

The Highest Price Ever: The Great NYSE Seat Sale of 1928–1929 and Capacity Constraints

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During the 1920s the New York Stock Exchange's position as the dominant American exchange was eroding. Costs to customers, measured as bid-ask spreads, spiked when surging inflows of orders collided with the constraint created by a fixed number of brokers. The NYSE's management proposed and the membership approved a 25 percent increase in the number of seats by issuing a quarter-seat dividend to all members. An event study reveals that the aggregate value of the NYSE rose in anticipation of improved competitiveness. These expectations were justified as bid-ask spreads became less sensitive to peak volume days.

In February 1929 the New York Stock Exchange decided to increase its membership, fixed at 1,100 since 1879, by 25 percent. This expansion occurred when business was booming and the real price of a seat on the exchange was the highest it has ever been. In this exuberant era, the NYSE was under extraordinary pressure. Members found it increasingly difficult to handle the rising flow of orders. At peak times, there was a scramble on the floor to find counterparties and process trades; and some observers claimed that bid-ask spreads widened. These problems contributed to the slow erosion of the NYSE's share of the national equity market. Although the membership had rejected previous recommendations by the NYSE's leadership to increase seats, this time they listened and voted to accept a quarter-seat dividend to expand capacity and shore up the exchange's dominant position.

Drawing upon newspaper accounts and archival materials from the NYSE, we chronicle the NYSE's internal struggle over how to meet the

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soaring demand for its services. The management's proposed solution of a quarter-seat dividend to each member convinced a majority of brokers that it was the best way to expand the exchange's capacity. These dividends were then traded to create whole new seats that raised the total membership from 1,100 to 1,375. We conduct event studies of the failed effort to expand the exchange in 1925 and the successful one in 1928/29. When the news of a possible seat dividend reached the membership in late 1928, seat prices rose. We estimate that there was approximately a 20 percent abnormal return, implying that the increased number of seats was anticipated to make the exchange more competitive, thereby augmenting its aggregate value (the number of seats times the price of a seat), rather than leaving it constant.

The effects of order surges on NYSE-listed stocks' bid-ask spreads are examined using a panel of individual stocks drawn from high and low volume days both before and after the increase in the number of seats. In 1928, when volume climbed and the exchange was at capacity, the bid-ask spread became very sensitive to the total number of shares traded on the floor and the dispersion of orders at the posts across the floor. After the increase in the number of seats, these effects were muted and customers' costs did not jump. The brokers thus correctly anticipated that the increased attractiveness to customers of the exchange from the seat-dividend would help to maintain the NYSE's dominant position.

This increased capacity permitted the NYSE to absorb more easily orders on the high volume days that punctuated every year. However, these additional seats did not provide enough reserve capacity for the exchange to manage the volume on the truly rare days of a panic, such as occurred in October 1929. Panic driven surges in orders have persistently swamped exchanges throughout the twentieth century, leading the ticker to run late, delaying the delivery, execution, and settlement of orders, no matter the extent of technological innovations

THE NYSE FACES THE COMPETITION

The current struggle by national stock exchanges for world domination has its origins in the competition among American exchanges in the 1920s, when technology and greater public participation forced changes in the markets. While the NYSE was the dominant exchange, its position was slowly slipping away as volume and new issues moved to other venues. The dramatic expansion of the NYSE in 1928/29 was perhaps its most important structural change prior to its 2006 transformation into a publicly owned company and its merger with Archipelago. Both re-

sponses to competition led to a rapid rise in the price of a seat on the exchange, reflecting the market's favorable assessment.

Our investigation of this earlier structural transformation and its effect on the competitiveness of the exchange is facilitated by newly collected data from the archives of the New York Stock exchange for all seat prices from 1879 to 1971. Three volumes of the New York Stock Exchange's Committee on Admissions registered all transfers of membership. The recorded transfers cover the period from 28 November 1879 to 8 January 1880, followed by a gap, and then from 27 December 1883 to 28 June 1971. The exact dates of the transfers are not provided until January 1935. Until that time, all trades during a week were reported as of the end of the week. The supply of seats has been relatively constant over time. Except for the 275-seat expansion in 1929, there was only an increase of 70 seats in 1879 and a reduction of nine in 1953. Seats were traded in a market operated by the Secretary of the NYSE, who posted the current bid and ask prices.¹

Nominal seat prices from 1883 to 1971 are graphed in Figure 1.² The irregular time scale reflects the varying number of trades from year to year and reveals the extraordinary run up in the price of seats and volume of trading that began in 1925. The collapse precedes the 1929 stock market crash, while the low prices afterwards reflect the distressed state of the capital markets and the effects of the New Deal regulatory regime. The data reveal a striking feature that has been hitherto overlooked: the nominal 1929 seat price of \$625,000 was the highest real price ever attained. Just before the NYSE's conversion into a publicly traded company in March 2006, a peak nominal price of \$4 million was reached in December 2005. However, adjusting the 1929 seat price by the CPI, the GDP deflator, or the Dow Jones Industrial yields a real price in 2005 dollars of \$7.1 million, \$5.9 million, or \$7 million.³ By this measure, the value of access to the floor of the Exchange was never higher than it was in 1929; the NYSE was arguably at its apogee in the late 1920s.

¹ There were private sales of seats to business associates and relatives that were recorded by the Secretary, often at prices well below the market prices. Of the 4,344 transactions between 1883 and 1940, 775, or just under 18 percent, were private sales. These trades were roughly evenly dispersed over time. We excluded these trades from our study, as they represented transfers of property to family members or partners and not market conditions.

² Every new broker, taking advantage of the increased number of seats, bought a quarter seat from each of four sellers. The price paid by a new broker is equal to the prices of the four quarter seats, which were recorded when he exchanged these rights for a whole seat. The prices for private sales were excluded as these were usually far below market prices.

³ Although in late 1968 and early 1969 seat prices hit \$525,000, their real value was considerably below the 1929 peak. A seat priced at \$625,000 in 1929 had a real value of \$1.3 million measured by either the CPI or the GDP deflator in 1969.

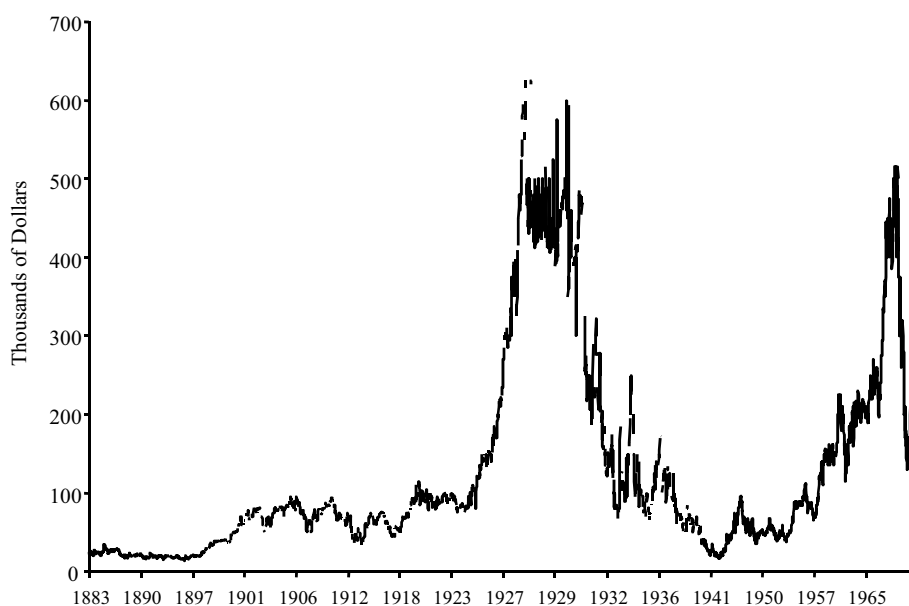


FIGURE 1
PRICE OF SEATS ON THE NEW YORK STOCK EXCHANGE, 1883–1971

Source: NYSE, Committee on Admissions.

Seats on an exchange are capital assets whose prices reflect stockbrokers' expected future profits from the special access offered to them by a seat on the exchange. Until the NYSE became a publicly owned company in 2006, the ownership of the exchange was vested with its members. The member-owners determined the number of seats; and before the advent of the New Deal legislation governing the securities exchanges, they set the rules of the exchange. The value of their seats, which they zealously guarded, was affected by the volume of activity on the exchange and the degree of competition among traders on the exchange and between the exchange and the rest of the market.

By the mid-1920s there were many reasons for brokers on the NYSE to be pleased. More firms were listing on the exchange and turnover was rising. The *Commercial and Financial Chronicle* and the *Wall Street Journal* gleefully reported new trading records.⁴ Yearly sales of shares in 1925 topped the 1919 record and monthly sales the 1901 record. Annual NYSE volume rose from 1.6 and 1.5 billion shares in 1925 and 1926 to 1.9 billion in 1927, and then soared to 3.2 and 3.9 billion shares

⁴ *Commercial and Financial Chronicle*, 31 October 1925; and the *Wall Street Journal*, 29 October 1925.

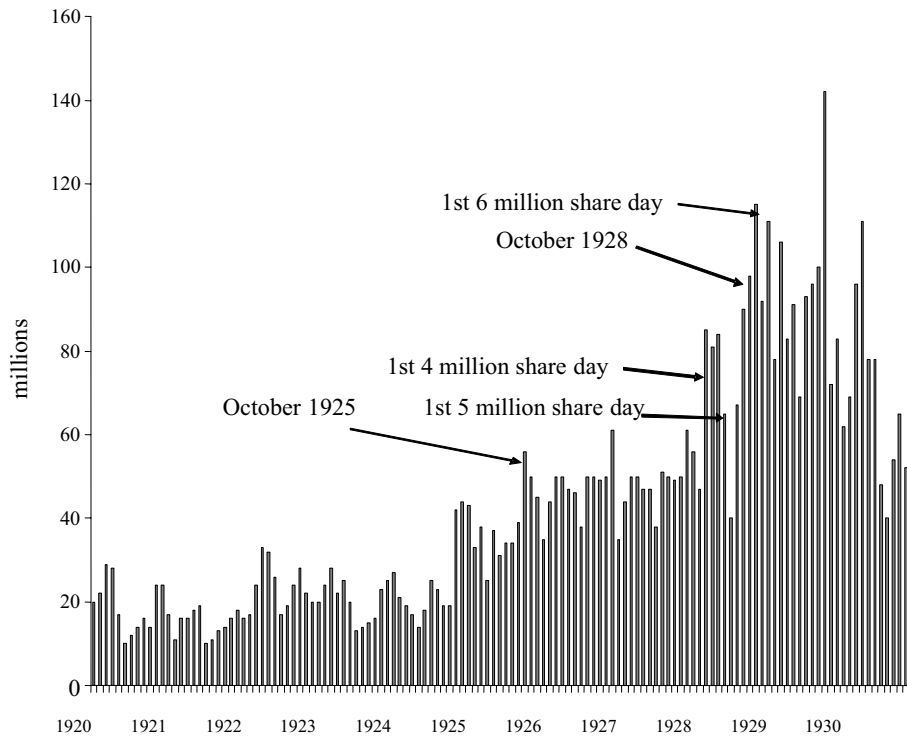


FIGURE 2
MONTHLY NYSE STOCK SALES, 1920-1930

Source: Board of Governors of the Federal Reserve System, *Banking and Monetary Statistics*, table 135.

in 1928 and 1929.⁵ The growing flood of monthly orders is shown in Figure 2. There were more 1 and 2 million share days and consecutive million plus share days than in the previous boom years of 1901 and 1919. The first 4 million share day was reached in 1928; it was followed quickly by a 5 and then a 6 million share day.⁶

Behind this rising flow of orders was an increase in the social and geographic span of the market.⁷ The rise of the small investor brought

⁵ NYSE, *Yearbook*, 1930.

⁶ NYSE Statistics Archive, <http://www.nyse.com>.

⁷ Another factor contributing to the rising demand for the services of the NYSE was the demise of the Consolidated Exchange. Founded in 1885, the Consolidated traded its own list of securities and many NYSE-listed securities, commodities, and petroleum futures. Unlike the restrictive NYSE, membership was available for "a few hundred dollars, with no questions asked." The Consolidated grew rapidly after the panic of 1907. Trading reached a peak in 1922, after which the Consolidated was wounded by a series of brokerage failures that implicated its president, William S. Silkworth. The scandal was fatal to the Consolidated, which quickly lost business to the NYSE. Its closure was announced in 1926, but it did not finally wind down its operations until two years later. See Sobel, *History*.

about an increase in odd-lot dealings, and the extension of the stock ticker west of the Rocky Mountains encouraged more trading by providing a timely dissemination of prices. The forthcoming extension of stock ticker services to the Pacific Coast and Florida was anticipated to increase business. To process greater flows, the NYSE announced on 13 April 1928 the introduction of a new and speedier stock ticker—a ticker capable of running at twice the speed of the current machines. Then in 1929, a newer model was promised that would operate three times as fast as the old one. In addition, a new central quotation system for reporting the bid and asked quotations was inaugurated at six trading posts on 1 October 1928. By 11 February 1929 it provided service to all posts. To ease physical constraints, the New Bond Room was opened on 14 May 1928, adding 6,000 more square feet to the trading floor. Searching for more space, the exchange purchased the Commercial Cable and Blair Buildings on 21 December 1928.⁸ New enclosed trading posts replaced the old style round posts in 1929 to speed up the management of paperwork and enable the clerks to better assist the harried specialists.

Although more trading boosted brokers' profits, it placed new strains on the operation of the exchange and the ability of brokers to deliver their services to their customers in a timely fashion. When volume was high, the clerical work of entering hundreds of orders in their proper sequence could not keep up.⁹ The rising volume of activity strained the exchange, and a new late closing record of 42.5 minutes in 1925 beat the old one of 25 minutes set in 1915. The President of the Stock Clearing Corporation, Samuel F. Streit reported that records were reached in the number and value of stocks cleared:

Settlements of these transactions have congested the machinery of the Stock Exchange and all hands have been called upon to work overtime in clearing the slates each day. All brokers and member firms have been called upon to make their deliveries as early as possible, for the purpose of speeding up the machinery, and banking institutions also have been requested to assist the Stock Clearing Corporation in every possible way.¹⁰

By the mid-twenties, the increased volume of orders regularly delayed settlement, forcing late hours and even a closing of the exchange on Saturday. There was also discussion of permitting the delivery of stock two days after the execution of orders instead of on the succeeding day. These remedies represented efforts to smooth the order flow as peak

⁸ NYSE, *Yearbook*, 1928–1929.

⁹ *New York Herald*, 26 January 1929.

¹⁰ *Commercial and Financial Chronicle*, 31 October 1925.

demand with a fixed clerical staff created temporary problems. The solution was to increase the staff or use more automation.

While these problems affected the timely delivery of cash and certificates, the rising trend and peak volume days also increased the cost of transactions as individual brokers found it harder to find counterparties for their orders on the floor. With a fixed number of brokers, the market's capacity was not easily altered. When volume continued to climb in the second half of the 1920s, problems became more severe, and there were public complaints about the declining performance of the exchange. The NYSE conceded that there were difficulties because of "poor executions and the limited capacity of our market."¹¹ Members of the exchange began to fear that unless changes were made business would be lost to the Curb market and the out-of-town exchanges.¹²

At a time when turnover was rising, the increase in new issues placed even more stress on the machinery of the NYSE. Yet, most new issues appeared on other exchanges. The exchange's relatively tough listing standards limited new listings by the "high tech" firms of the day, which were more likely to appear on the New York Curb market and the regional exchanges. Although data on other exchanges are scarce for this period, Table 1 reveals the dimensions of the challenge faced by the NYSE. Between 1927 and 1929, the NYSE's listings rose by over 12 percent, and annual turnover jumped from about 1.0 to 1.5. Nevertheless, its competitors grew faster. The New York Curb market was the NYSE's largest rival but it also complemented the NYSE by taking listings that were below the NYSE's standards. Many more new issues were listed on the Curb, and its volume rose faster than the volume on the NYSE. Chicago was the largest regional exchange, but did not participate in the boom until 1928. It had only 237 stocks listed on 1 January 1927 and 238 a year later. But Chicago reasserted itself; by 1 January 1929, it had 426 issues. Annual turnover, which had been a mere 0.14 in 1927, rose to 0.62 in 1929.

New exchanges also opened to accommodate the growing demand for new issues. On 4 June 1928 the Los Angeles exchange created its own Curb to expand capacity to handle new stocks and securities that did not meet the exchange's requirements. The parent exchange saw its total volume increase from 27.1 million in 1927 to 49.4 million in 1928. Total volume for both Los Angeles exchanges reached 67.8 million in 1928, or 7.3 percent of the NYSE's volume.¹³ Aggressively pursuing new business, the Los Angeles exchanges played a central role in the

¹¹ NYSE, "Memorandum on Increasing Stock Exchange Memberships," n.d.

¹² *New York Times*, 5 November 1925.

¹³ *Commercial and Financial Chronicle*, 16 March 1929.

TABLE 1
U.S. EXCHANGE LISTINGS AND VOLUME, 1925–1929

	1925	1926	1927	1928	1929
NYSE					
Listed stocks	927	1,043	1,081	1,097	1,177
Number of shares (millions)	433	492	585	654	757
Market value (millions)	27,072	34,489	38,376	49,736	67,472
Annual volume (millions)	452	449	576	921	1,124
Annual turnover	1.04	0.91	0.98	1.41	1.48
New York Curb					
Annual volume (millions)	88	116	125	236	474
Volume as percent of NYSE	19.5	25.8	21.7	25.6	42.2
Chicago					
Listed stocks			237	238	426
Number of shares (millions)			77.2	91.5	132
Market value (millions)			5,200	6,069	9,328
Annual volume (millions)	14.1	10.2	10.7	38.9	82.2
Volume as percent of NYSE	3.1	2.3	1.9	4.2	7.3
Annual turnover			0.14	0.43	0.62

Sources: NYSE, *Report of the President*, 1929; New York Curb Exchange, *New York Curb Exchange—History*; and Chicago Exchange, *Chicago Stock Exchange: Record of Progress*.

opening of the San Diego Stock Exchange in March 1929; their members took half of the 40 San Diego seats.¹⁴ These exchanges not only handled new regional business but also poached trading from New York. Sampling the volume of shares traded as reported in the *Bank and Quotation Record* for the Baltimore, Boston, Chicago, Cleveland, Detroit, Los Angeles, Philadelphia, Pittsburgh, and San Francisco exchanges, Tom Arnold, Philip Hersch, J. Harold Mulerin, and Jeffrey Netter found that there was a significant overlap of trading on the U.S. stock exchanges.¹⁵ In January 1929, 8.6 percent of the trading volume on the NYSE occurred in securities traded on regional exchanges, while the Curb had 27.7 percent of its volume in such securities. However, trading in New York stocks was much more important for the regional exchanges, where regional stocks only accounted for 63.7 percent of their trading volume, with NYSE and Curb market-listed securities representing the remainder. If the NYSE began to experience difficulties, the regional exchanges were only too happy to seize its business.

Although volume data for many exchanges are sketchy, the problems of the NYSE can be seen by comparing the aggregate values of American exchanges as measured by the prices of their seats. Given the forward-looking nature of asset prices, the price of seats assesses the future prospects of the exchanges. The bull market of the late 1920s led to a

¹⁴ *Commercial and Financial Chronicle*, 23 March 1929.

¹⁵ Arnold, Hersch, Mulerin, and Netter, "Merging Markets."

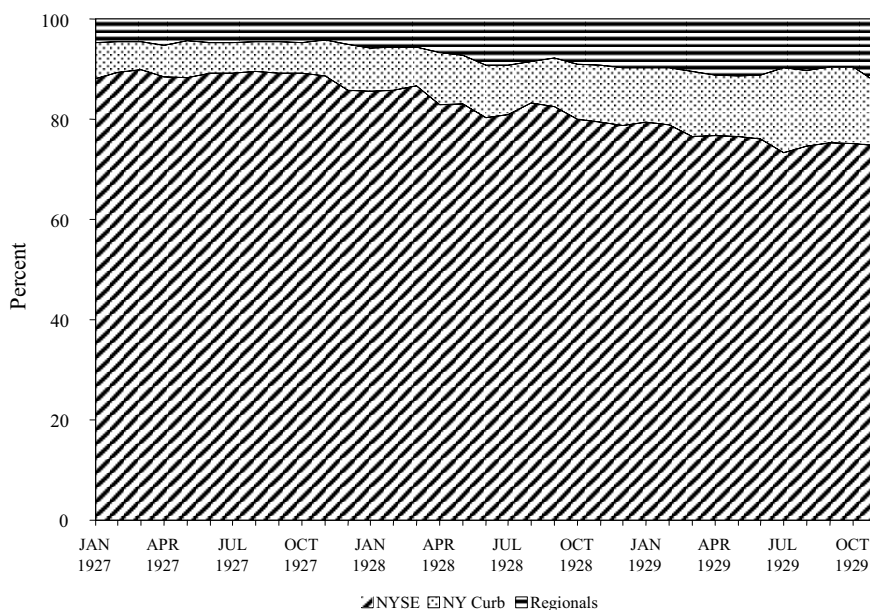


FIGURE 3
THE RELATIVE SHARES OF THE AGGREGATE VALUE OF U.S. STOCK EXCHANGES,
1927–1929

Source: *Bond and Quotation Record*, 1927–1929.

general rise in the value of American stock exchanges. The aggregate value of the U.S. exchanges soared from \$220 million in January 1927 to \$372 million a year later, climbing to a peak of \$912 million in September 1929 before collapsing. Although the NYSE increased in value from \$192 to \$687 million from January 1927 to September 1929, it steadily lost “market share” as seen in Figure 3. Averaging 89 percent of all exchanges’ value in 1927, the NYSE saw its share of aggregate value drop to an average of 76 percent in 1929. It is no surprise that many NYSE brokers were alarmed as they watched changing seat prices, which meant that the New York Curb Exchange increased its share from 7 to 13 percent and the regional exchanges from 5 to 10 percent over the same period.

While individual NYSE brokers were enjoying higher profits from the boom in volume, the erosion of the NYSE’s market share represented a serious threat to their future earnings. The profitability of the NYSE derived from its dominant position. Order processing costs are a decreasing function of volume, and higher volumes will produce shorter holding periods and lower bid-ask spreads. If one market has greater volume, its cost advantage will attract more volume and lead to consolidation in a single market. Liquidity thus attracts more liquidity, and this

positive trading externality should result in one trading venue.¹⁶ The NYSE had achieved the dominant position in its listed stocks by providing the lowest cost market, but the rapid growth in new issues in the late 1920s created viable alternative venues. Any problems on the NYSE would raise the cost of trades executed on its floor and reduce its attractiveness vis-à-vis other exchanges, leading to the prospect that it could lose its cost advantage and dominant position.

Early on, the NYSE responded to the rising inflow of orders by raising commissions. On 24 October 1924 the NYSE significantly raised its minimum commission per hundred shares.¹⁷ However, in this competitive environment further increases in commissions would have driven more business to other exchanges. Thus, the NYSE did not consider a further increase in the minimum commission after 1924.¹⁸ Somehow it would have to expand capacity without undermining the value of existing seats. Technology could speed up the delivery of orders or the dissemination of prices with a faster ticker, and a larger back office staff could process settlement more quickly, but the key constraint was on the floor of the exchange where the number of members who could trade stocks was fixed. This constraint created problems that threatened to decrease liquidity, widen bid-ask spreads, and alienate customers.

THE CAPACITY CONSTRAINT ON THE FLOOR OF THE NYSE

How exactly did a higher inflow of orders, especially on peak volume days, reduce the liquidity of the NYSE and what effect did it have on bid-ask spreads? Brokers on the floor of the exchange were identified by their principal function: specialist, commission broker, odd-lot broker, two-dollar broker, and floor broker. An incoming order for the purchase or sale of a specific stock arrived in the hands of a commission broker who took the order to the post on the floor assigned to that specific stock. At the post, a specialist (trading on his own account or as an agent for another broker) had an affirmative obligation to maintain a

¹⁶ Madhavan, "Market Microstructure."

¹⁷ Beginning on 8 May 1919, the minimum commission was \$15 per 100 shares for stocks priced from \$10 to \$124 ⁷/₈ and \$20 for shares over \$125. After 30 October 1924, the minimum for shares priced from \$10 to \$99 ⁷/₈ was \$12.50 plus 0.1 percent of the amount traded rounded down to the nearest \$2.50. Thus, if a share cost \$80 (the average price of a stock on the NYSE in 1928–1929 was approximately \$80), the price of a 100 share trade would be \$20. Trades of shares ranging from \$100 to \$199 ⁷/₈ cost \$25. See Jones, "Century."

¹⁸ In 1928 several odd-lot houses raised their minimum commissions. "Because of pressure on small-lot business, 75 of the larger firms yesterday advanced their minimum commissions to \$5 for each transaction." See *Commercial and Financial Chronicle*, 16 February 1928. These firms accounted for only a modest share of the securities markets.

continuous market and to post bid and ask prices for the stock. The commission broker could trade with the specialist at the posted spread or with any other broker at or within the spread. The greater the number of counterparties faced by the commission broker, the increased competition and hence liquidity would press down the bid-ask spread.

Other brokers played important roles at the post. If an order were for less than 100 shares, the commission broker would transact with an odd-lot broker who acted as an intermediary on his own account to accumulate and trade shares in round lots.¹⁹ If there were more incoming orders than the commission broker could handle, he might have some orders taken to the appropriate posts by two-dollar brokers for a fee. When volume surged, the two-dollar brokers' assistance to harried commission brokers was important to ensure the delivery of orders to the posts across the floor. Floor traders traded for their own account and helped to maintain a continuous market at the posts, ensuring that "momentary inequalities in the market arising from the mechanical methods of executing the round-share orders of commission houses and odd-lot dealers are instantly smoothed out and eliminated."²⁰ Contemporaries regarded floor traders as a vital group of potential counterparties who could move across the floor and provide liquidity as profit opportunities emerged.

The geography of the floor influenced the liquidity of the market. With a fixed number of brokers, if trading were concentrated in a few stocks at a few posts, there would be a large number of potential counterparties for incoming orders, squeezing the bid-ask spread. But if trading were more diffused, spread out among the posts on the floor, then even with the same volume, the market could be much thinner as potential counterparties would be spread out. Bid-ask spreads would widen as brokers would have to scramble from post to post to execute their orders and costs to customers would rise.

Not all 1,100 brokers were on the floor at a given time and, in fact, the maximum number of active brokers was estimated at somewhere between 900 and 1,000. Unfortunately, there is no record of how seats were distributed among the different types of brokers who, with the exception of the specialists, decided how to make use of the seat. The number of seats occupied by specialists (approximately 150) changed slowly.²¹ Commission brokers were the largest group and their numbers increased as commission houses in New York and outside of the city

¹⁹ In 1922 Meeker claimed that the odd-lot brokers accounted for 25 percent of volume and that their share declined substantially in boom markets. Meeker, *Work*.

²⁰ Meeker, *Work*, p. 101.

²¹ Meeker, *Work*.

opened more branches to handle the inflow of orders during the 1920s. One problem for the exchange was that purchases of seats by the out-of-town firms reduced the number of active members on the floor of the exchange. In addition, there were “inactive” seats held by prominent financiers, including John D. Rockefeller, J. Pierpont Morgan, Frank Jay Gould, Percy A. Rockefeller, and Mortimer Schiff, who occasionally appeared on the floor to trade on their own account.

Contemporary observers believed that the ability of the exchange to ensure a continuous market was compromised, in part, by the shrinkage in the number of floor traders. Meeker blamed this loss on the New York State stock transfer stamp tax of 1905 and the federal stamp tax, introduced during World War I, both of which fell disproportionately on the floor traders.²² The combined state and federal taxes imposed a \$2.00 tax on every sale of 100 shares of stock of \$100 par value.²³ For a trade that earned 1/8, or \$12.50, on 100 shares at \$100, a floor trader would only earn \$7.50 after paying \$1.00 to a commission house to clear the trade and \$4.00 in taxes. At the beginning of the twenties, Meeker contended that the number of floor traders had fallen from 200 to 50, commenting that “the whole of the market has to a considerable extent been rendered less stable than formerly,” with presumably the number of commission brokers increasing.²⁴ In 1928 the NYSE president made a similar claim that the wartime federal transfer tax had caused the number of floor traders to fall from 200 to 30, and that this small number was a cause of the “wide span between bids and offers on the floor.”²⁵

How seriously did rising trend volume and peak surges affect the efficiency of the exchange? If there were real capacity constraints imposed by the fixed number of seats, it should have reduced liquidity and produced a rise in the bid-ask spreads. In this period, the *New York Times* reported daily closing bid-ask spreads for the NYSE stocks in addition to daily volume, high and low prices for the year, high and low prices for the day, opening and closing prices and the change in price from the previous day. Order-flow problems should have been most severe on peak days, when there was an exceptionally high volume and the orders were diffused among a large number of listed stocks. To capture the effects of this problem, we collected daily data on all stocks from the *New York Times* for selected days before and after the quarter-seat dividend.

²² Meeker, *Work*.

²³ Goldman, *Handbook*.

²⁴ Meeker, *Work*.

²⁵ E. H. H. Simmons, *Report of the President NYSE 1 May 1928 / 1 May 1929*, p. 62; and “Memorandum on Increasing Stock Exchange Memberships,” undated, NYSE Archives.

First, to select the days, every day from January to October 1928, when the seat increase was proposed, was sorted by volume. The five peak days (12 June, 16 May, 21 September, 7 September, and 27 March) were selected to capture any congestion. To examine how the exchange handled peak volume after seats were added, every day from March 1929 to August 1929 was sorted by volume.²⁶ The top two volume days, 26 March and 1 March, were selected. However, they may not provide a good indication of whether the seat increase eased congestion because few additional seats were effectively added by March and volume on these two days was significantly higher at 8.2 million and 6.0 million shares compared with the volume of 5.3 million shares on 12 June 1928, the highest predividend volume day. The possibility remains, therefore, that congestion could occur at these much higher volumes even with an increased number of seats. To assess more accurately the effect of seat expansion on congestion, three days were picked (9 August, 22 May, and 16 August 1929) that nearly matched the peak volume for the period January–October 1928. To provide a contrast with potentially congested days, the five lowest volume days' data for March–August 1929 (20 April, 15 June, 8 June, 25 May, and 18 May) were collected. The low volumes for January–October 1928 were lower by more than one-half, so only the three lowest (20 April, 15 June, and 9 June) were picked, and two low days (3 March and 19 July) that matched the period after seat expansion were chosen.

The key statistics for all 20 days are presented in Table 2. Relative to low volume days, high volume days, measured either by total daily volume or daily turnover, involved a larger number of stocks, although on a given day several hundred listed stocks were not traded. Higher volume for a particular stock should have lowered the spread; but there is no obvious evidence for this effect in the median or modal spread, where one-eighth was the minimum tick. Nor do volumes five times higher seem to lower the mean spread (weighted by sales) or the weighted mean spread as a percentage of the closing price. However, the spreads do seem to be influenced by the distribution of trading. The more concentrated trading was—as measured by the share of sales in the most active stock, the most active 20 stocks, or a Herfindahl index of sales—the lower the spreads. The concentration of brokers at fewer posts, which increased the number of potential counterparties at one location, appears to have reduced bid-ask spreads no matter whether it was a low or high total volume day.

²⁶ The months of November 1928 to February 1929 were omitted because they followed the dividend announcement and preceded the increase in seats. The choice of days for the sample ends in August to eliminate the effects of the crash of 1929.

TABLE 2: THE COST AND CHARACTERISTICS OF TRADES ON THE NYSE, 1928-1929

	No. of Stocks Listed	Daily Volume of Shares	Daily Turnover (percent)	No. of Traded Stocks	Median Spread (\$)	Modal Spread (\$)	Mean Spread (\$)	Mean Percent Spread (percent)	Herfindahl Index for Trading	Share of Top 20 Stocks	Share of Top Stock	
Pre-Increase, High Volume												
6/12/1928	1,113	5,252,425	0.768	803	1.000	1.000	0.753	1.686	112.9	34.6	7.07	
5/16/1928	1,098	4,965,000	0.735	790	0.630	0.500	0.515	1.104	116.7	33.7	7.21	
9/2/1928	1,122	4,861,350	0.689	698	0.500	0.500	0.390	0.758	188.5	43.8	9.42	
9/7/1928	1,122	4,855,770	0.688	680	0.500	0.500	0.435	0.783	180.0	47.0	6.22	
3/27/1928	1,097	4,845,240	0.728	727	0.500	0.250	0.405	0.650	313.0	56.3	12.83	
Pre-Increase, Low Volume												
3/3/1928	1,097	1,256,100	0.189	535	0.500	0.250	0.352	0.589	991.5	58.0	30.45	
7/19/1928	1,118	1,214,200	0.176	555	0.500	0.500	0.444	0.825	237.4	49.8	9.53	
6/23/1928	1,113	719,100	0.105	526	0.500	0.500	0.579	1.079	213.8	45.8	9.87	
7/14/1928	1,118	512,570	0.074	448	0.500	0.500	0.350	1.099	198.1	47.3	8.05	
7/21/1928	1,118	597,440	0.087	457	0.500	0.250	0.426	0.864	256.3	55.9	8.33	
Post-Increase, High Volume												
3/26/1929	1,307	8,246,740	0.979	831	1.000	0.500	0.675	1.452	173.3	45.9	6.51	
3/1/1929	1,307	6,021,300	0.715	810	0.500	0.500	0.405	0.707	121.3	40.5	4.35	
8/9/1929	1,257	5,022,360	0.517	799	0.750	0.500	0.501	0.780	123.7	40.1	5.47	
8/16/1929	1,257	4,796,030	0.494	779	0.500	0.500	0.379	0.693	125.6	41.0	5.27	
5/22/1929	1,220	4,844,130	0.540	802	0.750	1.000	0.566	0.953	160.3	44.6	6.59	
Post-Increase, Low Volume												
4/20/1929	1,205	1,292,310	0.150	589	0.500	0.500	0.354	0.639	131.3	42.6	4.16	
6/15/1929	1,230	1,264,420	0.136	588	0.500	0.250	0.470	0.788	208.6	41.7	11.05	
6/8/1929	1,230	1,201,500	0.129	578	0.625	0.500	0.519	0.935	171.2	45.4	7.35	
5/25/1929	1,220	1,210,430	0.135	645	0.500	0.500	0.532	1.003	176.4	43.5	7.98	
5/18/1929	1,220	1,249,640	0.139	613	0.500	0.500	0.484	0.781	115.9	40.4	3.85	

Sources: New York Stock Exchange, *Year-book* (1928-1929); and *New York Times*.

To determine whether peak order flows reduced the liquidity of the NYSE by widening specialists' bid-ask spreads, we employed a standard model of the bid-ask spread.²⁷ We estimated the bid-ask spread for the i th stock on date t , measured as the log of the closing bid-ask spread divided by the closing price or $lnspread_{it}$

$$\begin{aligned}
 lnspread_{it} = & b_0 + b_1lnsales_{it} + b_2lnprice_{it} + b_3lnyearvlt_{it} + & (1) \\
 & b_4ln dayvlt_{it} + b_5ln callrate_{it} + b_6ln totalvolume_t + \\
 & b_7ln herfindahl_t + b_8highvolume*lnsales_{it} + \\
 & b_9highvolume*lnprice_{it} + b_{10}highvolume*lnyearvlt_{it} + \\
 & b_{11}highvolume*ln dayvlt_{it} + \\
 & b_{12}highvolume*ln callrate_t + \\
 & b_{13h}highvolume*ln totalvolume_t + \\
 & b_{14}highvolume*herfindahl_t
 \end{aligned}$$

Specialists have an obligation to accept orders from other brokers and maintain a portfolio of stocks. The bid and ask prices they post are affected by the volume, the number of trades, capitalization, the price of a share, and price volatility.²⁸ Although we do not have information on the number of trades or the capitalization of companies that are usually used as explanatory variables for liquidity in models of the bid-ask spread, we do have volume.²⁹ The higher the daily volume, the greater the number of orders brought to a specialist's post, the greater the liquidity, which should have lowered the bid-ask spread. To capture this effect, we included the variable $lnsales_{it}$, the log of the sales for stock i , whose effect is expected to be negative. Although the spread should be proportional to the price of a security, the NYSE's fixed commissions altered this proportionality. With costs high for low-priced stock, investors tended to trade in high-priced stock to lower their transactions costs and so created a negative relationship between price and spread. For this effect, we used the log of the closing price, $lnprice_{it}$, which we expect to have a negative sign on its coefficient. Increased volatility should have elevated bid-ask spreads, as it increased the risks for the specialist holding the portfolio of stocks. As the standard deviation of returns or market betas is not readily recoverable, we measure volatility by $lnyearvlt_{it}$, the log of the difference between the yearly high and low

²⁷ For surveys of the literature see Madhavan, "Market Microstructure"; and Stoll, "Friction."

²⁸ See Stoll, "Supply"; Menyak and Paudyal, "Determinants"; and Stoll, "Friction." It is also argued that the spread serves as compensation for asymmetric information costs for the losses that specialists would have incurred from trades with well-informed traders that are recouped from less-informed traders, which the dealer could not have distinguished. See Easley and O'Hara, "Price"; and Demsetz, "Cost."

²⁹ Laux, "Trade Sizes."

price of the stock divided by the closing price, and by $ln\text{dayvlt}_i$, the log of the difference between the daily high and low price of the stock divided by the closing price. We anticipate that these variables will have positive coefficients. Interest rates may also have influenced the willingness to hold inventories of stock and hence the bid-ask spread. This factor is represented by the log of the call rate on brokers' loans or $ln\text{callrate}_i$, which we expect to have a positive coefficient.³⁰

Activity on the whole of the exchange also influenced the bid-ask spread of an individual stock. If the total volume on the exchange rose with a given volume in an individual stock, it put upward pressure on the stock's spread because of the fixed capacity. However, if trading became more concentrated in fewer stocks and thus focused on a few posts, liquidity was enhanced, as brokers were not spread out across the floor of the exchange. We proxy these volume and trading concentration effects by the log of total volume of the exchange, $ln\text{totalvolume}_i$, and the log of the Herfindahl index of all individual stock sales, $ln\text{herfindahl}_i$. We expect these variables to have positive and negative coefficients respectively. It is worth noting that the exchange-wide variables, the total volume and the Herfindahl index, are highly correlated (-0.728) because during the early days of the stock market boom increases in volume were accompanied by trading in a greater number of stocks. Added to the regression to identify the differences between high and low volume days, and thereby highlight the capacity constraint on the machinery of the exchange, were six interaction terms, which indicate how high volume days affected the coefficients on the individual explanatory variables.

For the combined ten high and low days in 1928, we estimated the model using fixed effects for individual stocks to capture some of the individual characteristics of stocks and the omitted variables, notably capitalization.³¹ Table 3 reports the coefficients and standard errors for two versions of equation 1; most of the coefficients are tightly estimated. As expected, higher sales and a higher closing price lowered the bid-ask spread; and, as anticipated, more volatility drove the bid-ask spread up. However, even if a stock was traded, there was often no change in the price during the day. In these cases, the difference between the high and low is zero and the daily volatility cannot be calculated. Nevertheless, dropping those stocks from the regression is a useful check because they were typically less active, smaller issues;

³⁰ The call loan rates were obtained from the Board of Governors of the Federal Reserve System, *Banking and Monetary Statistics*.

³¹ We also estimated the equation using OLS. The results were similar and can be found in Davis, Neal and White, "Highest Price."

TABLE 3
ESTIMATES OF THE DETERMINANTS OF BID-ASK SPREADS, 1928

	Fixed Effects	Fixed Effects
Sales	-0.113* (0.012)	-0.220* (0.018)
Closing Price	-0.699* (0.054)	-0.605* (0.068)
Yearly Volatility	0.187* (0.034)	0.128* (0.045)
Daily Volatility		0.247* (0.027)
Call Loan Rate	1.045* (0.297)	1.057* (0.375)
Total Exchange Volume	0.200* (0.059)	0.224* (0.073)
Herfindahl Index	0.028 (0.059)	0.025 (0.073)
High Volume * Sales	0.042* (0.012)	0.043* (0.018)
High Volume * Close	0.012 (0.022)	-0.006 (0.030)
High Volume * Yearly Volatility	0.098* (0.028)	0.051 (0.042)
High Volume * Daily Volatility		0.031 (0.032)
High Volume * Call Rate	-1.555* (0.303)	-1.322* (0.380)
High Volume * Herfindahl	-0.337* (0.061)	-0.315* (0.073)
High Volume * Total Volume	0.229* (0.052)	0.203* (0.064)
Constant	-1.667 (1.433)	-1.657 (1.828)
Adjusted R^2	0.380	0.475
Number of Observations	6,140	4,327
Number of Stocks	1,020	849

* indicates significance at the 1 percent level.

+ indicates significance at the 5 percent level.

Note: Standard errors are in parentheses.

fortunately, the estimates of the coefficients changed little for this smaller sample. As expected, a higher call loan rate induced brokers to lower their inventory and raised the spread. In general, higher total volume on the exchange drove up the bid-ask spread, but concentration of trading had no significant effect on spreads. However, it was on the high volume days, identified by the interaction terms, when congestion created problems and these variables assumed greater importance. The bid-ask spread responded differently to individual sales volume, volatility, and the call rate on the high volume days. What is striking is that total volume on the exchange becomes more important and concentrated

TABLE 4
PREDICTED PERCENTAGE BID-ASK SPREAD

	High Volume		Low Volume	
	Daily Volatility Excluded	Daily Volatility Included	Daily Volatility Excluded	Daily Volatility Included
Mean total volume	0.777	0.764	0.847	0.649
1 percent increase in total volume	0.804	0.791	0.848	0.649
Total volume at 4 million	0.377	0.399		
Total volume at 5 million	0.801	0.847		
Total volume at 6 million	1.483	1.568		
Total volume at 1 million			0.864	0.661
Total volume at 2 million			0.941	0.726

Source: See the text.

trading, which brought more brokers to fewer posts, matters now. The Herfindahl index has no significance except for high volume days, as indicated by the interaction term for high volume days and the index. These results confirm that a capacity constraint from the limited number of brokers tended to drive up bid-ask spreads.

By how much would the bid-ask spread increase if volume jumped? Table 4 provides estimates of the predicted percentage bid-ask spread, where all variables except total volume have their mean values for high and low volume days. The first row shows the predicted values when the total exchange volume was set equal to the sample means.³² The average price of a share in this period was \$80; and at the mean volumes, spreads of 0.65 to 0.85 percent implied costs of 52 to 68 cents. Spreads were quoted in ticks and the minimum tick was an eighth or \$0.125; so for the spread to move one tick it had to change by more than 0.15 percent of \$80 or \$0.12. Consequently, from both high and low volume day means, a 1 percent increase in volume would have yielded no perceptible effect on the bid-ask spread. An increase from one to two million in total volume increased the bid-ask spread by less than 0.10 percent or less than a tick, so costs would have increased little if at all. On peak volume days, by contrast, higher total exchange volume quickly drove up spreads for individual stocks. The change from 5 million to 6 million raised the spread from 0.847 to 1.568 percent, suggesting a near doubling in cost. As contemporaries had warned, higher volumes yielded substantial jumps in the spread, enough to induce some investors to seek other venues for transactions.

³² These predicted forecasts lie in the range of the bid-ask spread as measured by Jones for Dow-Jones stocks in the 1920s. Jones, "Century."

The responsiveness of the bid-ask spread reflected the general problems of the exchange in processing and executing orders. The number of brokers on the floor was a hard constraint that translated into higher costs when the floor was swamped with orders. The exchange's leadership saw that higher spreads, slow processing, and rising fails would redirect order flow to other markets. At some point, the position of the NYSE as the most liquid market would begin to decline, undermining its cost advantage and giving competitors the opportunity to become the lowest cost venues. The upward trend in volume and the increased frequency of high volume days also gradually impressed many of the exchange's members with a heightened sense of urgency to expand the NYSE's capacity.

THE QUARTER SEAT DIVIDEND

The capacity of the exchange had been fixed nearly 50 years before. After the May 1869 merger of the NYSE, which had 533 members, with the 354 member Open Board of Brokers and the 173 member Government Bond Department, the number of seats was set at 1,060. The only increase occurred in 1879 when the Governing Committee proposed the sale of 40 new memberships, increasing the total seats to 1,100, to finance the purchase of additional property adjacent to the exchange to ease its physical constraint. The seats were sold to the highest bidders with a minimum price of \$10,000. Although 40 more seats would seem unlikely to have had much effect on seat prices, the vote by the membership on the proposal was extremely close, 530 in favor and 510 against.³³

Apparently, 1,100 brokers provided sufficient liquidity for the exchange until the boom in the mid-1920s, as there is no recorded discussion of the need to expand capacity on the floor of the exchange until then. On 28 October 1925 the Governing Committee of the NYSE took up the question of how to accommodate the increased demand for services on the exchange. The chairman of the committee, Warren B. Nash, made the case for more seats, pointing to the rise in listings and volume. As membership had not increased since 1879, "a point might soon be reached when there would not be enough active members on the floor to handle adequately the constantly rising volume of orders." Nash argued that capacity required not only "additional space and mechanical facilities but also more members to handle the market."³⁴ The committee then presented the members with a proposal to increase the number of seats from 1,100 to 1,125. Their plan called for the sale of

³³ The memberships were then sold at prices ranging from \$13,500 to \$15,000. W. B. Nash, "Remarks made before the Governing Committee Meeting," 28 October 1925.

³⁴ W. B. Nash, "Remarks made before the Governing Committee Meeting," 28 October 1925.

five seats each at \$135,000, \$137,500, \$140,000, \$142,500, and \$145,000.³⁵ Nash touted the change as yielding an equal benefit for all members, as the \$3.6 million realized by the sale could be used to pay off part of the Exchange's \$6.5 million debt on its building, thereby reducing annual dues for all members.

The optimism of the Governing Committee was not shared by many members, and there was a groundswell of opposition to this surprise proposal. Opposition members felt that the Governing Committee had acted secretly and against their interests, and was engineering an increase in competition.³⁶ Simmons attempted to placate the membership by meeting with them on 4 November. In the end, the Governing Committee failed to persuade the membership, and the resolution was rejected by a vote of 648 to 268.³⁷ Most observers pointed out that members expected to see their earnings drop if this proposal had been implemented.³⁸

After this ignominious defeat, the leadership abandoned plans to expand the exchange until the extraordinary stock market boom began to place additional pressure on the exchange. On 15 October 1928 President Simmons called a meeting of the Governing Committee to establish a Special Committee to consider again the question of whether the membership should be increased. To avoid a repeat of the 1925 failure, Simmons convoked a meeting of the members on 30 October 1928 before any recommendation was made. There he put forth the case for an increase in membership.³⁹ He pointed out how the growth of the market affected every group of brokers on the exchange. For the commission house and two-dollar brokers, the extension of New York firms' ticker wires, along with the establishment of branch offices and advertising by radio, had greatly augmented the inflow of business. Simmons observed that the odd-lot houses, whose business was also booming with the growth of the small investors, found it hard to obtain sufficient partners or representatives on the exchange. He told the members:

all this increased business must be poured into our floor through an artificially restricted membership, which has obviously reached its capacity this year for handling the volume of business offered. There is no use in continuing our other efforts to extend and expand our business unless a comparable expansion occurs in our membership.

³⁵ NYSE Resolution, 28 October 1925; Simmons, "Letter to the Members of the NYSE," 28 October 1925 and, *Report of the President*, 1 May 1925 / 1 May 1926.

³⁶ *Commercial and Financial Chronicle*, 31 October 1925; and *New York Times*, 5 November 1925.

³⁷ *New York Times*, 12 November 1925; and *New York World*, 3 February 1929.

³⁸ *New York World*, 3 February 1929; and *New York Herald*, 26 January 1929.

³⁹ Simmons, *Report of the President*, 1 May 1928 / 1 May 1929; NYSE archives, "Memorandum on Increasing Stock Exchange Memberships," undated.

The inflow of orders placed specialists under enormous pressure to execute them and handle the paperwork. He bluntly told the members:

There is no denying that in the great markets of this year, the Stock Exchange has been hampered in giving the public perfect brokerage service because of insufficient attendance on the floor. As our markets grow larger and larger in volume, there is no reason for doubting that poor execution of public orders will continually grow worse.

Simmons believed that the NYSE stood to lose the good will of the American public. He argued that laborsaving devices had been fully exploited and “no new mechanical device can in the future make up for insufficient members on the floor to handle the business.” The inability to provide high quality service would throw business to the New York Curb Market and the out-of-town exchanges, which were beginning to list issues whose sole market had been in New York. Now that Europe had returned to the gold standard, he also saw the specter of competition from the London and Berlin markets. He noted that neither of those two exchanges limited their membership and even the Paris exchange was considering adding new brokers.⁴⁰

Faced with even higher future orders, Simmons proposed the issue of a seat “dividend” for each member that would double the number of seats to 2,200. To provide additional revenue for a future physical enlargement of the exchange, he recommended an increase in the transfer fee on seats from \$4,000 to \$10,000. By increasing the number of seats and improving facilities, Simmons claimed that each exchange member would be able “to have his cake and eat it too.”

While Simmons lobbied the membership, the Special Committee sent a poll to the members of the exchange. Members were queried about how quickly—within three months, within one year, or more than one year—they would sell their rights if there were a 25, 50, or 100 percent increase in membership. In addition, the poll asked if members would try to buy up other rights and thereby be able to nominate a candidate if there were a 25 or 50 percent increase in membership.⁴¹ Based on 662 answers, the special committee concluded that that increasing the number of potential seats by 25 percent would be acceptable to the membership.

As in 1925 and even 1879, the brokers would have been concerned that more competition would reduce their current profits, but the value of their seats (reflecting the capitalized value of their future earnings) could also decline if the NYSE became less valuable. If business continued to slip away, other exchanges would have lower bid-ask spreads

⁴⁰ NYSE archives, “Memorandum on Increasing Stock Memberships,” undated.

⁴¹ NYSE archives, Ballot, undated.

and might gain dominance in many securities. Even if there was more competition on the floor, brokers had to ensure that the exchange had the capacity to continue attracting the growing flow of orders. Thus, brokers might be willing to accept a 25 percent increase in the number of seats, as some increase in competition on the floor would be offset by maintaining the dominance of the exchange in an expanding market.

Following this sentiment, the Special Committee produced a report that recommended a 275 member increase to be achieved by the issue of a one-quarter seat right to each current member.⁴² Transfers would begin on 18 February 1929 with all bids and offers in multiples of \$500.⁴³ In order to encourage the rapid creation of new seats, the committee proposed that members be required to dispose of their rights within three years.

Yet, increasing the number of seats was not the only possibility. The Special Committee had received other proposals for expanding the capacity of the exchange. The most important of these proposals were to: allow partners or employees of members, especially clerks, to make contracts, substituting for members in some tasks on the floor; or permit leasing of seats by inactive members to increase the number of active traders on the floor. Both of these alternatives appear to have been rejected because they only found favor with out-of-town brokerages and the larger in-town brokerages that promoted them before the committee.⁴⁴

A leading opponent of the seat dividend proposal was Edward Allen Pierce. A former member of the stock exchange, Pierce was a partner in one of the largest brokerages, a firm with 18 partners, three of whom were members of the exchange. Pierce claimed that more seats would dilute their value and would not necessarily add brokers on the floor. Instead, he proposed that out-of-town members be allowed to lease their seats for a fee to individuals approved by the Admissions Committee. As an example, he suggested that an annual fee of \$50,000 might be set, with \$30,000 going to the lessor, \$10,000 to the Exchange, and \$10,000 apportioned among the members to compensate for the increased competition. This proposal received relatively little support as most members of the exchange were neither members of large brokerages nor out-of-town houses, and they owned but one seat. Allowing the leasing of seats would expand capacity and increase competition for them. The

⁴² One member of the committee dissented, complaining that there was not enough physical space on the floor of the exchange to accommodate 275 new members, recommending only a 10 percent dividend. Letter of Edgar Boody to the Governing Committee, 19 January 1929.

⁴³ Special Committee Letter to Members of the New York Stock Exchange, NYSE archives, 7 February 1929.

⁴⁴ NYSE archives, C. Clothier Jones, Letter to Ashbel Green, Secretary of the NYSE, 17 December 1928.

proposed compensation from leasing even 50 or 100 seats seemed small when spread among all the members.

Similarly, allowing clerks on the floor to assist with some activities or partners to substitute for the owners of the seat seemed to offer greater benefits to the larger brokerages that might more easily hire additional staff or get a partner as a substitute. With a clerk's active assistance on the floor, a broker would be able to handle more business than an individual broker. Both of these alternatives were rejected by the committee. Clerks' roles on the floor were then narrowly defined, and the Governing Committee adopted a rule that precluded the possibility of clerks acting in any capacity as brokers on the floor.⁴⁵ Leasing remained off the table until 1978, when the ownership of seats was dominated by large brokerages.⁴⁶ The promise of the quarter-seat dividend was that it would expand capacity and allow the NYSE to maintain its position as the dominant market, while compensating all brokers for the increase in competition on the floor; and crucially it had the potential for increasing the value of a seat if it augmented the exchange's competitiveness with other markets.

On 24 January 1929 the Governing Committee convened and voted 31 to 1 to adopt the recommendations of the Special Committee.⁴⁷ A straw vote revealed that members favored the increase by a ratio of three to one.⁴⁸ The *New York Herald* wrote that the membership was being asked to "vote themselves a 'melon' of \$137,500,000" (on the assumption that each right would be worth \$125,000).⁴⁹ Unlike 1925, this time the leadership swayed the members; and on 7 February 1929, by a vote of 782 to 133, the members overwhelmingly approved the expansion.⁵⁰

DID THE DIVIDEND INCREASE THE VALUE OF THE NYSE?

The decision to augment the number of seats by 25 percent was an admission that the structure of the exchange needed to be revamped.

⁴⁵ *Commercial and Financial Chronicle*, 15 December 1928.

⁴⁶ The Special Committee also complained that leasing and permitting clerks on the floor would undermine the "individual moral and financial responsibility" of traders on the floor because they might have little or no capital in the case of losses. Advocates responded that many seats were held by individuals who had little or no capital, and whose purchase money has been provided by their firms. Thus, responsibility rested with the firm, not with the individuals. See NYSE archives, E. A. Pierce, Letter to E. H. H. Simmons, 30 January 1929; and *New York World*, 3 February 1929.

⁴⁷ NYSE Governing Committee Minutes, 21 January 1929, pp. 619–20; and 24 January 1929, p. 631.

⁴⁸ *New York World*, 3 February 1929.

⁴⁹ *New York Herald*, 26 January 1929.

⁵⁰ NYSE Governing Committee Minutes, February 13, 1929.

The announcement of this increase was accompanied by a substantial contemporaneous gain in the value of a seat and of the exchange. Before any discussion of a seat dividend, the price of an individual seat in October 1928 was \$450,000, implying that the aggregate pre-announcement value of the exchange would have been \$495 million. The postannouncement prices, which fluctuated between \$560,000 and \$625,000, yield aggregate values for the exchange of \$616 to \$688 million. For the postdividend distribution prices, which ranged between \$420,000 and \$500,000, the exchange was valued between \$578 and \$688 million.

However, the great bull market was in full swing, and prices of seats may also have been climbing because of ordinary fundamentals. To separate the rise in prices due to anticipated gains in the competitiveness of the exchange from that of basic fundamentals, an event study is useful.⁵¹ Members of the exchange held strong views about any change in the structure of the exchange. Holding the other factors constant, the announcement of a change in the number of seats should have had an immediate effect on their prices. To examine the effects of announcements proposing changes in number of seats on the value of the NYSE, we employ a CAPM model to estimate NYSE seat returns and the abnormal returns induced by the announcements.⁵² We conduct two event studies; the first event is the announcement of the failed proposal to add seats in 1925, and the second is the announcement of the successful increase in 1929.

Owing to the fact that seat sales for the whole week were only recorded on the last day of the week, we restrict our analysis to weekly changes in the prices of seats, taking the last observed sale as the end of week price. The fundamentals that govern commissions and profits for brokers, and hence, seat prices on the exchange are the level of stock prices and the volume of shares traded. In the simplest model where microstructure, technology, and regulation are held constant, profits to brokers should be a function of the stock prices on the NYSE and the volume of shares traded. Assuming that the discount rate and commission rate are constant, seat prices will change only if there has been a

⁵¹ Campbell, Lo, and Mackinlay, *Econometrics*.

⁵² Seat prices provide insight into the efficiency of the exchange under different technology, rules, and regulations. Schwert, "Stock Exchange Seats," examined the efficiency of the market for seats, using end-of-month seat prices for 1926–1972. In similar studies, Jarrell, "Change"; and Golbe, "Negotiated Commissions" and "Has Deregulation," used end-of-month postwar data to examine the effects of deregulation on the exchanges. More recently, Keim and Madhavan, "Information," employed all bids, offers, and sale prices of NYSE seats for 1973–1994 to study the determinants of pricing and the ability of seat prices to predict future activity on the exchange; and Keim and Madhavan, "Relation," used additional annual data to look at the predictive power of seat prices for future stock market returns.

change in volume or share prices. The two measures of fundamentals we use are the innovations in the Dow Jones Industrials average and in the volume of shares traded on the NYSE. We employ both the change in the daily volume from week to week and the change in the volume over the last thirty days. Seat price returns and innovations in the explanatory variables were all stationary. Using Dickey-Fuller tests we easily rejected the hypothesis that there were unit roots in the time series.

We estimated the following CAPM regression⁵³

$$R_t - r_{f,t} = \alpha + \sum_{i=0}^k \beta_i (r_{m,t-i} - r_{f,t-i}) + \sum_{i=0}^k \delta_i \text{DailyVol}_{t-i} + \sum_{i=0}^k \theta_i \text{30DayVol}_{t-i} + \varepsilon_t \quad (2)$$

where R_t is the return on a seat on the New York Stock exchange over time t , $r_{f,t}$ is the risk free rate, measured by the three- to six-month rate on U.S. Treasury notes and certificates.⁵⁴ The market return, r_m , is the return on the Dow Jones Industrials. The variables for the changes in daily volume, DailyVol_t , and monthly volume 30DayVol_t , use volume data for the NYSE.⁵⁵

To conduct our event studies, we need to define the time of the event.⁵⁶ Prices for seats would have moved once members became convinced that a change in the number of seats would or would not occur. The movement of seat prices around the 1925 event window is depicted in Figure 4. The first public knowledge of a proposal to increase seats was 28 October 1925 when the Governing Committee issued a resolution to create and sell 25 new seats. This date marks the beginning of the event window, although some discussion of the proposal might have leaked out beforehand. The proposal was rejected by the membership on 11 November 1925, closing the window. This failure seems to have occasioned a rise in seat prices from \$130,000 to \$150,000; the uncertainty about the rise in the number of seats feared by brokers may have depressed prices until the outcome of the vote was known.

The event window for the 1928–1929 quarter seat dividend is shown in Figure 5. Members' expectations about the proposed increase in the number of seats probably evolved over time. There was no simple

⁵³ See Keim and Madhavan, "Relation."

⁵⁴ The seat return is the weekly percentage change in the price of a seat. The data on interest rates were obtained from the Board of Governors of the Federal Reserve System, *Banking and Monetary Statistics*.

⁵⁵ New York Stock Exchange, *Yearbooks*.

⁵⁶ Binder, "Event Study Methodology."

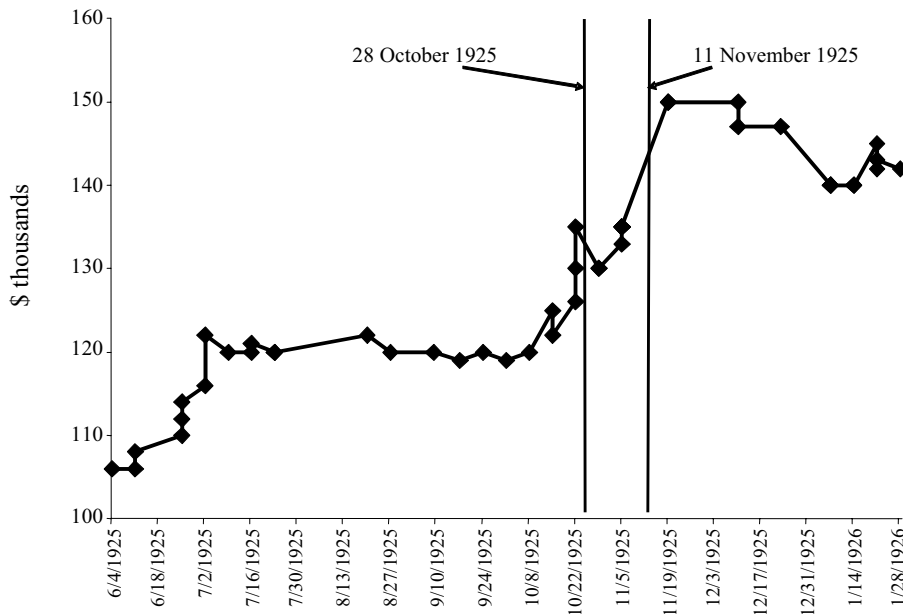


FIGURE 4
NYSE SEAT PRICES, JUNE 1925–JANUARY 1926

Source: Source: NYSE, Committee on Admissions.

announcement that would have influenced prices; and given the failure in 1925, members might well have been skeptical about new efforts by the leaders of the exchange. The first indication that an increase in the number of seats was possible appeared on 15 October 1928 when President Simmons called a special meeting of the Governing Committee to discuss whether to increase membership. This body decided to convene a Special Committee. Seat prices were already rising before 15 October, although this increase may have been driven by other fundamentals. There might also have been some private conversations that leaked out in advance of this meeting, which could have raised seat prices. Consequently, selecting this date as the beginning of the event window may underestimate the abnormal return. As he did not want to be accused of being secretive, as he had been in 1925, President Simmons pressed the case for increasing membership in a meeting with members on 30 October 1928. At this point, the potential increase in the number of seats could have ranged from 25 to 100 percent. Members were then polled on how fast new seats could be formed. The official proposal for the quarter-seat dividend came in a report by the Special Committee that was submitted to the Governing Committee on 21 January 1929. Three days later on 24 January, the Governing Committee reconvened and

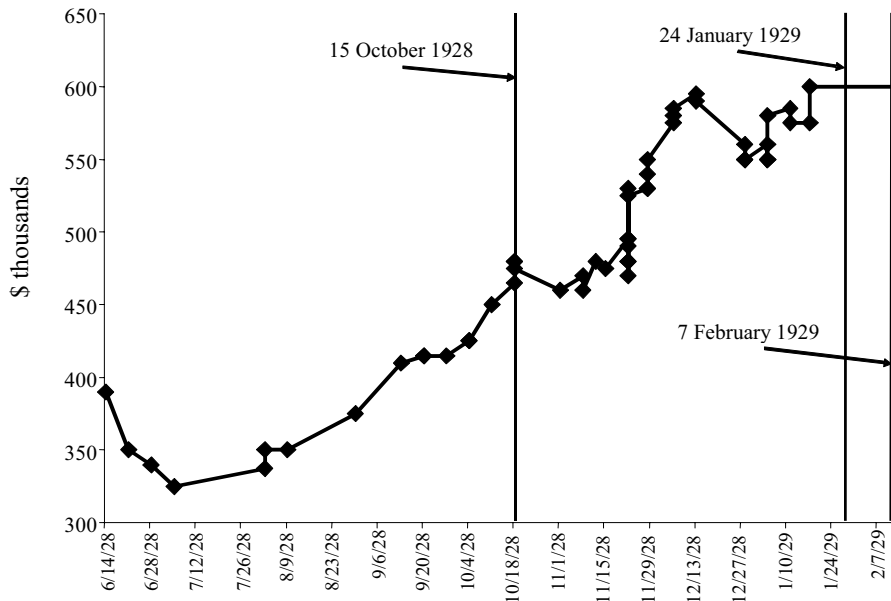


FIGURE 5
NYSE SEAT PRICES, JUNE 1928–FEBRUARY 1929

Source: NYSE, Committee on Admissions.

voted to accept the report's recommendations, a key moment marked on Figure 5. This action was followed by the members' favorable vote on 7 February 1929 that permitted transfers to begin on 18 February 1929. Thus, the second window covers the period from 15 October to 7 February and encompasses a rise in the value of a seat from \$425,000 to \$600,000.

The estimates of equation two for both events are presented in Table 5.⁵⁷ Although only one lag is used, the results are robust to other lag structures. One typical feature of asset return data is that the volatility of asset returns is serially correlated.⁵⁸ To correct for possible autocorrelation and heteroskedasticity, we have estimated the Newey-West standard errors and reported these in the table. The first regression estimates

⁵⁷ A more complete test of the announcement effects would include a test of the effects on the returns to seats on regional exchanges to determine if there were negative excess returns from the expansion of the NYSE. Unfortunately, such tests are not feasible, as data for these exchanges is only monthly and they were thin markets with fewer seats and fewer trades. The Curb Exchange in New York was bigger than the regionals, but even it had a relatively thin market in seats compared to the NYSE. Furthermore, the Curb had a long-term cooperative relationship with the NYSE. See White, "Anticipating the Stock Market Crash."

⁵⁸ See, Campbell, Lo, and MacKinlay, *Econometrics*; and Poon and Granger, "Forecasting Volatility."

TABLE 5
DETERMINANTS OF THE RETURNS TO NYSE SEATS

	1920–1925	1920–1928
Intercept	0.001 (0.003)	0.005+ (0.003)
$r_{m,t} - r_{f,t}$	0.189+ (0.104)	0.191* (0.111)
$r_{m,t-1} - r_{f,t-1}$	0.297+ (0.164)	0.357* (0.136)
Monthly Vol _t	0.009 (0.009)	0.005 (0.007)
Monthly Vol _{t-1}	0.003 (0.008)	-0.004 (0.009)
Daily Vol _t	-0.017 (0.028)	-0.054 (0.039)
Daily Vol _{t-1}	0.009 (0.041)	-0.008 (0.027)
Number of Observations	211	320
Adj. R ²	0.060	0.066

* indicates significance at the 5 percent level.

+ indicates significance at the 10 percent level.

Note: The Newey-West standard errors are in parentheses.

the model using data from 8 January 1920 to 15 October 1925, the end of the week for the last recorded sale before the opening of the first event window. The second regression covers the period from 8 January 1920 until 11 October 1928. The estimates for the fundamentals leading up to the first and second events are very similar. A rise in the market returns and the innovations in the 30 day volume caused a positive change in the return to a NYSE seat. However, both measures of changes in volume have little effect. The fit of the equations is relatively weak, although this is typical of most event studies of asset returns.⁵⁹

The difference between the observed returns on NYSE seats and the fitted values gives the abnormal returns. Figures 6 and 7 plot the cumulative abnormal returns, beginning several months before the event windows for 1925 and 1929.⁶⁰ In the case of the abortive 1925 attempt to increase the number of seats, there is no movement at the time of the announcement. But, there is a large sustained leap in the abnormal return immediately after the members voted to block the creation of the new seats, a move that reflected their view that this action preserved the value of their seats.

⁵⁹ See Keim and Madhavan, "Relation."

⁶⁰ Typical of event studies, the cumulative abnormal returns exhibit considerable, apparently unexplained movement.

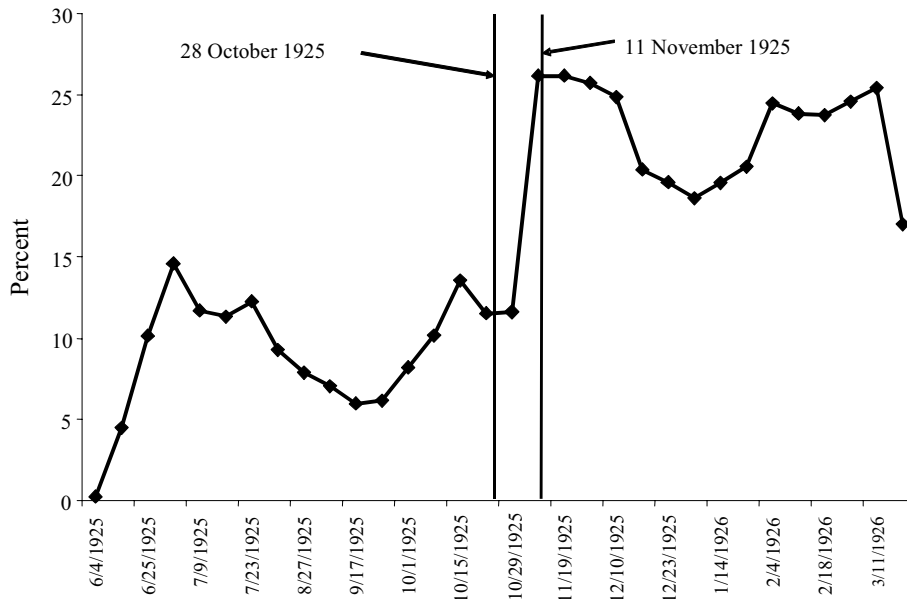


FIGURE 6
CUMULATIVE ABNORMAL RETURNS, JUNE 1925–MARCH 1926

Source: See the text.

In Figure 7, large cumulative abnormal returns begin at the opening of the event window in 1929 and reach about 20 percent. This increase suggests that the price of seats may have increased by 15 or perhaps 20 percent (if news leaked out early) because of the quarter-seat dividend. We conclude that the potentially greater liquidity of the exchange made the seats more valuable. The brokers expected the expansion to ease the NYSE's capacity constraint and enhance its competitiveness. This increase in abnormal returns does not appear to be related to the stock market boom because the timing of these returns does not match the movements in the boom well. The first run up in the market began in March 1928, well in advance of the seat dividend. The market again experienced high monthly returns in October and November of 1928 when discussions of the seat dividend were at an early stage, but the extraordinary returns in summer of 1929 have no effect on seat prices, which are roughly flat. In fact, in a subsequent study, it appears that NYSE brokers became very pessimistic during the summer and the model of seat prices forecasts much higher prices than were observed, suggesting that brokers may have expected a collapse in the market.⁶¹

⁶¹ White, "Anticipating the Stock Market Crash."

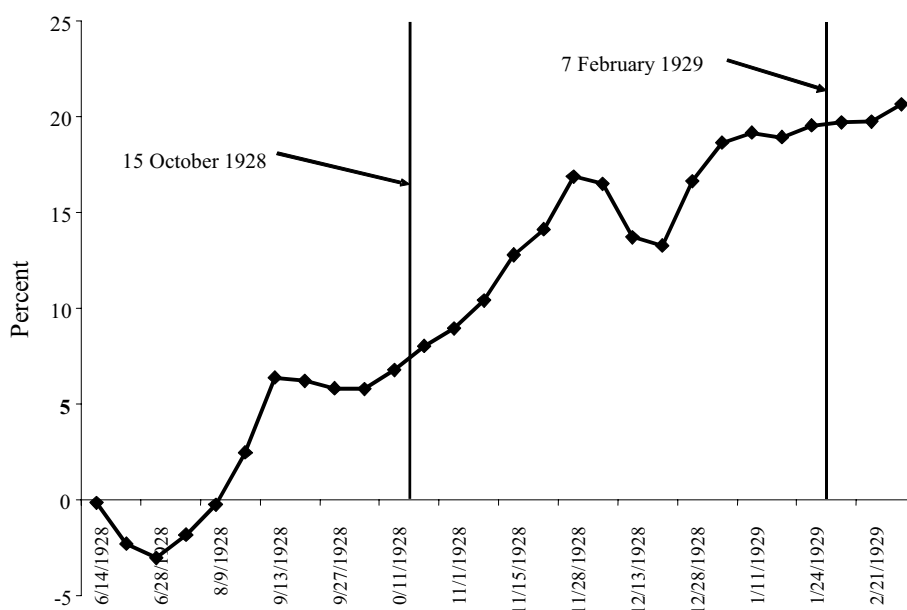


FIGURE 7
CUMULATIVE ABNORMAL RETURNS, JUNE 1928–FEBRUARY 1929

Source: See the text.

SOLUTION OR FALSE HOPE?

Were the members of the exchange too sanguine, expecting that they could prevent further erosion of the NYSE's première position by the quarter-seat dividend? Whether or not the exchange improved the liquidity and the competitiveness of the exchange should be visible in the behavior of the post-seat-dividend bid-ask spreads. Separate regressions of equation one that combine the high volume days for 1928 and 1929 and low days for 1928 and 1929 reveal the extent of the changes. A dummy variable for the extraordinarily high day of 26 March 1929, when volume climbed above 8 million shares, is included to test for any higher-level capacity constraint. The interaction terms are now set equal to one for the predividend period to provide a means of comparing the effects of the seat increase for both high and low volume days. If the NYSE had been capacity constrained before the seat dividend but not afterwards, we would expect the coefficients on the interaction terms for the exchange-wide variables, total volume and the Herfindahl index, to be significant in the combined high volume regressions but not in the combined low volume regressions.

TABLE 6
ESTIMATES OF THE BID-ASK SPREADS: COMBINED HIGH AND LOW VOLUME
DAYS, 1928 AND 1929

	High Days 1928–1929 Fixed Effects	High Days 1928–1929 Fixed Effects	Low Days 1928–1929 Fixed Effects	Low Days 1928–1929 Fixed Effects
<i>Sales</i>	-0.188*	-0.196*	-0.141*	-0.215*
	(0.007)	(0.007)	(0.011)	(0.017)
<i>Closing price</i>	-0.444*	-0.438*	-0.576*	-0.518*
	(0.025)	(0.024)	(0.046)	(0.057)
<i>Yearly volatility</i>	0.274*	0.281*	0.179*	0.219*
	(0.019)	(0.019)	(0.034)	(0.048)
<i>Daily volatility</i>		0.000		0.238*
		(0.000)		(0.030)
<i>Call loan rate</i>	0.887*	0.878*	-0.234	-0.408+
	(0.162)	(0.160)	(0.144)	(0.077)
<i>Total exchange volume</i>	0.143	0.134	0.132+	0.149
	0.145	(0.144)	(0.061)	(0.077)
<i>Herfindahl index</i>	1.691*	1.668*	0.019	-0.154
	(0.185)	(0.183)	(0.035)	(0.101)
<i>Dummy march 26, 1929</i>	-0.681*	-0.658*		
	(0.143)	(0.142)		
<i>Predividend * sales</i>	0.060*	0.018	0.032+	0.014
	(0.009)	(0.098)	(0.014)	(0.023)
<i>Predividend * close</i>	-0.119*	-0.084	-0.033	-0.036
	(0.023)	(0.023)	(0.026)	(0.039)
<i>Predividend * yearly volatility</i>	-0.001	-0.004*	-0.091*	-0.187*
	(0.001)	(0.001)	(0.034)	(0.056)
<i>Predividend * daily volatility</i>		0.0528*		-0.001+
		(0.004)		-0.000
<i>Predividend * call rate</i>	-1.412*	-1.227*	0.750+	0.949+
	(0.176)	(0.175)	(0.335)	(0.424)
<i>Predividend * Herfindahl</i>	-2.078*	-1.991*	-0.126	0.026
	(0.187)	(0.185)	(0.096)	(0.117)
<i>Predividend * total volume</i>	0.846*	0.803*	0.030	0.050
	(0.187)	(0.077)	(0.072)	(0.092)
Constant	-8.572*	-8.248*	0.815	1.102
	(2.377)	(2.351)	(1.459)	(1.897)
Adjusted R^2	0.540	0.571	0.443	0.503
Number of Observations	7,559	7,555	5,480	3,366
Number of Stocks	985	985	1,068	801

* indicates significance at the 1 percent level.

+ indicates significance at the 5 percent level.

Note: Standard errors are in parentheses.

Table 6 presents fixed effects regressions for the combined high and low volume days. The estimates for the stock-specific variables are again stable and similar to previous estimates. On low volume days, higher volume of trading or greater concentration appears to have no effect. On high volume days, all the exchange-wide variables are highly

TABLE 7
PREDICTED PERCENTAGE BID-ASK SPREAD

	1928 High Volume	1929 High Volume
<i>Mean total volume</i>	0.777	0.759
<i>1 percent increase in total volume</i>	0.804	0.761
<i>Total volume at 4 million</i>	0.377	0.695
<i>Total volume at 5 million</i>	0.801	0.734
<i>Total volume at 6 million</i>	1.483	0.768
<i>Total volume at 8 million</i>	3.920	1.309

Source: See the text.

correlated, as is the dummy for 26 March 1929, making it difficult to estimate the coefficients precisely. The flood of orders on the 8 million share day drove bid-ask spreads down further. The only unexpected result is that the Herfindahl index has a positive and significant sign. More importantly, the interaction terms for the exchange-wide variables confirm the presence of capacity effects on high volume days before the increase in the number of seats. Before the seat dividend, higher total volume on the exchange significantly increased individual stocks' bid-ask spreads, mitigated by more concentrated trading as indicated by the coefficient on the Herfindahl index. These effects are absent in the combined low volume regressions, as conjectured. Thus, the increase in the number of seats appears to have dampened the effects of volume surges on bid-ask spreads.

Table 7 presents the predicted spreads for high volume days in 1928 and 1929 using the mean values of the variables. In contrast to the results for 1928, the response of bid-ask spreads to high volume days was drastically reduced in 1929. A 1 percent increase in total volume had an imperceptible effect, and the increases from five to six million remain modest, under one tick. Although the coefficient on the high volume day, 26 March 1929, is negative, these estimates suggest that there may have been a new higher capacity constraint even with 1,375 seats. At eight million shares, the bid-ask spread would have jumped to 1.309 percent, but it still would have been far below a predicted 3.92 percent when there were 1,100 seats. Thus, there was still a substantial weakening of the effects of volume surges on bid-ask spreads after the quarter-seat dividend. The expansion of the exchange had enhanced its liquidity and competitiveness.

The expansion of the exchange created more competition on the floor of the exchange for existing brokers. Did they lose out or did business on the exchange rise enough to compensate them for potentially lower bid-ask spreads? Unfortunately, there are no records of brokerage

houses available to test this possibility. However, a naïve calculation suggests that the increased volume following the expansion outweighed the decline in bid-ask spreads. At the mean volume prior to the expansion, the mean percentage bid-ask spread was 0.777 percent; afterwards it was 0.759 percent. Trading was consistently higher month-by-month in 1929 compared to 1928. In July 1928 the market value of shares traded on the NYSE was \$52,903 million and in July 1929 it was \$77,264 million.⁶² These figures would imply that profits would have been \$411 million for 1928 and \$586 million for 1929, an increase of more than 25 percent. The exchange's gambit thus appears to have been quite successful.

CONCLUSION

After World War I the flow of orders to American stock exchanges was rapidly increasing, and the NYSE reached a capacity constraint that was determined by the fixed number of seats. Given the state of technology and the rules of the exchange, higher order flows produced delays and reduced the quality of service to customers. Concern over the potential loss of business to competing exchanges forced the NYSE to consider its options. Although some members were unhappy, the overwhelming majority found that the creation of a quarter-seat dividend provided them with a means to personally capture the gains from increasing the efficiency of the exchange. The rise in the number of seats eased the pressure on the bid-ask spread from surges in volume. As anticipated, the increase in seats greased the order processing machine on the floor of the exchange and delivered benefits to customers, even as competition from other exchanges continued to grow. The 275 new seats moved, but apparently did not eliminate, the constraint, as critics who pushed for an even greater increase had warned. However, this boundary would not be tested until long after the Great Depression. Volume had exceeded 5 million shares on 24 days in 1928 and 36 days in 1929. Afterwards, it was a rare occurrence: one day each in 1937, 1939, 1946, 1959; two days in 1957, 1958, and 1960; and three days in 1955. Only when the go-go years began in 1961 and the exchange experienced 5 million plus shares on 41 days would the capacity of the exchange be tested again.

⁶² NYSE, *Yearbook 1928–1929*.

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