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WHAT HAPPENED TO LIQUIDITY WHEN WORLD WAR I SHUT THE NYSE?

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## Abstract

### What Happened to Liquidity When World War I Shut the NYSE?

The suspension of trading on the New York Stock Exchange for more than four months following the outbreak of World War I fostered a substitute market on New Street as a source of liquidity. The New Street market suffered from a lack of price transparency because its transactions were not disseminated on the NYSE ticker and its quotations were blacklisted at the leading newspapers. This paper shows that despite the impaired information flow and the somewhat wider bid-ask spreads compared with the New York Stock Exchange, New Street offered economically meaningful liquidity services. The absence of price transparency turned an individual stock's reputation for liquidity into an important variable in explaining the structure of bid-ask spreads on New Street.

## I. Introduction

It is not so surprising that the outbreak of World War I forced the New York Stock Exchange (NYSE) to close. The threat of European liquidation of US securities probably justified a suspension in trading -- as a preventive measure or circuit breaker. It is surprising, however, that the Exchange remained shuttered for more than four months, from August 1, 1914 to December 12, 1914.

Closing the Exchange for more than four months would be unthinkable today. It was also unthinkable in 1914.<sup>1</sup> The only other time the NYSE suspended trading, other than to commemorate some departed dignitary, was during the Panic of 1873 when more than thirty Wall Street firms failed<sup>2</sup>. Even so, according to Sprague [1910, p.13] the Exchange closed for only ten days in 1873, from September 20 until September 30. In August 1914 the Exchange had to deal with only one failure.<sup>3</sup>

How could the New York Stock Exchange remain closed for almost the entire second half of 1914? From the outset, the Wilson Administration wanted the Federal Reserve Banks in place before reopening the Exchange.<sup>4</sup> Wilson's

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<sup>1</sup> Noble [1915, p. 87] says: "If at any time up to July, 1914, any Wall street man had asserted that the stock exchange could be kept closed continually for four and one-half months he would have been laughed to scorn."

<sup>2</sup> The Wall Street Journal, August 4, 1914, reprinted a list of 33 New York firms that failed in 1873, led by Jay Cooke & Co.

<sup>3</sup> Noble [p. 21] mentions only the failure of S. H. P. Pell & Co. The New York Times, September 23, 1914, reports that three firms failed during this period.

<sup>4</sup> I develop this argument in "Birth of the Federal Reserve: Crisis in the Womb," [in process]. The following quote from the New York Times on August 1, 1914 is instructive: "After a conference with the President, [Treasury] Secretary McAdoo expressed the belief that there should be no further serious delay in getting the new reserve bank system fully organized... The international character of the Federal Reserve banks under the new law is broad and flexible in the matter of dealing with gold coin and bullion..." The article goes on to say: "The closing of the New York

Treasury Secretary, William G. McAdoo, succeeded in keeping the Exchange closed until after the Reserve Banks opened (November 16, 1914), in part, because a liquid marketplace had emerged to accommodate trading. This liquid alternative, the New Street market, relieved the pressure to reopen the Exchange.

The contemporaneous commentary frequently disparaged the New Street market. The Wall Street Journal [January 7, 1915] said: “The quotations that were made in New Street were no more legitimate than the quotations that were made in Belgium, where people with securities in their pockets, and fleeing from war and starvation, sold them for cash at thirty and forty percent discount to some itinerant peddler.” More recently, Friedman and Schwartz [1963, p.172fn] referred to New Street as an ‘outlaw’ market and Sobel [1968 p.344] called it a ‘gutter’ market.

New Street has been discredited largely out of ignorance. That ignorance stems from an effective campaign by the New York Stock Exchange during the trading suspension to suppress New Street prices. The NYSE Ticker did not disseminate New Street transactions. Henry Noble, President of the NYSE, successfully lobbied the leading newspapers of the day to embargo New Street quotations (see Noble [1915, pp.24-6]). The press satirized the legitimacy of New Street, and academics perpetuated the misrepresentation, because price data were unavailable publicly to refute the allegations.

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Stock Exchange was approved at the White house and the Treasury Department.” President Wilson succeeded in getting the Federal Reserve Board in place by August 10<sup>th</sup> but it took until November 16<sup>th</sup> for the regional banks to open for business.

It turns out that the Exchange committee established to oversee NYSE business during the suspension closely monitored the New Street market. Their records provide bid and ask prices on stocks traded there. I have examined those quotes and found that New Street provided economically meaningful liquidity services despite somewhat wider bid-ask spreads on New Street compared with the NYSE. For example, New Street offered a two-sided market that dominated an alternative facility sponsored by the NYSE Clearing House more than sixty percent of the time.

How can a market provide efficient liquidity services without price transparency? I will show that when price data are suppressed, market participants rely on other sources of substitute information. In particular, an individual stock's 'reputation for liquidity' becomes an important determinant of a stock's bid-ask spread. Reputation often matters in the liquidity services business, especially for marketmakers and exchanges. The lack of price transparency on New Street extends the role of reputation to individual stocks. I estimate a cross-sectional model of bid-ask spreads on New Street showing that securities with an established reputation for liquidity had narrower spreads.

Two objectives motivate this paper: (1) To set the record straight about the effectiveness of the substitute market that emerged during the four-month closure of the New York Stock Exchange; (2) To show how a market with impaired price transparency overcomes its shortcomings. Section II explains the origins of New Street and Section III profiles its battle with the establishment to avoid suppression. Despite the attempts at muzzling New Street, Section IV

shows that New Street's liquidity dominated the New York Stock Exchange's Clearing House facility. The data also show that the wider spreads on New Street compared with the NYSE were not large enough to produce a measurable 'liquidity discount' in stock prices.<sup>5</sup> Section V presents the cross-sectional model of bid-ask spreads that highlights an individual stock's reputation for liquidity as an antidote to the impaired flow of price information.

## II. The Birth of New Street

According to Noble [1915, pp.11-12], the Governing Board of the New York Stock Exchange voted to suspend trading less than fifteen minutes before the scheduled 10am opening bell on Friday, July 31, 1914. On that same morning the front page of the New York Times carried a headline that read: "Bankers Here Confer on War: Closing of Stock Exchange Not Necessary, Meeting at Morgan Offices Decides." What happened between the meeting at Morgan offices (reported taking place late Thursday afternoon) and 9:45 Friday morning?

Most observers believed that the Exchange closed because an overnight build-up of sell orders from Europe would pressure stocks downward.<sup>6</sup> But the New York Times article just cited quotes an unnamed banker saying; "We think the Exchange should not be closed on account of the heavy European liquidation so long as there are buyers in the market." And everyone knows that there are

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<sup>5</sup> Amihud and Mendelson [1986] and Silber [1991] show that illiquidity has a potential negative impact on stock prices.

<sup>6</sup> The major European exchanges had already closed so that sales could not take place abroad. See footnote 11 for some contradictory evidence on whether prices would have declined had the NYSE opened.

always buyers at a price. Instead, pressure of another sort nailed the Exchange shut. At 9:30 on Friday morning, J. P. Morgan, Jr. relayed a message to the Exchange from Treasury Secretary McAdoo [1931, p. 290], suggesting that the NYSE close.<sup>7</sup>

At the conclusion of the meeting on July 31<sup>st</sup>, Henry Noble, President of the NYSE, established the Committee of Five to oversee Exchange business during the suspension.<sup>8</sup> Formal approval of the Committee of Five came in a vote by the NYSE Governing Board on August 3<sup>rd</sup>. The Committee started work immediately. It met with representatives of the Bank Clearing House regarding certifying checks drawn on Exchange members; it dealt with the issue of clearing transactions completed before the suspension of trading; and it confronted the problem of securities trading outside of the Exchange.

Efforts to circumvent the suspension of trading began that first weekend of August 1914. The New York Times carried an advertisement on Monday, August 3, announcing: "Emergency Stock Market: Pending the resumption of trading on the New York Stock Exchange...we are prepared to buy and sell all classes of securities..." It was signed: "New York Curb."<sup>9</sup> The confrontation dissipated the next day when the Wall Street Journal carried the following retraction: "No Dealings on the Curb: Advertisements which appeared in papers...are herewith

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<sup>7</sup> Noble [pp. 12-13] protests too much when debunking the "false assertions...that [NYSE] members were unwillingly coerced by outside pressure."

<sup>8</sup> Noble [p.12] says that he appointed Exchange members "H. K Pomroy, Ernest Groesbeck, Donald G. Geddes, Samuel F. Streit, with himself, to constitute the Committee."

<sup>9</sup> The New York Curb Market Association normally traded securities not listed on the NYSE (referred to as unseasoned securities) outdoors on Broad Street, near the New York Stock Exchange. In 1921 it became the American Stock Exchange and moved indoors (see Sobel [1972]).



absolutely repudiated.” It was signed: E. R. McCormick, Chairman, New York Curb Association.

The regional stock exchanges were another logical venue for trading NYSE listed securities. Back then nearly every major city had a stock exchange of its own, trading securities of local companies as well as NYSE listed stocks. The New York Times reported on August 1<sup>st</sup> that all regional exchanges voted to close along with the NYSE.<sup>10</sup> In addition, the Consolidated Stock Exchange, located in New York and trading primarily “odd-lots” of NYSE listed stocks, also closed on the morning of July 31.<sup>11</sup>

According to Noble [pp.34ff], a flood of communications inundated the Committee of Five to modify the trading prohibition. On August 5<sup>th</sup> the Baltimore Stock Exchange reported to the Committee that a member of the NYSE had “been guilty of going directly to the trust companies and making offerings of bonds.” The Committee responded [Noble, pp.34-7] that it would like the name of the member so that it could take appropriate action. Instead, on August 7 the Baltimore Stock Exchange urged the Committee to reopen the Exchange for bond trading.

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<sup>10</sup> The Times reports that Boston, Philadelphia, Pittsburgh, Baltimore, Detroit, Indianapolis, St. Louis, Chicago, Cincinnati, Columbus, Washington, and San Francisco all voted to close along with the NYSE, while Cleveland remained open (on July 31), but no business was done. Curiously, an announcement in the Wall Street Journal on September 4, 1914 states: “Cincinnati Stock Exchange: Did Not Suspend on August 1, But is Closed Now Until Further Notice.”

<sup>11</sup> The New York Times [August 1, 1914] reports that the Consolidated Stock Exchange opened (as usual) at 9:30 on July 31 but then closed at 10am when the NYSE voted to close. The New York Times also reported transactions in six stocks during that 30-minute trading session. Half of the stocks traded above the mid-point of their July 30 closing bid and offer and half traded below. Of the three that declined, only one stock fell by more than 2 percent. For the origin of the Consolidated Exchange see Nelson [1907]. Its demise in 1926 is discussed in Sobel [1972].

Noble [p. 38] admits that by August 11th “the growth of an unregulated outside market began to force itself upon the attention of the Committee.” He refers to the participants as “a group of mysterious individuals...seen loitering in New Street behind the Exchange.” But before long, Noble says [p.39], “this furtive little group developed into a good sized crowd of men who assembled at ten o’clock in the morning and continued in session until three o’clock in the afternoon.” Noble [p.40] was somewhat schizophrenic towards New Street. He recognized that “irregular dealing, as long as it remained within narrow limits and was not advertised in the press, furnished a safety valve;” but he then concludes: “the Stock Exchange authorities must do all in their power to hold the development of this market in check.”

The Committee of Five took a number of steps to restrain the New Street market (see Noble [p.40ff]). It barred the practice of some stock exchange members, who refrained from trading on New Street, but who indirectly helped the practice by clearing stocks for those who traded there. The Committee successfully persuaded the press to resist regular publication of New Street prices,<sup>12</sup> although there were still occasional published reports of “the very low figures at which some leading stocks were quoted.” But the most important step to counter the New Street market was taken on August 12<sup>th</sup> when the Committee authorized trading through the New York Stock Exchange Clearing House at prices “no less than the closing prices of Thursday, July 30, 1914.”

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<sup>12</sup> The Wall Street Journal [August 4, 1914] published Henry Noble’s denunciation of any attempt to establish quotations: “I must ask the newspapers of New York to cooperate with the officials of the Exchange in preventing these practices.” Noble [1915, p.26] congratulates the press on their cooperation.

Noble reports [p.42] that with the trading floor closed, the NYSE Clearing House required “a large clerical force [to] tabulate the orders received and bring purchasers and sellers together who were willing to trade in similar amounts and at similar prices.”<sup>13</sup> He goes on to say [p.43] that: “A very considerable amount of business began at once... [but] a little later this ‘Clearing House Market’ fell to the arbitrary minimum of the [July 30] closing prices...and the New Street market grew in proportion. During the darkest days of depression in prices...in the Street, ...business in the Clearing House almost ceased. [When] New Street prices rose again to the Clearing House level a relatively small business on the ‘outlaw’ market was transformed into a relatively large business conducted under the supervision of the Exchange.”

Noble’s observations are precisely what one would expect. Trading in ‘black markets’ increase in proportion to the spread between market-clearing prices and ‘officially sanctioned’ prices. And New Street was, in fact, a black market. But how did Noble observe the relationship he describes between the relative trading volume on the two markets and relative prices without knowing what New Street prices were? Was he simply speculating based on ‘first principles’ or did he follow New Street quotations more closely than he admits?

It turns out that Noble knew much more about New Street prices than he lets on in his “insider’s view of the crisis.”<sup>14</sup> An examination of the Records of the

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<sup>13</sup> Noble [p.42] quotes the Committee’s ruling as follows: “ Members of the Exchange desiring to buy securities for cash may send a list of same to the Committee on Clearing House...giving amounts of securities wanted and the prices they are willing to pay. Members of the Exchange desiring to sell securities...may send a list of same...giving amounts of securities for sale. No prices less than closing prices of July 30<sup>th</sup>, 1914 will be considered.”

<sup>14</sup> Noble’s opening paragraph in his book says: “At the present (1915), when the great events...are still close to us, even their details are vivid in our minds and we need no one to

Committee of Five reveals a collection of news clippings giving price quotations from the New Street market.<sup>15</sup>

Stock prices were unavailable to the general public because none of the usual sources carried New Street quotes. The NYSE successfully restrained the New York Times, the Wall Street Journal and the Commercial and Financial Chronicle. But people really needing the information could find it. In particular, the news clippings pasted into the Committee of Five Records came from the Morning Telegraph, normally a “theater and turf paper.”<sup>16</sup> Evidently, the New York Stock Exchange could not muscle the Morning Telegraph, which did not depend on Wall Street for regular news. Thus, the Morning Telegraph filled the void with a table of price quotations and descriptive commentary.

### III. A Profile of New Street

The New York Times [January 3, 1915] reviewed the activities of the New Street market as follows: “It furnished a market where stocks could be bought and sold by those who had especial need of liquidating their holdings or had money to invest...At the height of its activity, the New Street market consisted of

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rehearse them. Time, however, is quick to dim even acute memories and Wall Street, of all places, is the land of forgetfulness. This being the case, it seemed to the writer of these pages that some record be kept...by one who happened to be very favorably placed to know the story in its entirety.” Noble is right that first-hand histories benefit from ‘inside information’ but they often suffer from the protagonist’s perspective. In this case, Noble’s ‘land of forgetfulness’ clouded his story.

<sup>15</sup> I would like to thank Steven Wheeler, Archivist at the New York Stock Exchange, for help in locating the Records and for providing copies of some of the entries. The Records total four binders, each of which is about one inch thick. They contain all of the public releases issued by the Committee but do not describe any of its deliberations. In addition to the published price quotations, the Records also contain news clippings reporting on the Committee’s activities.

<sup>16</sup> I would like to thank Mitchell Stephens of NYU’s Journalism Department for the reference to Frank Luther Mott [1950, p.658] which has a passing mention of the New York Morning Telegraph.

about thirty-five brokers who dealt for cash only. In the downward slant of prices in October, it was estimated that fully 40,000 shares a day were handled for a number of days, fairly well divided between 100 share lots and fractional amounts of stock. The average daily turnover during September, October and November was placed...between 8,000 and 12,000 shares.”<sup>17</sup> By the time this relatively detailed description appeared in the New York Times, the New Street market had already disappeared. The need for its liquidity services evaporated on December 12, 1914, when the New York Stock Exchange reopened its trading floor to stocks.

The New York Times was much less charitable towards New Street when the upstart market was alive. On October 7, 1914, the Times said: “Despite the wider publicity given quotations on transactions alleged to have been made in the street market, dealings in listed securities have not yet reached a scale that justifies the acceptance of prices made outside the Stock Exchange as a basis for buying and selling.” This self-serving description legitimized the Times’ suppression of New Street quotes, allowing the Morning Telegraph to step in.

The Telegraph usually published New Street bid / ask quotations on between 60 and 110 securities, compared with 100-150 securities quoted regularly in the New York Times before trading was suspended.<sup>18</sup> The number of quotations on New Street depended primarily on the source. More than 100 stocks were usually listed when the table cited: “Quotes by Beekman Underhill,

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<sup>17</sup> NYSE volume for the same stocks traded on New Street averaged about 250,000 shares per day during the month prior to the trading suspension.

<sup>18</sup> Close to 600 stocks were listed on the NYSE in 1914. Van Antwerp [1913] reports 555 listed stocks in 1912 and 502 in 1907.

16 Beaver Street. ” About 60 stocks appeared when Edward F. Breen (44 Broad Street) was the source. Attributions disappeared after September 23<sup>rd</sup>, most likely because the implicit penalties (see footnote 19 below) for providing ‘outlaw’ market quotations exceeded the benefit of free advertising.

Who were the people, referred to above by Noble as “a group of mysterious individuals,” that quoted prices and participated in trading on New Street? It is not surprising that neither Edward F. Breen nor Beekman Underhill were associated with the NYSE.<sup>19</sup> The threat of sanctions for disobeying Exchange regulations surely deterred NYSE members from participating in New Street, although we saw above that the Committee of Five had to deal with collateral violations. But other markets had much less rigid control over their members (see [Sobel 1971, pp.3-4]).

Curb Market brokers and dealers were the most likely New Street professionals. First, they had the communication facilities needed to service market participants who lacked the timely price information normally provided by the NYSE ticker. The Morning Telegraph [August 25, 1914] comments: “...interest in the market ...increased judging from the inquiries received... some of them coming by telegraph from distant points.” Second, when the New York Times published [January 4, 1915] its annual review of financial developments of 1914, it included a table of ‘High and Low Prices’ on New Street compiled with the help of “quotations supplied directly to the Times by George S. Crap, a *dealer*

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<sup>19</sup> The membership list of the New York Stock Exchange for 1914 contains neither name. Breen applied for membership at the NYSE in 1922 but his meeting before the Committee on Admissions was cancelled on June 8<sup>th</sup>. No explanation was given for the cancellation, but given the “clubby” nature of the Exchange, it would not be surprising if Breen’s price quotations for New Street worked against his admission prospects.

*in outside securities* [my italics] who participated in New Street trading.” The Times regularly published quotes from the Curb under the heading “Outside Securities” when the exchanges were open. Thus, the reference to George Crap as ‘a dealer in outside securities’ identifies him as a member of Curb. Third, we know that at least some Curb members placed an advertisement on August 3<sup>rd</sup> suggesting that the Curb Market Association would trade NYSE securities during the suspension. Finally, Curb Market participants were accustomed to conducting business in the open air, while battling the elements. New Street posed no unanticipated weather-related complications for Curb Market dealers.

The Consolidated Stock Exchange must have also supplied New Street with brokers. Members of the Consolidated Stock Exchange were already accustomed to trading odd-lots of NYSE stocks, since that was their normal business. Without these participants it would have been too easy for the Committee of Five to blame the Curb Market Association for de facto violating the ban on trading NYSE securities. Moreover, the Consolidated Stock Exchange led the lobbying for a resumption of trading.<sup>20</sup>

#### IV. Liquidity on New Street: An Overview

The contemporaneous commentary discussing New Street differs over the quality of liquidity services provided there. The Wall Street Journal dismissed New Street from start to finish. At the other extreme, Noble observed that as early as August 11th New Street trading had become sufficiently important to

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<sup>20</sup> On August 27, 1914 the Wall Street Journal reported that the Board of Governors of the Consolidated Stock Exchange held a meeting for the purpose of considering the question of reopening the exchange.

attract attention from the Committee of Five. We know from the Committee's Records that by August 25<sup>th</sup> they monitored New Street quotes published by the Morning Telegraph. Somewhere in the middle sits the New York Times, which recognized significant improvement over time. For example, on November 13<sup>th</sup> the Times signaled the arrival of bullish sentiment in the marketplace by noting: "A demonstration of the demand for listed stocks was given by the dealings in New Street, where prices scored gains." The Times then lists a table of 27 stocks traded on New Street showing the price change from the previous day. This is quite a turnaround from their October 7<sup>th</sup> rejection (see above) of New Street transactions.

The bid /ask quotes reported by the Morning Telegraph and preserved in the Records of the Committee of Five provide an opportunity to examine New Street liquidity more formally. The Telegraph did not report any trading data nor did it report the size of transaction that could be accommodated at the quoted bid and ask. Thus we focus on the immediate execution dimension to liquidity as measured by the spread between the bid and ask quotes.<sup>21</sup> Narrow spreads imply a more liquid market.

Quotations are available in the Committee's Records for a total 28 days between August 25 and October 26, the 'early period' when New Street liquidity was under most suspicion. A total of 117 securities were quoted at least once during the period. We restrict our analysis to a sample of 71 stocks that had 10

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<sup>21</sup> See Stoll [2000] for a discussion of the quoted spread and other dimensions to liquidity.



days or more of bid / ask observations and had data available from the NYSE prior to the suspension of trading.<sup>22</sup>

Table 1 displays data for a total of twenty stocks in our sample: The first ten stocks have the lowest average bid-ask spread in New Street over the sample period and the last ten stocks have the highest average spread. The spread is measured in percent:

$$[(P^a - P^b) / (P^a + P^b) / 2] * 100,$$

where  $P^a$  is the ask price and  $P^b$  is the bid price.

Column 1 of Table 1 shows the stock's daily average spread on New Street during the sample. For example, the first entry in column 1 shows that the average spread for Reading Railroad was .437 percent on New Street. The last entry shows that Rumely had an average spread of 15.54 percent. Column 2 provides the daily average spread for the same companies when they traded on the NYSE during a 28-day period ending with July 29, 1914.<sup>23</sup>

For the entire sample of 71 securities, the average spread on New Street is 2.47 percent compared with a spread of 1.34 percent on the NYSE.<sup>24</sup> The increase in spreads is not surprising, given the impaired flow of New Street's price information. A key question is whether the increased spreads were large

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<sup>22</sup> The 46 securities that were disqualified include, 37 that had fewer than 10 observations, six that lacked a complete set of data from the NYSE, two that showed no change in either bid or offer price over the sample period, and one that was a bond. Almost all of the 37 stocks with fewer than 10 observations were not quoted when Edward F. Breen was the data source in the Morning Telegraph.

<sup>23</sup> The NYSE sample ends on July 29, excluding the day before trading was suspended. July 30 was abnormally active and might have distorted the pre-suspension sample.

<sup>24</sup> The averages in Table 1 are mean spreads. Median spreads are usually smaller for stocks on both New Street and the NYSE. For example, the median spread on New Street is 2.31 percent and the median spread on the NYSE is 1.18 percent. The qualitative comparisons between New Street and the NYSE are the same for mean and median spreads.

enough to cause a measurable 'liquidity discount' in stock prices (see Amihud and Mendelson [1986] and Silber [1991]). The Wall Street Journal parodied New Street by saying that it resembled a market where stocks traded at "a thirty or forty percent discount." What are the facts?

For each of the 28 days in the New Street sample I calculated the average return for each stock compared with the closing price on July 30 (the last day of trading before the suspension).<sup>25</sup> I then formed a series of equally weighted returns for all stocks compared with the July 30 close for each day of the sample. Those numbers are plotted in Figure 1. The data show that the price decline on New Street was negligible during the last few days in August and then fluctuated about 2 ½ percent below the July 30 close during September. The decline reached a little less than 9 percent in the last few days of October. The New York Times article cited above ascribed "the downward slant of prices in October" to depressing war news

The average price decline on New Street cannot be explained by the increase in bid-ask spreads. The decreases are very small during August and much of September, especially when we recall that the NYSE suspended trading on July 31<sup>st</sup> because of a rumored build-up in sell orders from Europe.<sup>26</sup> Nothing resembling the thirty and forty percent discount alleged by the Wall Street Journal ever occurred. The increased bid-ask spreads on New Street evidently

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<sup>25</sup> I used the mid-point of the bid-ask spread to represent the price on each day of the New Street sample.

<sup>26</sup> The standard deviation of daily returns is 1.42 percent for the equally weighted portfolio for the sample period ending July 29<sup>th</sup>. The price declines in late August and early September compared with July 30 are statistically insignificant.

were not large enough to produce a measurable 'liquidity discount' in stock prices.

The contemporary disagreement discussed above over New Street's importance raises the question of whether New Street offered economically relevant liquidity services despite the wider bid-ask spreads. Were there trading opportunities provided on New Street that would not have been otherwise available?

Recall that starting August 12<sup>th</sup> investors had the alternative to transact through the NYSE Clearing House at July 30 closing prices (or higher). The imprimatur of the New York Stock Exchange gave the Clearing House an important natural advantage over New Street. The problem with the Clearing House, on the other hand, was that it did not provide a two-sided market when there were more potential sellers than buyers at July 30 closing prices.

A two-sided market means that both a bid price and ask (offer) price are quoted so that potential sellers can hit bids and buyers can lift offers if they wish to transact immediately. It was always possible to *buy* immediately in the NYSE Clearing House from the available offers (either at or above July 30 closing prices), but it was not always possible to sell there because bids below July 30 were not permitted. Moreover, although a trader could always buy at the Clearing House from a seller at the July 30 close, the price would be 'too high' if the market-clearing equilibrium were below that level.

New Street quotes were always two-sided, even for the least liquid stocks. Thus if there were sellers only at the Clearing House and no buyers, some of

those potential sellers could dispose of their securities at the quoted bid prices on New Street. This disposal facility was an important liquidity service. However, potential sellers would be uncertain if the low bid price stemmed from a decline in the equilibrium price or was simply a reflection of the relatively wide bid-ask spreads on New Street.

When both the bid and offer on New Street were below the July 30 closing price, the New Street market dominated the NYSE Clearing House for both potential buyers and potential sellers. Moreover, under those circumstances the low bid prices gained credibility from the accompanying low offer prices.

I calculated the difference between the July 30 closing price and the ask price for each stock on every day of the sample. Both the bid and offer dominate the July 30 close when that difference is positive (because bids are always below offers). Days% measures the percentage of days in the sample for which 'the July 30 close minus the offer' is positive for each stock. The average value of Days% for the entire sample is 63.57. Thus, New Street stocks provided a two-sided market that dominated the NYSE Clearing House about 63 percent of the time. Forty-six of the seventy-one stocks on New Street had a value for Days% greater than 50 percent.

These results show that New Street offered liquidity services that were meaningful despite wider bid-ask spreads compared with the New York Stock Exchange.<sup>27</sup> New Street still had to overcome the NYSE trademark enjoyed by

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<sup>27</sup> The New York Times [August 2, 1914], reports that short sellers complained that the trading suspension would rob them of their profits if the NYSE were not reopened until after prices recovered. Shorts had the opportunity to close out their positions profitably when offer prices on

the Clearing House. The economic incentive to shift order flow to New Street should be greatest for stocks with large price level discounts on New Street compared with the July 30 close on the NYSE and for stock's with large values of Days%. The shift in order flow should help explain the structure of bid-ask spreads across stocks on New Street.

#### V. A Model of Bid-Ask Spreads on New Street: The Role of Reputation

The disparity in bid-ask spreads on New Street versus the NYSE in Table 1 is much less pronounced for the most liquid stocks on New Street. In particular, the average spread for the ten most liquid New Street stocks in Table 1 is .574 percent compared with an average spread of .403 percent for those same stocks when they traded on the NYSE. On the other hand, the average spread for the bottom ten in the table is 6.82 percent on New Street compared with an average spread of 3.1 percent when these relatively illiquid stocks traded on the NYSE. I estimate a model of the structure of bid-ask spreads on New Street to explain this cross sectional behavior of spreads and to see how spreads respond to the economic incentives just described.

Stoll [2000] reviews the extensive literature on bid-ask spreads and individual firm characteristics. Order processing and inventory considerations lead to the following cross-sectional empirical relationship:

$$(1) S = a_0 + a_1 \log V + a_2 SD + a_3 \log P + e.$$

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New Street were below the July 30 close. Short sellers were, therefore, among the important beneficiaries of two-sided New Street liquidity.

S is an individual stock's average percentage spread over some time period, V is the average dollar volume of trading in the stock during that time period, SD is the stock's historical standard deviation of returns, P is the average price level of the stock during the time period, and e is an error term.

Inventory risk associated with marketmaking in stocks implies that a stock with higher trading volume has a narrower spread because high volume permits traders to return quickly to a zero inventory position. A stock with a larger standard deviation of returns has a wider spread because greater volatility means any non-zero inventory position is riskier. A lower priced stock has a wider percentage bid-ask spread because of discreteness in price quotations ( $1/8$  was the minimum price change in 1914). Market capitalization sometimes appears in equation (1) as an additional proxy for risk.

Least squares estimation of equation (1) with contemporaneous cross-sectional data on volume and spreads is inappropriate because volume of trading and spreads are simultaneously determined. Higher volume leads to lower spreads because of dealer inventory behavior but lower spreads attract higher volume because of public investor behavior. It is also impossible to estimate equation (1) for New Street because the Morning telegraph did not publish trading volume. One solution to the estimation problem is to replace volume on New Street with a set of instrumental variables.

Volume of trading on New Street should respond to the economic incentives to trade there versus in the NYSE Clearing House. The incentive to

trade on New Street should be positively related to the magnitude of the difference between the July 30 closing price and the ask price on New Street. As suggested above, large positive values for that differential mean that New Street's two-sided market dominates the NYSE Clearing House by a lot, implying a greater incentive to shift order flow to New Street. For each stock,  $P_{minAsk}$  measures the average value during the New Street sample of the July 30 closing price minus the ask price, expressed as a percent of the ask price.<sup>28</sup> Higher values for  $P_{minAsk}$  should bring larger volume to New Street, implying lower bid-ask spreads.

The impaired dissemination of price information on New Street suggests that stocks that have a reputation for liquidity on New Street should also have higher order flow. We know that reputation matters in the liquidity services business. Silber [1984, p. 941] describes how marketmakers continuously quote a two-sided market to foster a reputation for liquidity so they can attract order flow. Exchanges with an established reputation for liquidity succeed against competitors, in part, because brokers have a fiduciary responsibility to send order flow to the most liquid market. In our case, the absence of price transparency on New Street makes liquidity a function of an individual stock's reputation for liquidity.

Stocks with a two-sided market that dominates the NYSE much of the time gain a reputation for liquidity on New Street. Hence, the  $Days\%$  variable, measuring the fraction of days with positive values for  $P_{minAsk}$ , should serve as

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<sup>28</sup> The average value of  $P_{minAsk}$  for each stock is calculated after setting any daily negative value equal to zero since all negative values imply a zero incentive to trade on New Street.

a proxy for each stock's reputation for liquidity on New Street. Stocks with larger values for Days% should attract larger order flow, implying narrower bid-ask spreads.

Replacing  $\log V$  in equation (1) above with PminAsk and Days% produces the following equation that can be estimated with ordinary least squares:

$$(2) S = b_0 + b_1 \text{Days\%} + b_2 \text{PminAsk} + b_3 \text{SD} + b_4 \log P + e.$$

Column 1 of Table 2 shows the results of estimating equation (2) with the average percentage spread on New Street for each stock as the dependent variable. The independent variables, in addition to Days% and PminAsk, are: SD, the stock's standard deviation of returns on the NYSE during the 28-day period ending July 29, 1914; and P, the stock's price level measured by the average of the bid-ask midpoints during the New Street sample. The results show that Days% has an expected negative coefficient that is statistically significant, but PminAsk is insignificant and has the wrong sign. P enters with the correct, statistically significant, negative coefficient and SD enters with the correct positive coefficient but is not significant.

The result for the Days% variable implies that stocks have lower average bid-ask spreads when they have a reputation for providing a two-sided market on New Street that dominates the NYSE Clearing House. The average bid-ask



spread does not respond to the magnitude of PminAsk,<sup>29</sup> perhaps because of the impaired price transparency on New Street.

An additional indicator of a stock's reputation for liquidity is persistently high historical trading volume. Average volume of trading on the NYSE prior to the trading halt should reflect a stock's long-term reputation for liquidity and is an appropriate added instrument for New Street volume.<sup>30</sup>

Column 2 of Table 2 shows the results of a least squares estimation of equation (2) with  $V$ , the stock's average daily dollar volume on the NYSE during the 28-day period ending on July 29, 1914, added to equation (1). Volume is statistically significant with the expected negative sign, Days% has the correct negative sign but is no longer statistically significant, and PminAsk continues to have an incorrectly signed insignificant coefficient.<sup>31</sup>

These results confirm that the impaired dissemination of New Street price information provides a special role for an individual stock's reputation for liquidity in explaining spreads. The statistical significance of historical NYSE volume, especially compared with Days%, implies that a stock's long-term reputation for liquidity is more important than its more recently acquired reputation when markets lack price transparency.

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<sup>29</sup> A number of alternative specifications of PminAsk were tried: (1) The average value of PminAsk was calculated for each stock without setting negative days equal to zero; (2) The ask price was replaced with the midpoint of the bid and ask; (3) Log PminAsk was used (after replacing zero values with .0001). None of these alterations changed the result that PminAsk was statistically insignificant.

<sup>30</sup> Note that average volume on the NYSE prior to the trading suspension has no necessary linkage to the purely economic incentive to shift order flow to New Street. The correlation coefficient between volume and PminAsk is -.02. Thus if historical NYSE volume explains the structure of spreads it is purely a reputation effect.

<sup>31</sup> Market capitalization was tried in both equations 1 and 2 but had the wrong sign and was not statistically significant.

## VI. Conclusion

It is easy to understand why New Street emerged almost immediately after the suspension of trading on the New York Stock Exchange following the outbreak of World War I. Few economic activities are as reliable as attempts to circumvent regulation. It is impressive, however, that the New Street market provided economically meaningful liquidity services despite extensive efforts to stifle its operations.

New Street survived competition from the NYSE Clearing House facility, it overcame disparaging newspaper publicity that denigrated the quality of its product and it survived efforts to muzzle the dissemination of crucial price information. It is disappointing that academics have perpetuated the myth of New Street's ineffectiveness by using pejoratives like 'gutter' and 'outlaw' to describe the market. New Street's reputation should, at least, reflect the fact that its liquidity dominated the NYSE Clearing House more than sixty percent of the time.

The cost of transacting on New Street suffered somewhat from the impaired flow of price information but responded to a stock's reputation for liquidity. Reputation always matters in the liquidity services industry but it becomes especially important when markets lack transparency.

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Table 1

Bid-Ask Spreads on New Street and the NYSE

Stock	(1)	(2)
	New Street	NYSE
Reading Railroad	0.437	0.091
Union Pacific RR	0.490	0.100
Consolidated Gas Co.	0.504	0.705
Atchison Topeka & Santa Fe RR	0.570	0.315
Great Northern RR preferred	0.571	0.341
Norfolk & Western RR	0.591	0.561
American Tel & Tel	0.637	0.353
Chicago and Northwestern RR	0.640	1.061
Pennsylvania RR	0.641	0.258
Northern Pacific RR	0.659	0.248
Colorado Fuel & Iron	4.105	3.013
Distillers Securities Corp	4.358	5.304
Guggenheim Exploration	4.603	0.807
Kansas City Southern RR	4.741	2.058
Pressed Steel Car	5.446	1.477
Pittsburgh Coal	5.447	3.134
International Paper preferred	5.606	1.946
Virginia Carolina Chemical	9.039	1.453
Corn Products	9.339	4.111
Rumely Co.	15.540	9.765

Table 2  
 Cross-Section Regressions Explaining New Street Bid-Ask Spreads

	(1)		(2)	
	Coefficient	t-value	Coefficient	t-value
Intercept	8.296	4.206	10.190	5.516
Day %	- .015	- 2.656	- .008	- 1.408
PMinAsk	.014	.081	.191	1.101
Log P	- 1.454	- 3.519	- .799	- 1.954
SD	26.326	1.356	45.717	2.507
Log V	---	---	- .526	- 3.959
Adjusted R <sup>2</sup>	.508		.595	
Observations	71		71	

Figure 1

New Street Price Level Versus NYSE July 30 Close

