Margins:
A Review of
the Literature

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The economic literature on margin requirements is exceedingly sparse. Most work on the subject seems to have been generated by the controversy over whether margins on futures contracts should be set by the exchanges or by the government, and whether margins should be used to curb “excessive speculation.” Briefly, some congressmen and regulators have argued that excessive speculation can lead to abberant price behavior and that an effective way to curb such excesses is via government control of margins. According to this view, higher barriers to entry are in the public interest.

The opposing view is that margins have a narrow, but important, purpose—namely to insure the integrity of futures contracts and to protect the clearinghouse and the member firms from customer losses. Exchange officials point out that the safeguards embodied in the current margining system have stood the test of time—in recent years on the major exchanges no customers have ever lost money due to an exchange’s or clearinghouse’s failure to honor futures contracts. Furthermore, exchange officials contend that margin requirements are difficult to set. They have to be high enough to protect the clearinghouse yet low enough so that they do not inhibit market liquidity. As a result, it is argued that the exchanges should set margin requirements since exchange officials have their fingers on the pulse of the market and are, therefore, in the best position to balance these competing requirements on a day-to-day basis.

Perhaps the most interesting questions raised in this debate concern the role of speculation and the efficacy of margins for curbing speculation. I would like to talk about four attempts to answer these questions—three empirical studies and one theoretical paper. After discussing these papers, I will say a few words about my own work on the subject.

The first empirical study, “Margins, Speculation and Prices in Grains Futures Markets,” was prepared by Robert R. Nathan Associates, Inc. under contract for the Economic Research Service of the U.S. Department of Agriculture [5]. The purpose of the study was to examine:

The nature of speculations in grains and their bearings on fluctuations in prices and whether minimum margin requirements by the CEA could be a feasible tool for controlling or helping to control excessive fluctuations ([5], p. 1).

The Nathan study used Holbrook Working’s Speculative Index to measure “excessive speculation.” Briefly, this index is a measure of the degree of balance between speculation and hedging in a market. High values of the index indicate that speculation exceeds gross hedging requirements. It should be noted, however, that Working did not design the index to measure “excess speculation,” but instead to measure the “minimum” level of speculation needed in a market.

In the Nathan study, the speculative index was calculated for corn, wheat, and soybeans traded on the Chicago Board of Trade (CBT) during the period 1956-1966. There are problems with the wheat results since the important interrelationship between the Chicago market, the preeminent speculative market, and the Kansas City and Minneapolis markets, important hedging
markets, was ignored. For this reason I will not discuss the wheat results today. All occasions in which the value of the index exceeded its mean plus one standard deviation were defined as instances of excess speculation. Similarly, index values less than the mean minus one standard deviation were considered examples of inadequate speculation. The speculative index values were also compared with weekly price range.

Several interesting findings resulted from this analysis. First, high values of the speculative index were most often associated with stable price behavior, while low values corresponded to more volatile price behavior. For example, for soybeans on 39 out of the 52 occasions when the speculative index indicated excessive speculation, prices showed little movement, while on 36 out of the 40 occasions when the index was low there was volatile price behavior. The results for corn showed that no large price changes were associated with high levels of the index even during the last two years of the period, 1965-1966, when the price range widened to historic levels. Thus, the authors of the Nathan study concluded from these associations that “speculators’ transactions often moderate rather than accentuate price volatility” ([5], p. 1).

A second finding was that the grain markets had changed greatly over the nine-year period. Enormous increases in hedging and spreading use of the markets had strained the ability of speculators to carry these positions. Thus, inadequate levels of speculation were seen as being characteristic of mature markets.

The price volatility effects of margin increases were also considered in the Nathan report. The average daily price range for the periods immediately before and after margin increases were compared. To isolate these price effects from important changes in fundamental factors, the days surrounding the release of USDA crop reports were excluded. The results showed that small and moderate-sized margin increases stimulated rather than dampened price fluctuations. On the other hand, large margin increases during 1947-1948 did reduce price volatility, but only over a very short-term period.

Finally, the Nathan report concluded that increased speculative margins entail costs to hedgers and consumers so that only in those situations where speculation is clearly fueling unwarranted price volatility would government control of margins, with the presumption of higher average margin levels, be advisable.

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2 Price behavior was described as stable, moderate, or volatile according to the level of daily and weekly price ranges over extended and brief market periods. See Nathan study, p. 34.

3 This analysis has recently been updated by Anne Peck in a paper entitled “The Role of Economic Analysis in Futures Market Regulation,” which was presented at the American Agricultural Economics Association 1980 Annual Meeting. Peck calculated speculative index values for the grains during the period 1972-1977. The values were very low and she interpreted them as indicating that “speculation in contemporary wheat, corn, and soybean markets is barely adequate.”
The second empirical study of the relationships between margin requirements, speculation, and price volatility is Wesley McCain's Stanford University doctoral dissertation entitled "An Empirical Investigation into the Effects of Margin Requirements in Organized Commodity Futures Markets." McCain looked at the effects of CBT wheat margin changes during the period 1936-1968 on selected market variables, such as price level, price range, volume, and open interest. He argued that margin changes are intended to produce immediate effects so he compared the average values of each variable in the days immediately preceding and after each margin change. A standard t-test was used for this purpose.

Most of the tests failed to yield significant results. For margin decreases, only the difference in the absolute value of the daily close-to-close price change was significantly different from zero; it was negatively correlated with the margin decrease. The results for margin increases were different—the t-tests for daily signed close-to-close price change, daily signed open-to-close price change, and daily price range were all significant. However, these results are difficult to interpret. The first two measures of price change were negatively correlated with the margin increase while the last measure was positively correlated. That is, margin increases resulted in decreases in the value of close-to-close and open-to-close price changes, yet increases in the value of price ranges. One possible interpretation is that while the price range is a direct measure of intraday volatility, open-to-close and close-to-close prices may reflect the pressure to liquidate at the end of the day. Higher margin requirements obviously intensify this pressure. It should also be noted that while the tests on volume and open interest were not significant at the .05 level, the signs were consistently negative for margin increases and decreases. That is, all margin changes were associated with decreases in the volume and open interest after the change.

McCain next looked at the effects of margin changes on speculation. He, too, used Working's Speculative Index to calculate the level of "unneeded" speculation in a market. Speculative index values before and after margin changes were compared and the differences were not significantly different from zero. McCain also ran a simple regression with margin change as the dependent variable and the speculative index as one of the independent variables. The regression coefficient for the speculative index failed to be statistically significant.

A final regression in which the initial speculative margin level was assumed to be a function of price level, price range, and the positions of large hedgers and speculators give more significant results. The coefficients for price level, price range, long hedging, and short speculation were all significant at the .05 level. The first three variables were positively correlated with margin level, while the last was negatively correlated. The most interesting result from this regression, however, was the differing effects of margin level on long versus short speculation. While the coefficient for long speculation was not significantly different from zero at the .10 level, it did have a positive sign. Thus, high speculative margin requirements were associated with high levels of long speculation and low levels of short speculation. McCain states that, while these results may seem surprising at first, they make sense when the profit positions of the traders are considered. Margins are usually raised when prices are advancing and longs are making money and shorts losing it. In these
circumstances, long speculators can use their profits to increase their positions while shorts may have to liquidate their positions. This suggests that symmetrical margin requirements for both sides of the market might not be effective in curbing speculation. On the other hand, the argument against asymmetrical requirements is that they are equivalent to announcing the desired price movement. In this regard, the Nathan report asked whether a regulatory agency would want to pursue such a policy and stated:

Federal Reserve actions on margin changes have reflected a desire to avoid placing that agency in the position of giving tips to speculators as to the direction in which stock prices will move ([5], p. 177).

A final chapter of McCain’s dissertation dealt with the 1947-1948 period of historically high wheat margin requirements. McCain’s analysis differs from the Nathan report’s conclusion that the high margins during this period restrained price volatility. While the largest margin increase appears to have reduced the daily price range, the effect of margin changes on volatility is less clear when all increases and decreases are considered. There were four margin increases and four decreases during this period. Two of the increases and three of the decreases were associated with reduced price ranges after the change. Thus, margin decreases were somewhat more effective than increases in curbing price fluctuations during this period.

Robert Bear, 1972 The third paper I will consider is Robert Bear’s “Margin Levels and the Behavior of Futures Prices.” Bear viewed the question of the effects of margin requirements on futures price behavior from a different perspective [1]. He was primarily interested in assessing the pricing efficiency of futures markets. He looked at how well CBT wheat and soybean futures prices during the period 1948-1969 conformed to the random walk model. However, unlike most other studies of pricing efficiency, he did not consider each price series as a whole, but divided the data according to margin levels. Suppose tests of the random walk assumptions were made for high-margin periods and low-margin periods. Serial correlation and runs tests were used to examine the assumption that price changes are independent, while the Kolmogorov-Smirnov test was used to test the normalcy of the distribution of price changes.

The serial correlation and runs tests revealed different types of dependence. The serial correlation tests on wheat suggested significant positive dependence at very high and low margin levels, while the runs tests indicated negative dependence when margin requirements were in the intermediate range. Similarly, the serial correlation tests on the soybean data indicated positive dependence when margins were set at their highest level and the runs tests showed a significant tendency toward reversal when margins were very low. All the tests of kurtosis showed that the distributions were leptokurtic, but the departures from normality were greatest when margins were at their highest and lowest levels for wheat and at their lowest level for soybeans.

Bear points out that serial correlation tests give greater weight to extreme observations than runs tests. Thus, according to Bear:

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4 This technique has been called rational subgrouping; its purpose is to detect nonrandom elements in a series that may not be apparent when the data are aggregated.

5 Leptokurtosis is described later in this paper.
This is precisely the result that would occur in a price series where (and only where) there is a general pattern of reversal—negative dependency—with occasional periods containing clusters of large, positively dependent observations. The results suggest that, while larger observations exhibiting positive one-day dependency existed in all subgroups, they were more dominant in periods having very high (and, in the case of May wheat, very low) margin levels ([1], p. 919).

Bear interpreted his results as showing that speculative margin requirements have been set too high at times for both commodities, leading to deficiencies in the level of speculation and a aberrant price behavior. The shortage of speculation meant that prices did not adjust quickly to new information. Bear's paper is important since it deals with the relation between margin levels and excessive price fluctuations more adequately than the other papers do. In the Nathan and McCain studies, the word excessive was used to describe all large fluctuations. The question of whether or not they were warranted was not considered. In the Bear paper, on the other hand, futures price behavior is judged by comparison to a widely accepted model of an efficient market.

Lester Telser and Basil Yamey, 1965

The final work, which addresses the advisability of government control of margin requirements, is a very short theoretical paper by Lester Telser and Basil Yamey [6]. They argue that the main factor that should lead the government to raise margin requirements, namely increased price volatility, also impels brokers and exchanges to raise margins. Increased price volatility, after all, means greater risks of customer default. Thus, the exchanges and the government would tend to raise margins under the same circumstances. Telser and Yamey note, however, that the level of requirements could differ according to who sets margins. They contend that a government agency would probably be more conservative than the exchanges and set higher margin requirements.

Betsey Kuhn, 1976

My own study of futures margin requirements took a slightly different tack. My work, described in my Stanford Ph.D. dissertation, addressed the question of how margin requirements ought to be set, assuming they are intended only to protect the clearinghouse and the member firms from customer losses. It is clear that, under these assumptions, margins must be set at a level high enough to protect the broker and the clearing firm against any losses that might accrue to a customer's account from the time the margin call is issued until the funds are received. It is also clear that to set margins higher than this is to risk unnecessarily reducing market participation. Viewed in this light, the problem becomes essentially one of predicting how futures prices behave over short periods of time, viz., the period needed to collect additional margin.

One way of ensuring that the clearinghouse and brokers are protected from loss would be to set margins as a function of daily price limits. If it takes five days to collect on a margin call to a customer, the maintenance margin could be set at five times the daily price limit. This margin level would be extremely safe—there would be virtually no risk of customer losses being passed on to the carrying broker—but it would also be excessively high. For example, given the price limits in effect in February 1974 and allowing five days to respond to a

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4 The authors of the Nathan study did make some effort to separate price changes that might be due to major fundamental news from the others. They eliminated days immediately before and after the release of USDA crop reports from their sample.
margin call, this would lead to margins of $1.00 per bushel for wheat, $.50 for corn, $1.00 for soybeans, and $2,000 per contract for live cattle. Compared to actual margins of $.50 per bushel for wheat, $.30 for corn, $.50 for soybeans, and $1,200 per contract for live cattle, these “safe” margins are considerably higher and would likely affect the volume of trading.

A second approach would be to look at past price behavior and estimate the frequency of various-sized price changes over different collection periods. These frequencies can then be viewed as measures of risk associated with various margin levels. In order to see what sort of margins would result from this approach, I examined the distributions of CBT corn, wheat, and soybean futures price changes and Chicago Mercantile Exchange (CME) live cattle futures price changes over the period 1964-1974. The “margin levels” associated with “collection periods” of three, five, and seven days and “risk levels” of from .01 to 10 percent were calculated.

The margin levels obtained from this method varied greatly over time. For example, assuming a collection period of five days, margins could have been quite low throughout most of the period. From 1964-1972, wheat margins never had to exceed $.26 per bushel, corn $.28, soybeans $.40, and live cattle $2.28 per hundred weight to permit only a .01 percent risk of default. In contrast, relatively high margins would have been necessary to provide the same degree of safety for the same commodities during 1973-1974. During the latter period, the margins associated with a default risk of .01 percent ranged from $.29 to $.72 for wheat, $.28 to $1.28 for corn, $.16 to $.31 for soybeans, and $1.86 to $5.02 for live cattle. This method of assessing the appropriate level of margins, however, is extremely tedious, so a more general method was sought.

The general method is based on the work of Louis Bachelier. Bachelier’s 1900 doctoral dissertation was the first theoretical and empirical study of speculative prices. It contains a mathematical theory of speculative price behavior based on the random walk model. Bachelier is able to derive a formula for determining the probabilities of various-sized price changes over any interval from the mean daily price change. If the random walk assumptions hold (or come close to holding) for the grain and live cattle data, this formula can be used to compute “appropriate” margin levels. I checked these assumptions for my data.

A standard runs test was used to test the first assumption that price changes are independent; the data appeared to support the assumption quite well. The assumption that price changes are normally distributed was not as well supported by the data. The grain distributions were significantly leptokurtic in the early years 1964-1972, and significantly platykurtic in the later years, 1973-1974. A leptokurtic distribution has a taller peak, thinner shoulders, and fatter tails than the normal distribution. In contrast, a platykurtic distribution has a flatter peak, fatter shoulders, and thinner tails than the normal distribution. The live cattle price changes were significantly platykurtic throughout nearly the entire period—the one exception was 1973 when the data appeared to be normally distributed. It should be noted that while other studies of commodity and stock price behavior have noted the leptokurtic

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tendency in speculative prices, this is the first evidence that futures prices may have the opposite tendency. I explain the platykurtic distributions as the effect of daily price limits on futures price behavior—that is, extreme observations of price changes which would fall into the tails of distribution were inhibited by the price limits. While the normality assumption did not hold for my data, it would be difficult to think of an alternative distribution that would be appropriate for all years. Consequently, Bachelier’s formula would seem to provide the best “simple” method of determining appropriate margin levels.

To check how well such a method would work, I compared the actual price change distributions previously compiled with those predicted by Bachelier’s formula. This general method seemed to work quite well. As might be expected, the success of setting margins by this method depends critically on the nature of the deviations from normality. I assumed that the exchanges would only tolerate very small risks of default when setting margins, so I was particularly interested in the tails of the distributions. In 1973-1974 the distributions tended to be platykurtic or to have too few observations in the tails. In these circumstances, Bachelier’s formula would overestimate margins. In the earlier years, on the other hand, the distributions tended to be fat-tailed. Thus, in these years, the general method would underestimate margins.

I also used the price change distributions to determine the levels of risk actually allowed by exchange officials during the 11-year period. These results are rather interesting. During the first eight years, grain margins were set rather conservatively or at higher levels relative to price volatility than the later years. Assuming a five-day collection period, risk never exceeded 8 percent for corn, 7 percent for wheat, 10 percent for soybeans. However, during this period, live cattle margins were less conservatively set at 28 percent. In addition, there were long periods when there was virtually zero risk of default; price changes over five-day intervals never approached the maintenance margin level. However, during the last three years, 1972-1974, exchange officials allowed much higher levels of risk. In the second half of 1973, 35 percent of all the corn price changes measured over five-day periods exceeded the maintenance margin level, 53 percent of the wheat price changes, 89 percent of the soybean, and 80 percent of the live cattle price changes. It would be interesting to know how brokerage houses dealt with the tremendous increase in price volatility relative to the margin levels required by the big exchanges and clearinghouses during these years.

The final chapter of my dissertation dealt with the effect of daily price limits on futures price behavior and their relation to margins. One of the purposes of daily price limits is to facilitate margin regulation. I found that from 1964 to 1972 price limits were set widely and rarely affected futures price behavior—limit move days were rare. In 1973-1974, on the other hand, limits were not changed to reflect the increased price volatility so they had a major impact upon price behavior. If the distributions of price changes during periods of constant margin level are plotted, one sees an enormous increase in the number of observations immediately before and at the limit during 1973-1974. Daily price limits clearly restrained price movements and aided margin regulation during this period. However, whether or not this was desirable is debatable; daily price limits may have undesirable side effects. First, on days when important information is released, the price may move swiftly to the limit and limit pools may form. In these circumstances, traders may be forced to
maintain positions they would prefer not to carry. Second, limits can delay warranted adjustment of prices and thereby create artificial prices. The same or an even greater reduction in the risk of customer defaults could have been achieved with larger daily price limits and higher margins.

**Summary**

What do all of these studies add to the current debate on margin regulation? First, there appears to be no evidence that high levels of speculation were associated with larger than average price fluctuations for the grains during the relatively long, though dated, historical period considered. In contrast, large price fluctuations were more apt to be associated with low levels of speculation. There also is evidence that hedging and speculation are fairly well balanced for the mature grain markets. Second, the Bear study showed that aberrant price behavior has been associated with high margin levels rather than low levels. In addition, the Nathan and McCain papers indicated that, in the past, margin increases have not been an effective way to curb price volatility. Thus, the limited empirical evidence does not support the view that higher “antispeculative” margins would be an effective way to control price fluctuations. If, on the other hand, margins are intended only to protect the clearinghouse against customer default, then it would be reasonable to set them according to a plan such as the one discussed in my dissertation.
Bibliography


Hal Hansen: I would just like to make one observation. None of these studies takes into consideration the actual margin collection practices of the industry. You talk about a five-day average collect time which no firm would ever dream of living with.

Betsey Kuhn: Well, what would be more appropriate?

Hal Hansen: A firm and the clearinghouse in turn might have their largest exposure with customers with large positions. Those customers are on a daily-collect basis, generally by wire transfer. So, five days would be totally unreasonable. I think any study of this nature would have to take into consideration the actual margin collection practices of the industry.

Betsey Kuhn: It’s very hard to find out that information. Very little is published on the subject.

Hal Hansen: I suppose part of that is because no one has ever asked the question.

Betsey Kuhn: Yes, probably.

Don Bidgood: I would like to add to what Hal said. I don’t think your studies have included the fact that many in the industry allow only a certain percentage of the equity to be in use as margins; 50 percent of equity is often the rule—especially now with the great growth of managed accounts, 50 percent of equity is quite common.

Betsey Kuhn: So you would have a big cushion in addition.

Tom Hieronymus: It’s rather apart from your whole paper, but I’m intrigued why the subject of margin requirements comes up for such general discussion both historically and at the present time. I think one of your first comments was that there is no record of any default at any time. So from a default point of view or a financial security point of view, the matter just does not seem to be at issue. What is at issue?

Betsey Kuhn: I think it’s that margins are viewed as a way to curb speculation. They look at margins as a barrier to entry. As a result, people who are concerned about speculation focus on margins.

Tom Hieronymus: What is the focus of the people who are concerned about speculation? Is this religious or does it have to do with price behavior? Is it moralistic or is it economic?

Betsey Kuhn: It’s alleged that it has to do with price behavior, but the evidence from these studies doesn’t support that.

Allen Paul: Anne Peck is going to explore the subject, but I got the impression that there is some question here.