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The Effect of the Establishment of the Day Clearing Branch on Trading Costs: A Look at the NYSE In 1920

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CLAREMONT McKENNA COLLEGE

THE EFFECT OF THE ESTABLISHMENT OF THE DAY CLEARING BRANCH ON TRADING COSTS: A LOOK AT THE NYSE IN 1920

SUBMITTED TO

PROFESSOR ERIC HUGHSON

AND

DEAN GREGORY HESS

BY

SAMUEL WONG

FOR

SENIOR THESIS

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Table of Contents

Acknowledgements

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Abstract

As a financial institution that clears and settles payments for equity and other securities, a clearinghouse essentially reduces the counterparty risk. It diminishes the risk of one party failing to meet its obligations, and makes markets more efficient through netting. This paper examines the impact of the establishment of the Day Clearing Branch on April 26, 1920, which allowed the NYSE Clearinghouse to net cash values and clear loans, supposedly resulting in savings in banking, time, and labor. The common and preferred equity securities that traded on the NYSE during the year 1920 were analyzed. The effect on bid-ask spreads and volume traded were scrutinized. It was found that these securities had increases in bid-ask spreads and decreases in volume traded, contrary to prior hypotheses.

I. Introduction

A clearinghouse is a financial institution which provides clearing and settlement services for financial and commodities derivatives and securities transactions. In other words, the clearinghouse acts as a middleman between a buyer and a seller to ensure the quality and efficiency of the trade. The processes included are reporting/monitoring, risk margining, netting of trades to single positions, tax handling, and failure handling. In return for these services, the clearing members are required to pay a fee to the clearinghouse. In addition, the clearinghouse removes the counterparty risk as well as a lot of paperwork and messages that would otherwise need to be sent in order to verify the quality of the transaction.

An important attribute of a clearinghouse is the ability to net trades. Netting involves offsetting opposite trades in order to settle transactions in a cleaner way, requiring fewer securities and less capital. For example, if Company A decides to buy 400 shares of stock X from Company B, but had also already sold Company B 500 shares of X earlier in the day, then, without netting, both transactions together would involve 900 shares of X. In addition, assuming the cost of X is $100, there would also be a bank credit of $90,000, and trips to both brokerage offices and both banks would need to be made. However, with netting in effect, the 400 and 500 share trades would offset one another, and A would deliver only the balance of 100 shares to B, resulting in a bank credit of just $10,000 and one single trip to the brokerage office and bank (Meeker, 1922). The Night Clearing Branch of the Stock Clearing Corporation has the ability to net trades involving the same stock. However, the establishment of the Day Clearing Branch

has improved the efficiency of the clearinghouse by netting not only trades of the same stock, but cash balances as well.

The ability to net trades reduces the trading costs for market makers, since they do not need to hold as much cash in order to make daily trades. This increased market efficiency should be passed down to traders through the form of smaller bid-ask spreads. The hypothesis that is tested is the effect of the establishment of the Day Clearing Branch of the NYSE on lowering bid-ask spreads. The additional services provided from the Day Clearing Branch are twofold: the ability to net cash balances and to clear cash extensions of balance contracts. Through examining firms before and after April 26, 1920, the date that the Day Clearing Branch was established, and controlling for determinants of bid-ask spreads such as volume, size, volatility, and interest rates, this conclusion is reached. Both of these aspects further decrease the amount of cash traders need to hold, thereby increasing market efficiency. Therefore, the establishment of the Day Clearing Branch should result in the reduction of bid-ask spreads.

Although there is literature on the determinants of transaction costs, there is surprisingly little literature on the effect of firms joining a clearinghouse and even less on the effect of institutions, which implement trade netting such as the Day Clearing Branch of the Stock Clearing Corporation.

In the following section, this paper examines the history of the NYSE Clearinghouse. Section III evaluates previous literature dealing with the determinants of bid-ask spreads. Section IV describes data collection and methodology. Section V continues by presenting and summarizing the data through regression analysis. Lastly,

Section VI concludes the findings and investigates possible opportunities in the future to further this research.

II. History of the NYSE Clearinghouse

In the pre-clearinghouse days, a selling firm would send a messenger to deliver a ticket with transaction details to a buying firm. Then, if the terms were agreed upon, both firms would keep a copy of the ticket. However, throughout the 1800s, the trade volume was steadily increasing, which made this system impracticable because the messengers could not deliver in time. Another large problem was the strain that was put on banks for financing these transactions. The broker needed a temporary banking accommodation for a few hours each day in order to make payment to the deliverer of stock. The bank would require the broker to keep a certain amount of cash in the bank before he could take out a loan. The situation would only get more complicated if a stock traded many times throughout the day. If person A sold to B who sold to C who then sold to D, four different messengers and bank balances were needed. Since the only direct profit the bank could make for providing these loans was a few hours to a day of interest, both the banks and brokers could have benefited from a better system.

On May 17, 1892, the NYSE Stock Clearing House was established to address these issues. The clearinghouse cleared trades on the NYSE and eliminated counterparty risk. The ability to net trades also made markets more efficient. The protocol whenever a trade was made, was for both parties to make sure it was recorded properly on the exchange, and then for the clearinghouse to distribute the tickets to both parties to keep, in order to compare it to their own records of the transaction.

The Stock Clearing House system was a feasible temporary solution. However, the volume of trades steadily continued to increase. This only led to increased strain on American credit facilities during and after the Great War, which created the need for an expanded clearance system. The Stock Clearing Corporation was established to fulfill these demands. The former Stock Clearing House was now dubbed the Night Clearing Branch, and the addition of the Day Clearing Branch cleared the cash values of security balances and of shifted security loans as well. The funds of the Stock Clearing Corporation were deposited as an ever-liquid fund, payable on demand in the event of counterparty failure.

The Day Clearing Branch's ability to net cash balances was essential for dampening the effect of trading on loans. For example, if a firm had to deliver 300 shares of stock A and received 200 shares of stock B, simply netting stock balances would not have any effect. However, assuming a price of $95/share for stock A and $94/share for stock B, the firm should obtain $28,500 and pay $18,800. Before, this would require $47,300 of bank credit but with netting, the firm can simply obtain the balance of $9,700.

Another essential aspect of the Day Clearing Branch was its ability to clear loans. Since the transactions of securities required credit accommodation by means of collateral time and demand or call loans, the constant receiving and repaying of call loans had placed a large burden on New York banks. Before the establishment of the Day Clearing Branch, a firm that was trying to trade based off of loans could easily find itself in a dilemma. If a firm had a loan for $100,000 called by bank A, the commission house could create an agreement with bank B to borrow a similar sum to pay back A. However, the firm would not be able to obtain the collateral from bank A before it had B's check,

and the firm would not be able to receive B's check without the collateral that it had in A (Meeker, 1922).

The Day Clearing Branch greatly alleviated this cumbersome process. For example, suppose a clearing member had a stock balance of 1,000 shares of A to deliver at $100 and 200 shares of B to receive at $80 as well as a loan of $100,000 called by the bank. With the help of the Day Clearing Branch, the delivery of A would result in a credit of $100,000 and B would result in a debit of $16,000, summing up to the total credit balance of $84,000 to the Stock Clearing Corporation. After considering interest, before loans were cleared, the firm would have to muster up $100,016.67 from some location to pay back the old loan. After loans were cleared, the firm could settle everything with a check to the Stock Clearing Corporation for $16,016.67 at the end of the day (Meeker, 1922).

The influence of a clearinghouse has been essential to both banks and traders. There has been large savings of about 60 percent in banking accommodation due to the decrease in the amount and timing of bank loans Meeker, 1922). The dramatic reduction in necessary bank credit has been beneficial as well in preventing the stock market from being warped by conditions in the money market (Meeker, 1922). In addition, the amount of time that has been saved due to the settlement of intermediate contracts and supervision of the deliveries of stocks has prevented a breakdown in the stock market (Meeker, 1922). A third method of savings enacted through the establishment of the clearinghouse has been the reduction of labor. The steady increase of trades due to the growth in the economy would have made the daily settlement system physically impossible. It has resulted in a decrease in the auditing and delivering work of clerks and

messengers as well as firm members themselves in comparison to the pre-clearinghouse days (Meeker, 1922).

The Day Clearing Branch has created a dramatic reduction in banking, time, and labor. Its ability to clear cash extensions of balance contracts has brought further savings that amount to about 60 percent of the value of the balance contracts remaining from the work of the Night Clearing Branch (Meeker, 1922). In addition, the clearance of loans through the Stock Clearing Corporation has resulted in a decrease in the number of checks drawn by nearly 92 percent (Meeker, 1922). The additional savings of time and labor has greatly reduced the amount of accommodation needed to pay for them. There has also been increased flexibility imparted to the stock market by freeing it from technical conditions in the money market (Meeker, 1922).

In the late 1800s, the NYSE faced challenges from other exchanges, most notably the Consolidated Stock Exchange, with 2,403 members (Michie, 1986). Because there existed a great rivalry between these two, the NYSE forbade its members to belong to both institutions, and tried to stop communication between the two floors. In fact, the New York Stock Exchange created artificial barriers to prevent the Consolidated from gaining ready access to current prices on the main market, forcing it to deal at wider prices (Michie, 1986). However, the Consolidated was attractive because it charged only 1/16 percent whereas the NYSE charged 1/8 percent due to regulation requirements that placed a floor on the rate they could charge. Although NYSE members were forbidden to have telephonic links with members of the Consolidated Stock Exchange, the practice continued through third parties, such as members of other exchanges who had legitimate access to New York prices (Michie 1986). In order to avoid paying the high fees of the

NYSE, these third parties would obtain information through technological means and trade on the Consolidated as well as the street, or the "curb" market. Because it was so difficult to monitor and control the leakage of information, the increased competition created a reduction in bid-ask spreads (Brown *et al*. 2008).

III. Literature Review

In previous academic literature, there have been found to be three primary reasons for the existence of bid-ask spreads: asymmetric information, monopoly power, and an inventory holding premium.

The discrepancy of information between two parties is critical to returns. Even when the specialist is risk-neutral and the expected value of profits is zero, there is a positive bid-ask spread when dealing with the presence of traders with superior information. This shows the difference between observable and realizable returns, which is created by the disparity in information (Glosten and Milgrom, 1985). By having more knowledge than the other party, the risks associated with transactions are minimized, thereby creating the spread. In previous research, after estimating a model for bid-ask spreads for the NYSE from 1981 to 1983, Glosten and Harris cannot reject the hypothesis that NYSE common stock spreads are due to asymmetric information.

Research has shown that bid-ask spreads are a positive function of the price level and return variance and a negative function of measures of market activity, depth, and continuity (Copeland and Galai, 1983). The bid-ask spread increases with greater price volatility in the asset being traded, with a higher asset price level, and with lower volume (Copeland and Galai, 1983). Within the model that they constructed, they also found that

a rational dealer will always set an ask price higher and a bid price lower than what he believes the "true" market price is (Copeland and Galai, 1983).

The four determinants of spreads: activity, risk, information, and competition (McInish and Wood, 1992) need to be closely examined with respect to the establishment of the Stock Clearing Corporation in 1920. The increasing volume of trades along with the difference in risk and information between the market maker and the other party affect the bid ask spread in a vacuum. The adverse selection component of bid-ask spreads increases uniformly with trade size. (Lin, Sanger, and Booth, 1995).

A monopoly power can affect bid-ask spreads as shown in history. In a paper by Brown, Mulherin, and Weidenmier (2008), the rivalry between the Consolidated Stock Exchange and the NYSE is closely looked at. The spreads before and after 1885 when this rivalry was enacted were examined and compared. After controlling for the price of the security, the trading activity, return volatility, and market conditions, they found that the bid-ask spreads narrowed significantly after the creation of the Consolidated Stock Exchange. They found a 10 percent decrease in the bid-ask spread, which was attributed to the difference between a monopoly and a market with two competitors. In addition, because of this lower cost, consumer welfare improved by an amount equivalent to US$9.6 billion today. (Brown *et al.* 2008).

Stoll researched the inventory holding model's effect on bid-ask spreads in 1978. Since the intermediaries must hold inventory and run risks when being in possession of that inventory, they post bid-ask spreads in order to rebalance his portfolio (Stoll, 1978). The dealer must increase both bid and ask prices after he sells and lower both bid and ask prices after he buys to equilibrate the inventory. The dealer changes the price of the

spread to the relative true spread in order to allow the transaction to rebalance his portfolio (Stoll, 1978). Therefore, the spread should reflect the inventory holding premium, which is dependent on 4 factors: the dollar amount for the transaction, the size of the dealer's initial holding, volatility, and the stock's return (Stoll, 1978).

The bid-ask spreads that the dealer posts are affected not only by uncertainty about the return on the inventory, but also from when the next transaction will occur. Previous research has shown that the difference between bid and ask prices is given by a risk neutral spread that maximizes expected profits in addition to a risk premium that depends on previous factors discovered (Stoll, 1978), as well as the dealer's attitude toward risk (Ho and Stoll, 1980). Even though the dealer changes the price based on the inventory that he has, the risk he has is greater than that shown in the one period model by Stoll in 1978. This is because the uncertainty of the demand to trade with the dealer is not completely eliminated by the aforementioned pricing strategy (Ho and Stoll, 1980). This conclusion includes cases with an asymmetric demand for trading with the dealer and cases where a dealer refuses to make a market (Ho and Stoll, 1980).

Besides determinants of bid-ask spreads, it is important to look at the clearinghouse itself. Sara Reed in her thesis found that the establishment of the NYSE clearinghouse reduces the spread. Once a firm joins the NYSE Clearinghouse, both its relative and absolute spreads are narrowed, resulting in an overall decrease of 5.28%. One strong reason why clearinghouses should inherently reduce trading costs is because of netting. Since market makers can now hold less cash, their inventory costs are lower. As a result, this is passed down in the form of lower bid-ask spreads to traders, assuming there is competition among clearinghouses. The NYSE clearinghouse that was

established in May 1892 was found to reduce spreads. That old system, now called the Night Clearing Branch, was fairly effective, but the strain on American credit facilities experienced during and after the Great War required the clearance system to clear the cash value of security balances and of shifted security loans (Meeker, 1922). The netting of cash values in the event that there were two or more different securities should have saved a lot of time and labor. In the same way, the lower costs should translate into lower costs for traders assuming some level of competition.

Previous research has explained many ways and discovered determinants that affect bid-ask spreads. In this paper, we are examining the effect of the establishment of the Day Clearing Branch of the Stock Clearing Corporation on spreads. Therefore, it is important to control for factors that have been previously found to influence bid-ask spreads.

IV. Data

In testing the efficiency of the Stock Clearing Corporation on financial markets, the bid-ask spreads of the NYSE stocks must be examined both before and after the enactment of the Day Clearing Branch on April 26, 1920. The data that is being used can be found in historical New York Times under the stock quotes section. Through accessing this database, three components are required: the NYSE transactions, the closing quotations for stocks that did not trade that day, and the information about the Consolidated Exchange. During the year 1920, stocks also traded on Saturday; therefore the data is from newspapers from Tuesday to Sunday (excluding holidays).

The NYSE transactions have information on the closing bid-ask prices as well as the high, low, and last transaction. For the stocks that did not trade that day, there are closing bid and ask prices as well. There is similar information for the Consolidated Exchange. It is important to look at stocks that did not trade that day, because if there was a narrower bid ask spread, maybe there would be more transactions and those stocks would have been able to trade.

The dependent variable in the regressions is bid-ask spread. The essential explanatory variable is a dummy variable that takes a value of 0 before the establishment of the Stock Clearing Corporation and a value of 1 after, designated MUTUALIZATION. Because of the supposed increase of liquidity from the establishment of this branch, there should be a negative correlation between spreads and this dummy.

As stated in the lit review, there are many other factors that affect the bid-ask spread and it is important to control for them. One example is the call loan interest rate, which may have needed to have been controlled for in the event of stocks not entering and exiting at the same time. However, in this scenario, all the mutualization of risk happened at the same time when the Day Clearing Branch was established, so this variable need not be included.

As a benchmark to the stocks on the NYSE, the stocks on the Consolidated are used. The use of a dummy that takes the value of 0 if it is not on the Consolidated and 1 if it trades on that exchange is used to control for differences in the bid-ask spreads that exist simply because they are two different exchanges. The Consolidated did not establish a branch similar to the Day Clearing Branch to increase efficiency, so there should be a negative correlation between this dummy and the dependent variable.

Data was collected for all stocks trading on the NYSE and the Consolidated for the months of January through November of 1920. The bid, ask, date, volume, and last trade were inputted for all 150,000 observations through the use of Data Entry Services. The first step was to group everything by the company that issued the stock. Because many securities were listed multiple ways (i.e. GM, General Motors, etc.), an ID was given to each security as to avoid confusion. When preferred and common stock were both listed on the exchange, they were given two separate identifications. After grouping the observations, it was clear that many of these data points were not able to be used due to a number of factors.

Many of the observations were missing a bid or an ask price due to one of two reasons. Either during that day there actually was no bid or ask, or that the old copy of the 1920 NY Times newspaper made that value impossible to read. All of these observations were removed. The difficulty in viewing the old newspapers also resulted in some incorrect values for the bids and asks. Observations with a higher bid than ask were also removed. In the 1920s, bids and asks were announced in multiples of 1/8, so any observation that was not divisible by 1/8, such as 1/3, were also taken out. One problem with the NY Times newspapers were errors in reporting. On certain days, stock names or their corresponding values were listed incorrectly. In order to make sure that these did not affect the results, observations that were either more than 120% than the previous day or less than 80% of the previous day were carefully examined. In some instances, these observations were preserved due to the low stock price. For example, a jump from $4.00 to $4.25 would be flagged and left in while a stock that jumped from $100 to $120 would be taken out. After all these changes, about 127,000 data points remained.

To have a closer look at the effect of mutualization of risk, a data set with the 50 observations before April 26 and the 50 observations after was created for each stock. Those that joined the NYSE later in the year or exited the NYSE early and therefore did not have both 50 observations before and 50 observations after that date were removed from the data set. All in all, there were 489 different securities remaining and therefore 48,900 observations in this new data set.

There are however, shortcomings to this method of analysis. When comparing the data before and after April of 1920, we are assuming that other factors which affect bid-ask spreads are constant. One example of this may be simply an increase in aggregate demand over time. This discrepancy in macroeconomic factors can contribute to a change in bid ask spreads and trading volume even though that is not what this study is trying to measure.

V. Results and Analysis

The effect of the Day Clearing Branch of the Stock Clearing Corporation on bid-ask spreads was investigated. The spread incorporates market efficiency due to its definition: it is the difference between the highest price a buyer is willing to pay and the lowest price a seller is willing to ask for. In the regression, explanatory and dummy variables were used, as formerly stated in Section IV. All regressions were run with ordinary least squares (OLS). The initial regression forms were as follows:

$$\text{SPREAD} = \alpha_i + \text{MUTUALIZATION Dummy} + \text{CONSOLIDATED Dummy} + \varepsilon$$

AND

$$\text{PERCENTSPREAD} = \alpha_i + \text{MUTUALIZATION Dummy} + \text{CONSOLIDATED Dummy} + \varepsilon$$

Dummy variables were also included in order to capture variables with only two possible results. The most important variable, the MUTUALIZATION dummy, took the value of 1 after April 26, 1920, when the Day Clearing Branch was established and the mutualization of risk occurred, and took the value of 0 before. The CONSOLIDATED variable took on the value of 1 if a firm's securities traded on the Consolidated Exchange and a value of 0 if they did not.

The regression that was initially run consisted of all the securities that were not erroneous nor had missing values. This consisted of all listed securities from January to November. When regressing SPREAD against the MUTUALIZATION dummy and the CONSOLIDATED dummy, both dummies took on a negative coefficient like expected. The table is shown in the Appendix. However, the MUTUALIZATION dummy had a p-value of 0.934 (clearly not statically significant). The regression was then run again with PERCENTSPREAD replacing the SPREAD variable and this time the MUTUALIZATION dummy had a value of 0.0081 and had a p-value close to 0. This is surprising because it had been expected that this dummy would have been negative. The results are again shown in the Appendix. Since the bids and asks ranged from $1 to over $1000, the spreads also had a great range, which had affected the first regression. Therefore, PERCENTSPREAD was shown to be a more accurate dependent variable.

These same regressions were then run with the data set consisting of 50 observations before the date of April 26 and 50 observations after. In addition, the largest 5 spreads per firm were removed in order to prevent outliers from affecting the data. When using SPREAD as the dependent variable, the MUTUALIZATION dummy this time was positive and statistically significant at the 5 percent level. The

CONSOLIDATED dummy was negative and statistically significant at the 1 percent level. When using PERCENTSPREAD, both the MUTUALIZATION and CONSOLIDATED dummies were significant at the 1 percent level. Both tables can be found in the Appendix.

Because the MUTUALIZATION variable had been expected to be negative, more regressions were run examining the possibility of a difference between Consolidated and non-Consolidated firms. The regressions were rerun, but now with an additional variable, MUTUALIZATION*CONSOLIDATED.

$$SPREAD = \alpha_i + MUTUALIZATION\ Dummy + CONSOLIDATED\ Dummy + MUTUALIZATION*CONSOLIDATED + \varepsilon$$

AND

$$PERCENTSPREAD = \alpha_i + MUTUALIZATION\ Dummy + CONSOLIDATED\ Dummy + MUTUALIZATION*CONSOLIDATED + \varepsilon$$

When the dependent variable SPREAD was used, the cross between these two dummies was not significant at the 10% level. However, when PERCENTSPREAD was used, this new variable had a negative coefficient and was statistically significant. Next, regressions were run separating Consolidated and non-Consolidated firms using PERCENTSPREAD as the dependent variable and the MUTUALIZATION dummy as the independent variable. When using only non-Consolidated firms, the coefficient came out to be 0.014, and when using only Consolidated firms, it was 0.0050. Both were statistically significant at the 1 percent level. Therefore, the bid-ask spreads increased almost three times as much for stocks that were only trading on the NYSE.

With this same data set, the medians of bid-ask spreads were also looked at in an attempt to remove any remaining outliers that could have affected the previous

regressions. The medians for each security were calculated, both before the date of mutualization and after. They were then compared in order to determine whether or not spreads had increased or decreased. Out of all the firms, 227 had increased median spreads, 137 had stayed the same, and 125 had decreased. This confirmed the results from the previous regressions by showing that spreads had in fact increased more often than they decreased.

Since volume traded is also a determinant of liquidity, it was also closely examined for these securities. An average trading volume was calculated for each security both before April 26 and after. The difference between the two averages for each security was calculated. For all firms that traded on the NYSE, 111 had increases in trading volume, 25 stayed the same, and 353 had decreases in trading volume. Consolidated and non-Consolidated firms were also looked at separately in order to determine the distribution of these changes in trading volume. For Consolidated firms, only 8 firms had increased whereas 125 firms had decreased. For non-Consolidated firms, 103 had increased volume, 25 had remained the same, and 228 had decreased. For those firms that had not changed their volume traded, most of them had no trades before and after the mutualization because of the disparity in the bid and the ask. By separating the Consolidated and non-Consolidated firms, it is easy to tell that the mutualization of risk increased volume for many more non-Consolidated firms (the less liquid ones). In fact, some of those securities did not have a single trade before April 26, and through the mutualization, had trades after that date.

A Chi-Squared test was run with 1 degree of freedom for both the change in median spread as well as the change in volume traded. The null hypothesis had $p_1 = p_2 =$

0.5, and the alternate hypothesis was that these probabilities were not true. The Chi-squared statistic, Q, was calculated as follows:

$$Q = \Sigma (N_i - np^0_i)^2/np^0_i$$

This test yielded chi-squared statistics of 59.658 for the median and 121.041 for the volume. Both of these tests clearly disproved the null hypothesis and supported the previous findings of changes in these two determinants of market efficiency.

These results were a stark contrast to what was expected to be true. The regressions showed a statistically significant positive correlation between mutualization and the bid-ask spread both in percentage and absolute terms, implying that after the mutualization of risk on the NYSE, the bid-ask spreads widened. Furthermore, the trading volume was shown to decrease through a Chi-squared test for both Consolidated and non-Consolidated firms. These results demonstrated that the efficiencies that were imparted into the Clearinghouse were not passed down to traders during the initial year of the mutualization of risk. It is possible that these efficiencies were realized at a later period in time.

VI. Conclusion

This paper opens up other areas of future study, most prominently in the derivatives market, where there has been discussion of more regulation. Credit Default Swaps (CDS) make up tens of trillions of dollars globally making them the most widespread, unregulated credit derivatives on the market. The Financial Crisis in 2008 was caused in part by a credit crunch as the increase of counterparty risk made actors more reluctant to deal, effectively deterring private capital from entering to restore viable

but damaged institutions (Claessens, 2009). Due to the connectedness of financial institutions to financial markets, the plunge of the CDS market led to the ultimate collapse of American International Group (AIG) and Lehman Brothers. Many credible economists support the idea of implementing a clearinghouse for over-the-counter (OTC) derivatives to insure payment even in the event of a default. Duffie and Zhu (2009) examined whether or not a central clearinghouse of a particular class of derivatives lowers counterparty risk. In that paper, they showed that the separate central clearing counterparties (CCP) when clearing one class of derivatives could reduce netting efficiency, leading to higher expected counterparty exposures and collateral demands. In addition, when multiple derivatives classes are cleared, it is always more efficient to clear them on the same CCP rather than on different CCPs (Duffie et al, 2009).

With more historical data on the different securities on the NYSE clearinghouse, it is possible to expand on this paper by examining broader and longer trends. Also, one could look at other clearinghouses for other exchanges such as the Chicago Clearing Corporation and examine the effect of their clearing methods on bid-ask spreads. In addition, the data could be expanded to include others as a comparison such as the Curb Exchange as well as other exchanges during a different time period when the Consolidated was closed. The model could be re-examined by including more variables that were perhaps omitted. One such variable is interest rates. It is possible that inclusion of this variable could increase the R^2 and perhaps explain the unexpected results. Nevertheless, through regression analysis, the implementation of the Day Clearing Branch of the NYSE Clearinghouse was shown to be statistically significant, resulting in the widening of bid-ask spreads and the decrease in volume traded.

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Appendix

Table 1 – List of Variables

Variable	Definition
SPREAD	the absolute spread measured by the ask minus the bid
PERCENTSPREAD	the spread as a percentage of the last trade of the midpoint of the bid/ask if no trades that day
MUTUALIZATION	dummy that is 0 before April 26 and 1 after
CONSOLIDATED	dummy that is 0 if not on the Consolidated Exchange and 1 if it is
MUTUAL*CONS	product of MUTUALIZATION and CONSOLIDATED dummies

Table 2 – Spread in Absolute and Percentage Terms from January to November

Spread and percentspread were regressed on the mutualization and consolidated dummies in (1) and (2) for all data from January to November. The cross between these two dummies was included for (3) and (4).

	(1)	(2)	(3)	(4)
VARIABLES	SPREAD	PERCENTSPREAD	SPREAD	PERCENTSPREAD
mutualization	-0.0039	0.0082***	-0.0162	0.0093***
	(0.047)	(0.001)	(0.055)	(0.001)
consolidated	-3.623***	-0.059***	-3.653***	-0.057***
	(0.051)	(0.001)	(0.086)	(0.001)
mutual*cons			0.0459	-0.0043***
			(0.107)	(0.001)
constant	4.272***	0.072***	0.072***	0.071***
	(0.041)	(0.001)	(0.001)	(0.001)
Observations	126869	126869	126869	126869
R-squared	0.0384	0.0589	0.0384	0.0590
Adj R-Squared	0.0384	0.0589	0.0384	0.0590

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

Table 3 – Spread in Absolute and Percentage Terms for 50 observations before and after

Spread and percentspread were regressed on the mutualization and consolidated dummies in (1) and (2) for 50 observations before and 50 after April 26, 1920. The cross between these two dummies was included for (3) and (4).

	(1)	(2)	(3)	(4)
VARIABLES	SPREAD	PERCENTSPREAD	SPREAD	PERCENTSPREAD
mutualization	0.1820**	0.0097***	0.2442***	0.0122***
	(0.077)	(0.001)	(0.090)	(0.001)
consolidated	-3.591***	-0.058***	-3.478***	-0.530***
	(0.087)	(0.001)	(0.122)	(0.001)
mutual*cons			-0.2289	-0.0094***
			(0.173)	(0.002)
constant	4.078***	0.067***	4.047***	0.066***
	(0.059)	(0.001)	(0.063)	(0.001)
Observations	46455	46455	46455	46455
R-squared	0.0358	0.0669	0.0358	0.0670
Adj R-Squared	0.0357	0.0668	0.0358	0.0670

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.10

Table 4 – Spread in Absolute and Percentage Terms for non-Consolidated firms only

Spread and percentspread were regressed on the mutualization dummy for 50 observations before and 50 after April 26, 1920 for non-Consolidated firms only.

	(1)	(2)
VARIABLES	SPREAD	PERCENTSPREAD
mutualization	0.1781	0.0136***
	(0.111)	(0.001)
constant	4.365***	0.070***
	(0.078)	(0.001)
Observations	35600	35600
R-squared	0.0001	0.0033
Adj R-Squared	0.0000	0.0033

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

Table 5 – Spread in Absolute and Percentage Terms for Consolidated firms only

Spread and percentspread were regressed on the mutualization dummy for 50 observations before and 50 after April 26, 1920 for Consolidated firms only.

	(1)	(2)
VARIABLES	SPREAD	PERCENTSPREAD
mutualization	0.0713	0.0050***
	(0.050)	(0.002)
constant	0.648***	0.015***
	(0.035)	(0.001)
Observations	13300	13300
R-squared	0.0002	0.0007
Adj R-Squared	0.0001	0.0007

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

Table 6 – The Change in Volume

Change in volume for all stocks, Consolidated stocks, and non-Consolidated stocks

	All Stocks	Consolidated	Non-Consolidated
Increase	111	8	103
Same	25	0	25
Decrease	353	125	228

Table 7 – The Median Change in Spread

Change in median spread for all stocks, Consolidated stocks, and non-Consolidated stocks

	Number of Stocks
Increase	227
Same	137
Decrease	125

Table 8 – Chi Squared Test

Median and Volume Chi-square statistics. Test is run with 1 df.

H_0: $p_1 = 0.5$ and $p_2 = 0.5$

	Median	Volume
Q	59.658	121.041