, the "grain gamblers" did not destabilize these markets.[35]

5 Conclusion

The interwar period was undeniably an era of great economic and political change in the United States. With respect to futures markets, the regulatory and institutional changes that occurred during the years between the two World Wars offer important lessons for the modern governance, regulation and institutions for futures trading. In particular, the interwar period serves as a unique example of a shifting regulatory regime from one of self-regulation to federal regulation of the futures exchanges. Indeed, a comprehensive understanding of the early development and regimes of futures trading is of great relevance, as it continues to shape futures trading to the present.

This paper fills a gap in the literature by introducing a new hand-collected dataset comprised of daily trading observations on grain futures contracts traded at the Chicago Board of Trade covering a 19 interwar years period. The daily sampling frequency represents an important contribution to the study of commodity futures markets. We focus on the futures trading of two of the most traded agricultural commodities during the interwar period, namely wheat and corn, and provide key insights about how these early grain futures markets functioned at that time. Based on the collected data on commitments of traders, we can also describe the traditional composition of futures traders and its evolution during the

[35]Similar results have been obtained for other treatments of nonreportable traders considered. See Appendix C for further estimation results.

interwar era. We construct futures continuation series for prices and returns, and a net trading speculative variable, which facilitate several empirical investigations. More specifically, we first analyse what drives speculators' trading decisions to buy or sell futures contracts. The main finding is that speculators are momentum traders and contrarians in corn and wheat futures markets, respectively, and they significantly reduce their net long positions in response to the negative media content, especially after the onset of Great Depression. We then go on to investigate the impact of the interwar speculative behaviour on the conditional volatility of futures prices and report that the net long position changes of speculators have a zero effect on price movements. Our results indicate that interwar speculation was neither a stabilizing nor destabilizing force for grain futures markets and provide therefore a robust empirical answer to one of the open questions in economic futures trading history.

Even though the newly collected data are limited to only a specific historical episode of futures trading, a thorough analysis of this early period with modern empirical and statistical techniques provides some interesting implications for today's institutions and governance regimes. Further work could, for example, focus on the efficiency of the imposed regulation and its consequent impact on the futures prices and trading decisions of market participants. Such analysis could point to interesting parallels with the more recent financial history. The dataset could also serve to explore empirically market microstructure related questions including price discovery and the behaviour of quotes and spreads. There may even be scope to utilize data to explore the implications of futures prices on broader prices.

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A Appendix Dataset

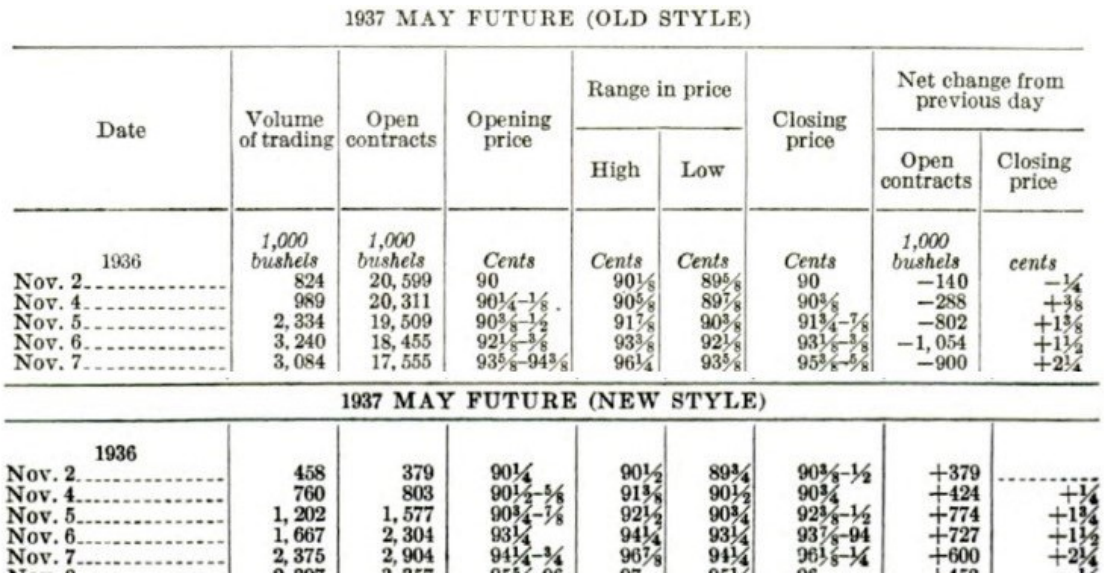
The data on grain futures trading comes from several sources. We hand-collected data from different reports published by the Commodity Exchange Administration (formerly Grain Futures Administration), all available online as scanned documents. The online collections can be found at: https://www.hathitrust.org/ and https://archive.org/. Below you can find an overview of the reports used:

1. Corn futures trading (1921-1939):
    - Statistical Bulletin No. 34 (1921-1929) (U.S. GFAD, 1931)
    - Statistical Bulletin No. 43 (1930-1932) (U.S. GFAD, 1933a)
    - Statistical Bulletin No. 55 (1933-1935) (U.S. CEAD, 1937a)
    - Statistical Bulletin No. 74 (1936-1939) (U.S. CEAD, 1941)
    - Technical Bulletin No. 199 (commitment of traders, 1924-1928) (Hoffman, 1930)
2. Wheat futures trading (1921-1939):
    - Statistical Bulletin No. 31 (1921-1929) (U.S. GFAD, 1930)
    - Statistical Bulletin No. 41 (1930-1932) (U.S. GFAD, 1933b)
    - Statistical Bulletin No. 54 (1933-1935) (U.S. CEAD, 1937b)
    - Statistical Bulletin No. 72 (1936-1938) (U.S. CEAD, 1940)
    - Wheat Futures Statistics (commitment of traders, 1939) (U.S. CEAD, 1942)

A.1 Futures Prices: Data Collection and Transformation

A screenshot of the scanned documents of the reports furnished by the regulatory agencies containing data on prices, volume of trading and open commitments can be seen in Figure A.1.1.

Figure A.1.1: Data collection of corn and wheat futures prices, open commitments and volume of trading.



1937 MAY FUTURE (OLD STYLE)

Date	Volume of trading	Open contracts	Opening price	Range in price: High	Range in price: Low	Closing price	Net change from previous day: Open contracts	Net change from previous day: Closing price
1936	*1,000 bushels*	*1,000 bushels*	*Cents*	*Cents*	*Cents*	*Cents*	*1,000 bushels*	*cents*
Nov. 2	824	20,599	90	90 1/8	89 5/8	90	−140	−1/4
Nov. 4	989	20,311	90 1/4–1/8	90 5/8	89 7/8	90 3/8	−288	+3/8
Nov. 5	2,334	19,509	90 3/8–1/2	91 7/8	90 3/8	91 3/4–7/8	−802	+1 3/8
Nov. 6	3,240	18,455	92 1/2–3/8	93 3/8	92 1/8	93 1/8–3/8	−1,054	+1 1/2
Nov. 7	3,084	17,555	93 5/8–94 3/8	96 1/4	93 5/8	95 5/8–5/8	−900	+2 1/4

1937 MAY FUTURE (NEW STYLE)

1936								
Nov. 2	458	379	90 1/4	90 1/2	89 3/4	90 3/8–1/2	+379	
Nov. 4	760	803	90 1/2–5/8	91 3/8	90 1/2	90 3/4	+424	+1/4
Nov. 5	1,202	1,577	90 3/4–7/8	92 1/2	90 3/4	92 3/8–1/2	+774	+1 3/4
Nov. 6	1,667	2,304	93 1/4	94 1/4	93 1/4	93 7/8–94	+727	+1 1/2
Nov. 7	2,375	2,904	94 1/4–3/4	96 7/8	94 1/4	96 1/8–1/4	+600	+2 1/4

The collected price observations represent the official quotations of the CBoT, and resemble daily information about the opening, highest, lowest, and closing prices traded for the wheat and corn futures contracts with delivery month in March, May, July, September or December. The opening price represents the first price paid on a trading day – usually at 9:30 a.m., the high and low prices are the maximum and minimum values at which futures contracts were purchased/sold during a trading session, whereas the closing quotation denotes the traded price for the last transaction of the day – prevailing at 1:15 p.m.. The closing quotation is given in some instances as a closing range, representing prices paid a few minutes before the end of a trading session, i.e. at 1:15 p.m.. This occurs when a trader, usually a floor broker, has a large order to fill shortly before the trading session ends, which reads "to sell/buy at the close". For analytical purposes, to obtain a single settlement price for days on which the

price quotations were given within a range, we compute the following average price:

$$P_t = \frac{P_t^{LB} + P_t^{UB}}{2} \tag{A.1.1}$$

where P_t^{LB} and P_t^{UB} denote the lower and upper bound of the closing quotation range, respectively.

Note that, over the entirety of the interwar period, there was trading in both "old style" and "new style" for corn and wheat futures with delivery in March, May, July, September and December for some limited number of active trading months. The need for these designations was occasioned by the change in grain grades deliverable on futures contracts, as suggested by the GFAD and CEAD in the published reports. To account for the period in which both "new style" and "old style" trading of futures contracts with the same maturity dates occurred, we calculate the settlement price (as a weighted average) by means of the following formula:

$$P_t = \frac{TV_{O,t}}{TV_{T,t}} \cdot P_{O,t} + \frac{TV_{N,t}}{TV_{T,t}} \cdot P_{N,t} \tag{A.1.2}$$

where $TV_{O,t}$, $TV_{N,t}$, and $TV_{T,t}$ represent the number of "old style", "new style", and total trading volume on any trading day t, respectively, the latter being the sum of the first two.

Regarding the construction of the continuous series (CS): we use data on the individual futures contracts to create two types of futures continuation series. The first type is based on the "first day" rolling mechanism, i.e. we take trading data of a contract that expires in a given month M and switch to the next nearest to expiry contract on the first day of the delivery month M. Te second type is based on a "trading volume peak" criterion, i.e. we take trading data of the most liquid contract L of any maturity month and switch to contract S on the first day of the month when the trading volume of S exceeds the traded volume of L.

Besides the choice of the rollover date, which will be discussed in what follows, it is

important when constructing continuous series that they are defined using a single daily price, recorded at a constant point within the observed period. Since the closing prices reflect the "latest" changes in the market situations, we use these as the daily measure to construct the CS for each commodity under scrutiny.

The choice of the rollover date, i.e. the time point when we switch from the nearest contract series to the next one, is crucial for the creation of continuous futures price series as it could lead to significant different econometric results. Usually, when constructing such series, the empirical literature relies on a "first day" rolling criterion based on the contract's expiration date, which draws on the prices of the front contract (i.e. the contract nearest expiry), and switches over to the next nearby contract (i.e. the contract with the second shortest time to expiry) on the first day of the delivery month. The major advantage of this procedure lies in its simplicity. However, a disadvantage of the "first day" rolling approach is that it employs only the nearest and second nearest to maturity contracts, because they tend to be more liquid than the more distant contracts that are usually more thinly traded. To overcome this drawback, and given that the daily collected data also includes trading volume and open interest for each of the principal futures, this paper also applies the "trading volume peak" criterion for constructing futures continuation series for wheat and corn futures prices, respectively.

In contrast to the "first day" rolling mechanism previously described, this method selects roll-over dates for futures contracts based on the market movements of the monthly trading volumes aggregates. More specifically, the daily trading volumes for each of the principal futures are aggregated monthly and compared, which leads to the choice of the most dominant futures during each month; finally, the series is built by drawing on prices from this most traded contract. Hence, this criterion ensures that the continuous series includes only the prices of the most liquid wheat or corn futures contracts, respectively. The rationale behind the "trading volume peak" method is based on the fact that if futures traders holding short/long positions intends to do so indefinitely, they would rely on the trading volume

peak as a liquidity indicator to switch the contract.

Figures A.1.2 and A.1.3 depict the monthly trade volumes for corn and wheat, respectively, and for each of the five different futures contracts of finite life span traded during the interwar period. It is clear that rolling over on the first day of the maturity month to the next-to-expire contract does not necessarily imply constant switching to the most liquid contract (see, for example, volume of trading in corn during October and November 1924, when the May contract was more dominant than the December contract, even though the latter was the contract nearest expiry; for wheat, see, for example volume of trading during August 1936 and 1937, months during which the December futures was more traded than the September futures, although the latter was the contract nearest to maturity). In any case, for robustness reasons and completeness, we construct the continuous series for each grain commodity under scrutiny using both rollover criteria described above. It is also interesting to contrast the levels of trading volumes from Figures A.1.2 and A.1.3. In the case of corn, the peak is around 600,000,000 bushels (=120,000 futures contracts). For wheat, there were three times as many futures contracts monthly traded at the CBoT at the peak (i.e., 1,750,000,000 bushels, corresponding to 350,000 futures contracts). Moreover, the trading volumes of both commodities during the 1930s reveal significantly depressed levels compared to those reached during the first half of the interwar period. These developments clearly suggest that the agricultural futures market underwent dramatic changes over the course of the period considered in our study.[36]

Table A.1.1 shows the descriptive statistics of the created continuous series for wheat and corn futures prices and returns over the interwar period.

[36]Recall the high number of regulatory and institutional changes, as well as the dramatic interwar events such as the stock market crash and the onset of Great Depression, which have undoubtedly affected the practice of grain futures trading.

Figure A.1.2: Monthly trading volume aggregates - *Corn*.

Figure A.1.3: Monthly trading volume aggregates - *Wheat*.

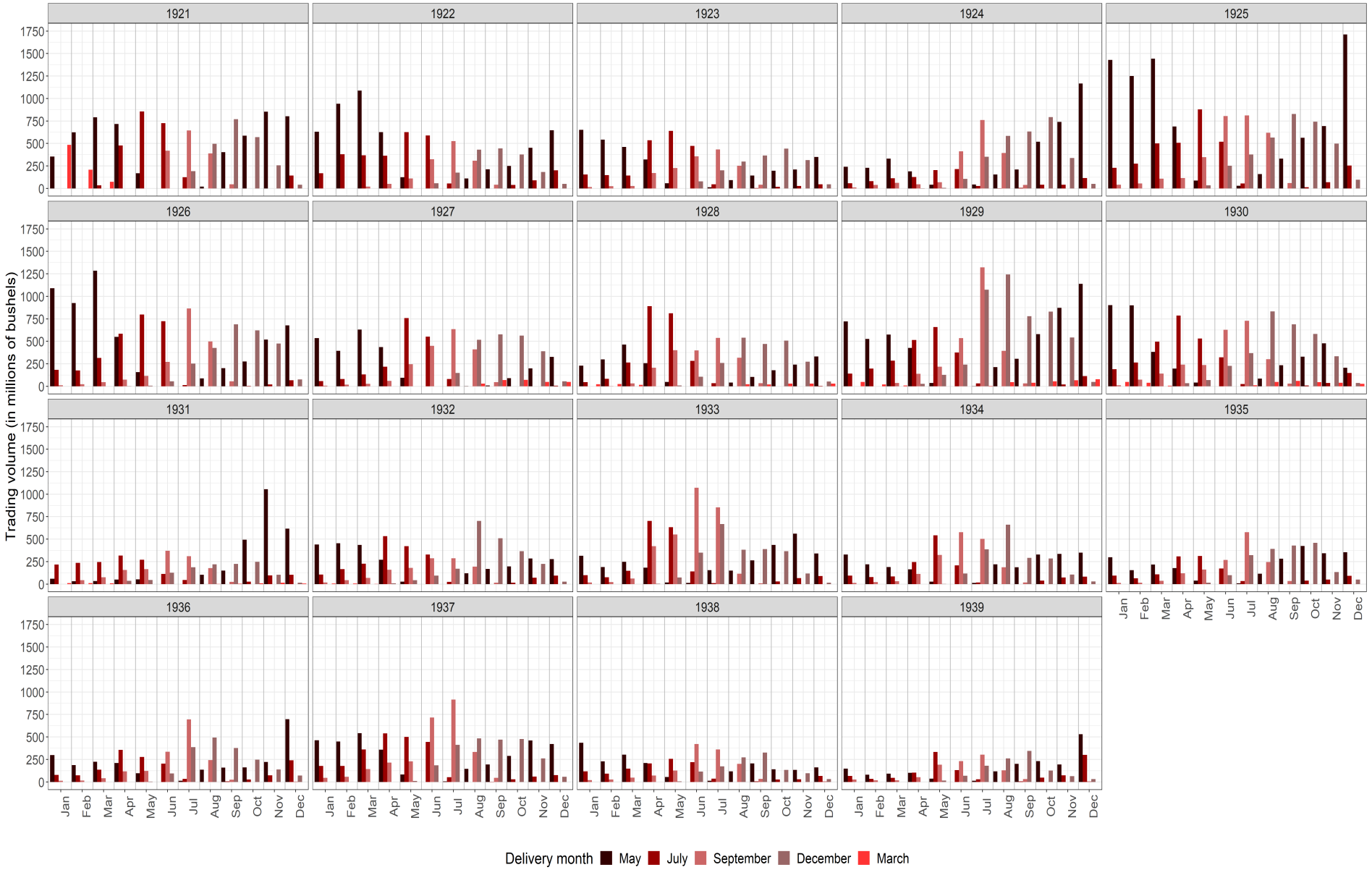


Table A.1.1: Descriptive statistics for wheat and corn futures prices.

Variable	Obs.	Min	Max	Mean	Std. dev.
"Trading volume peak" rollover					
Wheat P_t	5,701	43.94	204.88	107.26	31.58
Wheat R_t	5,700	-0.150	0.099	0	0.016
Corn P_t	5,701	23.56	137.25	72.33	22.77
Corn R_t	5,700	-0.205	0.116	0	0.017
"First day" rollover					
Wheat P_t	5,701	41.86	204.88	107.13	31.63
Wheat R_t	5,700	-0.150	0.099	0	0.016
Corn P_t	5,701	21.5	137.25	72.7	23.33
Corn R_t	5,700	-0.205	0.188	0	0.018

Note: Own calculations based on hand-collected data from the GFAD and CEAD reports. The data frequency is daily and covers the interwar years 1921-1939.

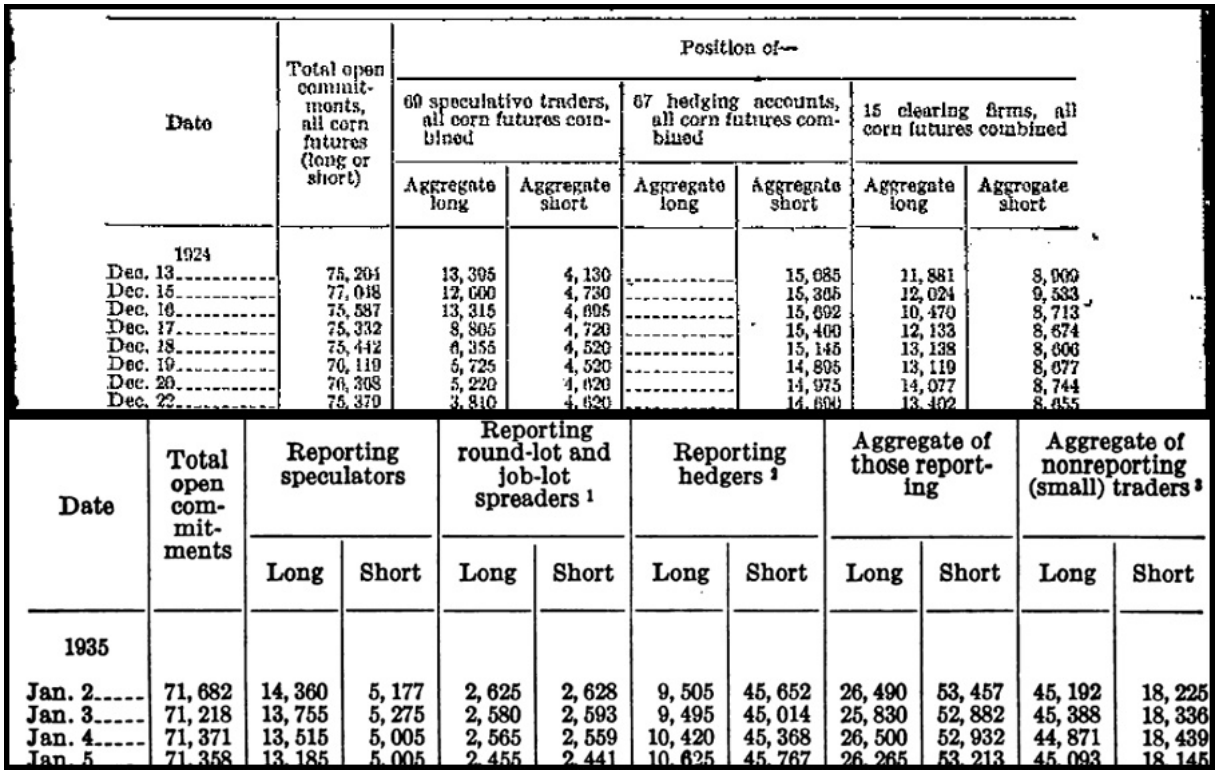
A.2 Futures Traders: Data Collection and Transformation

A screenshot of the scanned documents of the reports furnished by the regulatory agencies containing data on commitments of traders can be seen in Figure A.2.1.

During 1924-1928, around 5% of the observations are missing. The number of missing values is more noticeable for the hedgers class among all market participants. In order to enlarge the dataset, these missing values are imputed using a simple linear interpolation algorithm. Note that in the data cleaning and transformation process, the nonreporting positions are computed only after the missing values have been imputed.

As it can be seen in Figure A.2.1, the reports furnished by the GFAD and CEAD detail the aggregate short and long positions of futures market participants by trader type, for each trading day as follows: reporting speculators and hedgers, and nonreporting traders. For each sub-period, the reports provide daily information about a further class of traders, namely clearing firms (1924-1928), and spreaders between round lots and job lots (1935-1939). The latter class contains relatively few traders that buy futures in 5,000 bushel units (round lot) and sell them in lots of less than 5,000 bushels, or vice-versa. However,

Figure A.2.1: Data collection of traders' classes.



Date	Total open commitments, all corn futures (long or short)	Position of— 60 speculative traders, all corn futures combined		67 hedging accounts, all corn futures combined		15 clearing firms, all corn futures combined	
		Aggregate long	Aggregate short	Aggregate long	Aggregate short	Aggregate long	Aggregate short
1924							
Dec. 13	75,201	13,395	4,130		15,685	11,881	8,909
Dec. 15	77,018	12,600	4,730		15,365	12,024	9,533
Dec. 16	75,587	13,315	4,695		15,692	10,470	8,713
Dec. 17	75,332	8,805	4,720		15,400	12,133	8,574
Dec. 18	75,442	6,355	4,520		15,145	13,138	8,606
Dec. 19	70,119	5,725	4,520		14,895	13,119	8,677
Dec. 20	70,308	5,220	4,020		14,975	14,077	8,744
Dec. 22	75,379	3,810	4,020		14,690	13,492	8,655

Date	Total open commitments	Reporting speculators		Reporting round-lot and job-lot spreaders [1]		Reporting hedgers [2]		Aggregate of those reporting		Aggregate of nonreporting (small) traders [3]	
		Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
1935											
Jan. 2	71,682	14,360	5,177	2,625	2,628	9,505	45,652	26,490	53,457	45,192	18,225
Jan. 3	71,218	13,755	5,275	2,580	2,593	9,495	45,014	25,830	52,882	45,388	18,336
Jan. 4	71,371	13,515	5,005	2,565	2,559	10,420	45,368	26,500	52,932	44,871	18,439
Jan. 5	71,358	13,185	5,005	2,455	2,441	10,625	45,767	26,265	53,213	45,093	18,145

since these trader types represent "small speculators", as outlined by the regulatory agencies in the statistical bulletins, we aggregate the long and short positions of each of the two classes to the reporting long and short speculative positions, respectively. The nonreportable traders are not insignificant and deciding on a splitting rule that allocates a certain fraction to speculators and the remaining to hedgers requires caution. Several ways for how to treat the nonreporting positions are discussed and proposed by the academic literature on speculative activity. For robustness reasons, we consider several approaches and report the results accordingly. Based on prior knowledge, more specifically, according to the information provided in the GFAD and CEAD reports from where the data has been hand-collected, we consider a 80/20 split among speculators and hedgers as the main approach. That is, we assume nonreportables to be strongly dominated by speculators, therefore allocating a substantial fraction of 80% from their positions to speculators and the remaining 20% to hedgers.

Taking into consideration the aforementioned assumptions and transformations of the collected data on the futures traders in corn and wheat markets, the long and short positions of speculators (SL_t and SS_t) and hedgers (HL_t and HS_t) at day t can be summarized as follows:

$$SL_t = RSL_t + RCFL_t(RSPL_t) + \alpha \cdot NRL_t \tag{A.2.1}$$

$$SS_t = RSS_t + RCFS_t(RSPS_t) + \alpha \cdot NRS_t \tag{A.2.2}$$

$$HL_t = RHL_t + (1 - \alpha) \cdot NRL_t \tag{A.2.3}$$

$$HS_t = RHS_t + (1 - \alpha) \cdot NRS_t \tag{A.2.4}$$

where RSL_t and RSS_t, RHL_t and RHS_t, represent the long and short open interest of reporting speculators and hedgers, respectively. Analogously, the commitments of the reporting clearing firms (for 1924-1928) and spreaders (for 1935-1939) are denoted by $RCFL_t$, $RCFS_t$, and $RSPL_t$, $RSPS_t$, respectively. Finally, α equals, in turn, 0.8, 0.9, 0.5 and 1, and NRL_t and NRS_t resemble the number of nonreportable traders who hold long and short positions at day t, respectively.

B Appendix Paper

Table B.1: Summary Chapter 2.

Grain Market Disruption	**Regulatory Reaction**	**Institutional Reaction**
1921 Depressed grain prices: The Depression of 1920-1921, after the conclusion of WWI	**1921** Futures Trading Act **1922** Grain Futures Act **1923** Data gathering mandate	
1924-1926 Highly volatile grain prices: The "Cutten" Corner	**1924** Federal regulatory agency begins investigating futures trading in grains	**1926** Modern clearing House **1926** Business Conduct Committee
1929 Stock market Crash: The onset of Great Depression	**1930** Federal Farm Board intervention in grain futures markets	
1930-1933 Depressed grain prices: The depths of the Great Depression	**1934** Presidential call for heavier regulation **1936** Commodity Exchange Act	
1936-1937 Highly volatile grain prices	**1938** First Federal Speculative Positions imposed	**1936** Limitations on price fluctuations

C Appendix Further Results

Table C.1: Daily position changes, past returns and controls, $\alpha = 0.9$.

	Dependent variable: QS_t		
	Corn (1924-1928)	Corn (1935-1939)	Wheat (1935-1938)
R_{t-1}	0.026^{**}	-0.038	-0.129^{***}
	(0.012)	(0.026)	(0.021)
$Basis_{t-1}$	0.015^{*}	0.027^{**}	0.044^{***}
	(0.008)	(0.012)	(0.012)
Neg_t	-0.014	-0.137^{*}	-0.111^{*}
	(0.036)	(0.082)	(0.062)
DJ_{t-1}	-0.006	-0.001	-0.009
	(0.022)	(0.032)	(0.024)
QS_{t-1}	0.222^{***}	-0.016	0.453^{***}
	(0.038)	(0.027)	(0.026)
Observations	1,189	1,351	1,198

Note: Approach nonreportables: 90% speculators, 10% hedgers. ***, ** and * denote statistical significance at the 1%, 5% and 10% level of significance, respectively. Heteroskedasticity robust standard errors are in parentheses.

Table C.2: GARCH(1,1) results, $\alpha = 0.9$.

	Sample period		
	Corn (1924-1928)	Corn (1935-1939)	Wheat (1935-1938)
Mean equation: $R_{i,t} = \beta_0 + \beta_1 R_{i,t-1} + \sum_{n=2}^{4} \beta_n Controls_{n,t-1} + \beta_5 QS_{i,t-1} + \varepsilon_{i,t}$			
$AR(1)$	-0.038	0.049	-0.023
	(0.029)	(0.035)	(0.026)
$Basis_{t-1}$	0.002	0.017	0.003
	(0.016)	(0.019)	(0.013)
Neg_t	-0.043	-0.065	-0.093
	(0.074)	(0.072)	(0.068)
DJ_{t-1}	-0.031	-0.046**	-0.044
	(0.056)	(0.022)	(0.031)
QS_{t-1}	0.013	0.031	-0.062
	(0.055)	(0.031)	(0.040)
Conditional variance equation: $\sigma^2_{i,t} = \gamma_0 + \gamma_1 \varepsilon^2_{i,t-1} + \gamma_2 \sigma^2_{i,t-1} + \gamma_3 QS_{i,t-1}$			
ARCH(1)	0.101***	0.122***	0.082***
	(0.012)	(0.026)	(0.015)
GARCH(1)	0.833***	0.856***	0.897**
	(0.026)	(0.124)	(0.044)
QS_{t-1}	0	0	0
	(0)	(0)	(0)
$\gamma_1 + \gamma_2$	0.934	0.978	0.979
LM Test	0.022	0.153	0.294

*Note: Approach nonreportables: 90% speculators, 10% hedgers. ***, ** and * denote statistical significance at the 1%, 5% and 10% level of significance, respectively. Heteroskedasticity robust standard errors are in parentheses.*

Table C.3: Daily position changes, past returns and controls, $\alpha = 0.5$.

	Dependent variable: QS_t		
	Corn (1924-1928)	Corn (1935-1939)	Wheat (1935-1938)
R_{t-1}	0.079^{***}	-0.022	-0.117^{***}
	(0.019)	(0.021)	(0.018)
$Basis_{t-1}$	0.027^{**}	0.024^{**}	0.041^{***}
	(0.011)	(0.010)	(0.010)
Neg_t	-0.024	-0.130^{**}	-0.075
	(0.050)	(0.066)	(0.053)
DJ_{t-1}	-0.053^{*}	-0.021	0.002
	(0.031)	(0.026)	(0.021)
QS_{t-1}	0.041	-0.032	0.318^{***}
	(0.041)	(0.027)	(0.029)
Observations	1,189	1,351	1,198

*Note: Approach nonreportables: 50% speculators, 50% hedgers. ***, ** and * denote statistical significance at the 1%, 5% and 10% level of significance, respectively. Heteroskedasticity robust standard errors are in parentheses.*

Table C.4: GARCH(1,1) results, $\alpha = 0.5$.

	Sample period		
	Corn (1924-1928)	Corn (1935-1939)	Wheat (1935-1938)
Mean equation: $R_{i,t} = \beta_0 + \beta_1 R_{i,t-1} + \sum_{n=2}^{4} \beta_n Controls_{n,t-1} + \beta_5 QS_{i,t-1} + \varepsilon_{i,t}$			
$AR(1)$	-0.037	0.048	-0.023
	(0.029)	(0.034)	(0.028)
$Basis_{t-1}$	0.004	0.017	0
	(0.016)	(0.0179)	(0.019)
Neg_t	-0.044	-0.066	-0.088
	(0.074)	(0.068)	(0.066)
DJ_{t-1}	-0.033	-0.045**	-0.045
	(0.057)	(0.022)	(0.031)
QS_{t-1}	-0.033	0.024	-0.020
	(0.042)	(0.034)	(0.048)
Conditional variance equation: $\sigma^2_{i,t} = \gamma_0 + \gamma_1 \varepsilon^2_{i,t-1} + \gamma_2 \sigma^2_{i,t-1} + \gamma_3 QS_{i,t-1}$			
ARCH(1)	0.101***	0.121***	0.082***
	(0.013)	(0.026)	(0.021)
GARCH(1)	0.832***	0.857***	0.897***
	(0.028)	(0.089)	(0.084)
QS_{t-1}	0	0	0
	(0)	(0)	(0)
$\gamma_1 + \gamma_2$	0.933	0.978	0.979
LM Test	0.016	0.116	0.442

*Note: Approach nonreportables: 50% speculators, 50% hedgers. ***, ** and * denote statistical significance at the 1%, 5% and 10% level of significance, respectively. Heteroskedasticity robust standard errors are in parentheses.*

Table C.5: Daily position changes, past returns and controls, $\alpha = 1$.

	Dependent variable: QS_t		
	Corn (1924-1928)	Corn (1935-1939)	Wheat (1935-1938)
R_{t-1}	0.014	-0.042	-0.126^{***}
	(0.013)	(0.028)	(0.022)
$Basis_{t-1}$	0.013	0.028^{**}	0.046^{***}
	(0.009)	(0.013)	(0.013)
Neg_t	-0.016	-0.138	-0.123^{*}
	(0.038)	(0.087)	(0.066)
DJ_{t-1}	0.005	0.005	-0.011
	(0.023)	(0.035)	(0.026)
QS_{t-1}	0.227^{***}	-0.012	0.461^{***}
	(0.039)	(0.027)	(0.026)
Observations	1,189	1,351	1,198

*Note: Approach nonreportables: 100% speculators, 0% hedgers. ***, ** and * denote statistical significance at the 1%, 5% and 10% level of significance, respectively. Heteroskedasticity robust standard errors are in parentheses.*

Table C.6: GARCH(1,1) results, $\alpha = 1$.

	Sample period		
	Corn (1924-1928)	Corn (1935-1939)	Wheat (1935-1938)
Mean equation: $R_{i,t} = \beta_0 + \beta_1 R_{i,t-1} + \sum_{n=2}^{4} \beta_n Controls_{n,t-1} + \beta_5 QS_{i,t-1} + \varepsilon_{i,t}$			
$AR(1)$	-0.039	0.049	-0.026
	(0.029)	(0.034)	(0.025)
$Basis_{t-1}$	0.002	0.017	0.003
	(0.016)	(0.016)	(0.013)
Neg_t	-0.042	-0.064	-0.094
	(0.074)	(0.064)	(0.068)
DJ_{t-1}	-0.031	-0.046**	-0.043
	(0.056)	(0.022)	(0.031)
QS_{t-1}	0.026	0.030	-0.064*
	(0.053)	(0.027)	(0.037)
Conditional variance equation: $\sigma^2_{i,t} = \gamma_0 + \gamma_1 \varepsilon^2_{i,t-1} + \gamma_2 \sigma^2_{i,t-1} + \gamma_3 QS_{i,t-1}$			
ARCH(1)	0.101***	0.122***	0.082***
	(0.026)	(0.034)	(0.016)
GARCH(1)	0.833***	0.856***	0.897***
	(0.017)	(0.024)	(0.045)
QS_{t-1}	0	0	0
	(0)	(0)	(0)
$\gamma_1 + \gamma_2$	0.934	0.978	0.979
LM Test	0.024	0.159	0.269

*Note: Approach nonreportables: 100% speculators, 0% hedgers. ***, ** and * denote statistical significance at the 1%, 5% and 10% level of significance, respectively. Heteroskedasticity robust standard errors are in parentheses.*