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Jessica Moore April 13, 2012

A Study of the NYSE-Euronext Merger

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Abstract

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Access to stock markets greatly affects a company's ability to grow and be productive in any market place. Until recently, however, stock exchanges were not analyzed as firms competing and producing goods in their own market. The budding discussion became even more complicated as exchanges began engaging in mergers, in an attempt to increase profitability. We conduct an empirical analysis of the effects of one of these mergers on the stocks traded on the exchanges involved, and the marketplaces in which the exchanges compete. Our results show that stocks on both exchanges experienced lower liquidity during the time of the merger's announcement. They also indicate that stocks traded on the New York Stock Exchange (NYSE) experienced higher liquidity during the time of the merger, whereas stocks traded on Euronext saw lower liquidity. Moreover, we show that while the market shares of both participating exchanges increased, the level of market concentration remained relatively stable. Such stability of market concentration comes from both the statistic's previously high levels and tradeoffs between the market shares of the dominant exchanges. Our study adds to a growing body of research regarding transatlantic exchange mergers, which we predict will become increasingly common in the near future. Ours is one of the first to conduct an empirical analysis of a merger of this variety. We hope it will contribute to future research and policymaking regarding the appropriate mechanisms for regulating exchange merger.

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I. Introduction

On June 2, 2006, the NYSE Group, Inc. and Euronext N.V. jointly announced their intentions to create the first transnational equities exchange, to be called NYSE Euronext (Adamonis). While NYSE already held the title of world's largest stock exchange, the merger solidified the company's position in the global financial market. This merger represents one of the most well-known and frequently discussed episodes of financial market integration, but it is hardly the only one of significance. The number of major stock exchange mergers (including the creation of Euronext, the NASDAQ-OMX merger, and London Stock Exchange-Borsa Italiana merger) increased significantly during that past decade and its growth does not appear to be abating. The recent bidding war between Deutsche Borse, a German company, and NASDAQ OMX Group, an American one, over NYSE Euronext displays the increasing speed at which control of an exchange trades hands. Based on empirics and businesses' constant desire to capture market share and decrease costs, we anticipate that exchange mergers will continue long into the future.

While most people do not perceive this to be the case, a company's ability to access exchange markets affects outside parties in a very direct manner. Selling stock grants a company easy access to capital which enables it to expand. That situation benefits the populace at large by creating jobs and insofar as it generates higher levels of competition in other markets, driving down prices and encouraging the production of better products. Policymakers, therefore, have an obligation to regulate the market for stock exchanges in the same way they regulate other types of markets. They may even be wise to approach such regulation with a greater degree of caution, given stock markets' effects, the regularly high levels of market concentration, and the possibility that exchanges may expand internationally. In such a scenario, an empirical analysis, rather than purely theoretical one, is necessary. Historically-based evidence of exchange

mergers' effects should guide future regulations of such events, and may, more generally, enhance our understanding of stock exchanges as firms.

We study the NYSE-Euronext merger, in hope of both garnering information about the particular merger and learning what we might about the effects of future events of its type. Section II details the history of both NYSE and Euronext, the merger between them and its direct effects on the exchanges. The following section (Section III) reviews existing literature on liquidity and competition, both generally and as applied to situations similar to the NYSE-Euronext merger. Section IV details the data and empirical strategy used, and Section V reviews the results of our analysis. Section VI discusses our findings and their implications. Finally, Section VII provides concluding remarks and suggests additional studies for which this paper serves as grounding.

II. Background

Signed in 1792 by twenty-four stockbrokers looking to establish rules for trading bonds and shares of companies, the Buttonwood Agreement (named for the kind of tree under which it was signed) laid the foundation for what would become the New York Stock Exchange ("New York"). The stockbrokers drafted a constitution in 1817, officially establishing the New York Stock & Exchange Board ("New York"). The company became larger and more well-known over the course of the next two centuries, and eventually went both electronic and public in 2006 ("New York"). In the same year, it merged with the Archipelago stock exchange to form the NYSE Group ("New York"). Euronext, on the other hand, possesses a slightly shorter history. Created in 2000 from the Amsterdam, Brussels and Paris stock exchanges, the all-electronic Euronext attempted to take advantage of the European Union-based financial integration happening across the continent (Cave 2011). The creation of Euronext N.V. constituted an "implicit merger," because it involved total integration of the three exchanges (DiNora 2001).

All three began to operate through the same electronic trading platform and provide the same stock offerings to investors associated with any of the three exchanges (Bastianen 2009).

The next round of capital market integration in which Euronext participated, the NYSE-Euronext merger, occurred in a different manner. The NYSE Group, which already controlled two separate exchanges, simply purchased Euronext. NYSE made no immediate attempt to list the European stocks on one of their American exchanges, or those from one of their American exchanges on Euronext ("NYSE Group"). Thus, the same company controlled the trading platforms, but the exchanges neither listed the same stocks, nor catered to the same set of investors. As should be apparent, different degrees of integration provide participants with varying degrees of benefit and carry distinct implications for the market.

The reasons given for the NYSE-Euronext agreement indicated logic similar to that of most companies engaging in exchange mergers. First and foremost, the owners of the New York Stock Exchange hoped that joining forces with Euronext would enable the NYSE Group to recapture some of the business they had lost to European exchanges. The 2002 Sarbanes-Oxley Act (SOX), a bill passed in response to the Enron scandal in 2001, mandated stricter accounting standards for publically-traded companies (Harvey 2007, Zhang 2007). Because of its stringent requirements, SOX made it more difficult for foreign companies to list their stock on American exchanges, driving many to list elsewhere (Harvey 2007). Harvey suggests that the bill's passage quickened the pace at which American exchanges looked to buy their foreign counterparts (2007). Luckily for the NYSE Group, the Securities and Exchange Commission concluded that, although the holding company would be based in the United States, the Sarbarnes-Oxley Act would not apply to Euronext-listed stock (McGinnis 2008). The merger therefore provided access to revenue from a previously unavailable market, without the detrimental effects of U.S.

regulations. The merger also provided NYSE a method of horizontal expansion. For example, the union gave the American company a derivatives platform, which it had lacked up until that point (Lucchetti). Moreover, because exchanges make a significant profit selling equities information, the control of more sources of data provided the NYSE Group with an immediate financial benefit (Fiorina 2008). Integration with another major exchange also created synergistic, cost-cutting effects for all parties, because the institutions could share staff and technology (Kothari 2008). It was estimated that the merger would save the newly-formed company $250 million by 2009 (McGinnis 2008). In 2002, two years after the creation of Euronext, DeSmidt and VanRichtenburg identified efficiency as a primary reason that they predicted the pan-European exchange would come to dominate European capital markets. The same logic applies to the transatlantic union of the NYSE Group exchanges and Euronext. As the pressures to increase one's customer base, diversify market participation, and cut costs continue, mergers will become increasingly advantageous for all involved (McGinnis 2008).

To truly maximize cost-efficiency, exchanges owned by the same company would have to begin utilizing the same trading platform. A few impediments may stand in the way of NYSE Euronext achieving that goal in the near term. NYSE and Euronext currently operate on different electronic systems; their user interfaces, data processing units and clearing and settlement systems are unique (Furlonger and Redshaw). A radical, expensive overhaul of at least one of the platforms would be necessary for the two to function effectively together. The company's 2006 annual report expressed concerns about the significant resource investment it perceived would be necessary to make the change (NYSE Group, Inc. 2006). Furthermore, the regulations regarding international stock trading provided no clear strategy for legally moving toward the transatlantic stock exchange. Most laws assumed (and still do assume) only the possibility of domestic trading

and have yet to be re-written to account for broader possibilities (Schammo 2008). A complete merger might also subject European stocks to the requirements and restrictions of the Sabarnes-Oxley Act, which provides a distinct disincentive to those looking to create a totally integrated transatlantic exchange (McGinnis 2008). The NYSE-Euronext merger fits into a broader discussion in financial literature regarding the effects of exchange integration.

III. Literature Review

While much of the literature on stock exchange integration focuses on the difficulties of regulating a future transatlantic exchange, and even the current transatlantic holding company, few papers explore a merger's effects on the stocks listed on the affected exchanges (Kothari 2008). This paper fills that hole in the literature. We utilize two categories of analysis to explore the effects of the merger: stock liquidity and competition between exchanges.

A. Liquidity

Though the term has many implications, a financial instrument's "liquidity" refers to its ability to be bought and sold without changes in its price (Sarr and Lybek 2004). The liquidity of a stock is important insofar as the stock's price (and thus the profit a firm makes from selling it) is lower when the stock is more difficult to trade (Neilsson 2009). Potential purchasers are hesitant to acquire a stock that they cannot easily eliminate from their portfolios, should it become a disadvantageous investment. The exchange on which a stock trades affects its liquidity, because it determines the consumers and competition a company's stock faces. Thus, exchange integration may alter a stock's liquidity. Mergers could increase the pool of investors capable of purchasing a given stock, providing more opportunity for a company to sell a financial instrument (Neilsson 2009). The process could also increase the number of stocks of one variety trading in a given market, making it such that more shares of a stock can be traded without the

trades affecting the stock's going price (Neilsson 2009). Those two effects only occur in implicit mergers, because the traders and listing companies associated with each of the exchanges are functionally added to the same pool.

However, other forms of exchange integration, such as the non-implicit variety that characterized the NYSE-Euronext agreement, decrease transaction costs and costs to access information (Neilsson 2009). Such alterations affect the way stock prices change at the margins, because traders have to make enough money to cover those expenditures. Prior to the merger, NYSE and Euronext indicated intent to simplify the international trading process by cutting costs and increasing transaction efficiency (Lucchetti and MacDonald 2006, Osborne 2007-2008). The end point, therefore, ought to resemble an implicit merger, if in very limited form. Few arguments exist to support the conclusion that exchange market mergers would decrease the liquidity of traded stocks. The primary one suggests the merger could result in a monopoly, giving one company the ability to arbitrarily increase listing and trading fees, keeping potential participants out of the market (Neilsson 2009).

A few historical examples also guide our hypothesizing. The creation of Euronext provides strong empirical evidence regarding a merger's effects on liquidity, as liquidity was a primary reason for its establishment (Bastianen 2009). The implicit merger led to a rise in stock prices and a fall in returns on most stocks, effects similar to those of cross-listing (Bastianen 2009). The effect likely resulted from an increase in competition for the same stock, which would also produce less risk in holding any one of them (Bastianen 2009). The stock of larger firms with foreign sales saw higher turnover rates (a component of liquidity) after the merger (Neilsson 2009). The NYSE-Euronext merger may have produced similar, if significantly moderated, responses. We expect that the NYSE-Euronext merger increased liquidity of stocks traded on all

relevant exchanges. Its effects, however, were probably less great than those associated with the creation of Euronext or another implicit merger, because the stocks listed on one exchange were not listed on any others after the agreement went into effect. Moreover, the response of stocks traded on NYSE was likely greater than that of those traded on Euronext, because NYSE, as the "gold standard" of equities trading, would attract more attention from European traders than Euronext would from American ones. Additional empirical evidence is limited and reaches further back in history. In the late 1800s and early 1900s, NYSE faced competition from the Consolidated Stock Exchange ("the Consolidated"), which used information from the "Big Board" (NYSE) in order to conduct its trades. During the time "the Consolidated" existed, the traders using NYSE appreciably narrowed the bid-ask spreads on their trades due to perceived competition (Brown, Mulherin and Weidenmeir 2008). Such a change increased consumer welfare, as individuals did not have to spend as much per transaction (Brown, Mulherin and Weidenmeir 2008). Its collapse, then, increased bid-ask spread, significantly (Brown, Mulherin and Weidenmeir 2008). We find it unlikely that the NYSE-Euronext merger produced the same results as the fall of "the Consolidated," given the regionalization of trade and that, post-merger, both exchanges still had strong competitors in their markets.

B. Competition

If history or theory provides any guidance, the global financial industry is heading toward one or very few exchanges, in a given market (DiNora 2001). The question remains as to what size the market is. The existing literature focuses primarily on market size in terms of the selection process of listing firms. Most studies conclude that companies listing stock for the first time exhibit a bias toward exchanges in their home country, and so competition for these listings only occurs between exchanges in that nation (Kokkortis and Olivares-Caminal 2008). Given that the

company's goal is to rapidly gain capital while minimizing the cost to do so, it makes sense for the business to sell stock where it has a pre-existing reputation (Kokkortis and Olivares-Caminal 2008). Kokkortis and Olivares-Caminal conclude that, "due to the intensity of home bias, a cross-border merger between stock exchanges is unlikely to create any competition concerns, as far as the actual competition between these stock exchanges is concerned" (2008, 847). They caution that the future may see a reduction in home bias, because of increased international communication and automation, but that, thus far, there is little evidence of this (2008). Some companies looking to raise additional capital may opt for a secondary listing, as well. The competition for secondary listings occurs globally (Kokkortis and Olivares-Caminal 2008). Listing companies tend to select the market that they would like to tap into and then choose an exchange within that market (Kokkortis and Olivares-Caminal 2008). Because listing fees are only a marginal contribution to the cost of listing a company's stock, competition for a secondary listing occurs over non-price factors like reputation (OXERA 2007). The NYSE Group's 2005 annual report indicates that NYSE's principal domestic competitors for listings include NASDAQ and AMEX, while it also faced international competition from the London Stock Exchange, Euronext, the Hong Kong Stock Exchange and many more (NYSE Group, Inc. 2005). Currently a one-exchange system seems unlikely, simply due to differentiation among traders (Cantillion and Yin 2011). If the one-exchange system does arise, it will likely be from a currently-existing exchange or linked group of exchanges. Lack of liquidity prevents traders and issuing firms from switching to a new exchange, even when their current one institutes modifications with negative effects on their wellbeing, such as increasing fees or regulations (Kokkortis and Olivares-Caminal 2008). This situation may create a cycle in which a new exchange is predicted to be relatively illiquid, thus no firm or trader switches to the exchange

and it therefore remains illiquid. Such a self-fulfilling prophecy would cause new exchanges to fail quickly. Switching costs faced by trading firms produce a similar effect. For equity trading firms to move from one exchange to another requires that they become a member, learn that exchanges' system and sometimes receive certification for relevant employees (Cantillion and Yin 2011). Our theories on this issue are confirmed by the long-term coexistence of multiple exchanges (Cantillion and Yin 2011). None can fail or generate significant gains in market share because traders are largely locked-in to their current situation. Such circumstances may prevent the most efficient condition from being reach at any given time.

As with most mergers, the NYSE-Euronext agreement carries the potential to produce anti-competitive effects. The market size discussion is relevant because, if NYSE and Euronext competed in the same market, their consolidation may have reduced competition and produced negative effects for market participants. Competition among stock exchanges is a relatively new development in financial literature (DiNoia 2001). Until recently, they were considered public entities or formal private bodies, and so it was unusual to think of them as firms producing goods (DiNoia 2001). Competition between exchanges occurs on two levels: listings and orders (Kokkoris and Olivares-Caminal 2008). The two are interrelated insofar as more traders making orders on an exchange incentivizes more companies to list there and vice versa (Kokkoris and Olivares-Caminal 2008). A few game theory models show that implicit mergers present a clear strategic option for exchanges (DiNoia 2001). Because "all the firms and intermediaries get utility from all the other existing customers wherever they purchase listing and trading services," each exchange participating in the implicit merger becomes more attractive to both listing firms and trading firms (DiNoia 2001, 64). The NYSE-Euronext merger may provide a stronger incentive for a company with stock already listed on one of the exchanges involved to choose the

other for the location of its secondary listing. The listing firm also may choose the larger company, with an international presence, in hopes of easy expansion into international capital markets. A cross-border merger, however, could also increase competition in each region, because it may lessen the difficulty of listing or trading on the relevant foreign exchange. While the decision to list or trade on either NYSE or Euronext would ultimately benefit the same firm, the exchanges may nonetheless compete for participants. As mentioned above, moving from one exchange to another appears relatively difficult, and so exchanges consider attracting new listings uniquely important to gaining or maintaining a competitive position in the market place (NYSE Group, Inc 2006).

Only a couple of researchers appear to have conducted empirical studies relating to competition before and after stock market consolidation. These papers foreshadow what we might find with the NYSE-Euronext merger. After its creation, Euronext gained a greater market share than the sum of its component exchanges (Neilsson 2009). Traders found Euronext a better option, because of the ability to trade more equities and listing firms found it a better option because of the ability to access more traders. Based on these results, one might expect that the NYSE-Euronext merger would result in an increase the market shares of the two exchanges.

IV. Empirical Strategy

We can now turn to our own empirical work, in the hopes of adding to the current canon of research. We analyze our data on two levels: liquidity of traded stocks and competition between exchanges.

A. Liquidity

While liquidity does not have a strict definition, liquid equities are generally characterized by 5 traits: tightness, immediacy, depth, breadth and resiliency (Sarr and Lybeck 2002). Tightness

refers to low transaction cost; immediacy refers to the speed at which orders are executed; depth refers to the number of orders; breadth refers to the volume of orders and resiliency indicates that new orders quickly fill in order imbalances (Sarr and Lybeck 2002). Based on these traits, we arrive at a number of different methods for measuring liquidity. Due to data constraints, we will focus on transaction cost and volume-based indicators. High transaction costs reduce the demand for trades and the number of active participants (Sarr and Lybeck 2002). Volume calculations capture information on both the depth and breadth of the market (Sarr and Lybeck 2002).

Traders recoup transaction costs by buying at a lower "bid" price and selling at a higher "ask" price; the difference, therefore, tends to reflect the transaction costs that they face (Bessembinder and Venkataraman 2009). Thus, this spread serves as an indicator of market tightness (Sarr and Lybeck 2002). We utilize DataStream's records of the bid and ask prices between January 1, 2004 and December 31, 2008 for all stocks listed on Euronext and NYSE. Due to an absence of information for many dates or equities, our full set of bid-ask spread data only totaled 2,666,492 observations (as compared to a potential 18,000,000). Unlike the Euronext stock data, which begins at January 1, 2004, the NYSE data start March 9, 2006, because that was the date on which NYSE began collecting relevant information. Our NYSE data, nonetheless, total 1,468,816 observations across 2,536 stocks. The corresponding set of data from Euronext contains 1,196,576 observations across 1,606 stocks. The unfortunate reality of NYSE's lack of data may skew our evaluation, to some extent. However, the exchange did begin recording bid and ask prices three months before the merger's announcement, so we do have at least a limited baseline from which to evaluate changes. We regress the relative spread on a series of variables, to see if the merger had a statistically significant effect. Relative spread is calculated as:

$$S=(P_{ask}-P_{bid})/[(P_{ask}+P_{bid})/2], \text{ where}$$

P_{bid} and P_{ask} are the closing bid and ask price on a given day.

The variables in our regressions include an American stock index, a European stock index, volatility indices for both locations, and binary variables related to specific periods of time, prior to and after the announcement of the merger and the merger's date of effect. We also include daily trade volume, shares outstanding and a binary variable for each stock, so as to control for stock-specific tendencies. We include monthly dummy variables, as well, due to the volatile nature of liquidity (Neilsson 2009). Thus, the regressions are calculated as:

$$S_{it} = \alpha_0 \text{ US Index}_t + \alpha_1 \text{ US Volatility}_t + \alpha_2 \text{ European Index}_t + \alpha_3 \text{ European Volatility}_t$$

$$+ \alpha_4 \text{ Volume}_{it} + \alpha_5 \text{ Shares Outstanding}_{it} + \alpha_{6\text{-}17} \text{ Per-month Binary}_t$$

$$+ \lambda_t \text{ Announcement Binaries}_t + \varphi_t \text{ Merger Binaries}_t + \theta_i \text{ Per-stock Binaries}_i$$

We also test our hypotheses using a volume-based measure of liquidity; we find this beneficial insofar as trading volume measures the extent of participation in the market (Sarr and Lybeck 2002). A simple analysis of total trade volume is not particularly useful, because of the day-to-day volatility of the variable (Sarr and Lybeck 2002). Thus, we will use the Hui-Huebel Liquidity Ratio:

$$L = [(P_{max} - P_{min})/P_{min}]/[V/(S*P)] \text{ where,}$$

V is turnover value in dollars

S is instruments outstanding, and

P_{min} and P_{max} refer to the minimum and maximum price over a five day period

P is average closing price over five days

Lower HHL indicates higher liquidity. This calculation minimizes problems created by daily volatility and takes account of the resiliency of stocks by explicitly incorporating price changes (Sarr and Lybeck 2002). To conduct our calculations, we use DataStream's records for the same

four years (2004-2008). This data set contains 3,394,869 observations with all relevant information. For NYSE, we have 2,455,643 observations across 2,276 equities and for Euronext we have the remaining 939,226 observations spanning 1,026 equities. For all observations, we calculate the value of volume traded as the daily volume turnover multiplied by the closing price. This may decrease the accuracy of our results, but is likely compensated for, to some extent, by the volatility-smoothing nature of the HHL calculation. We regress the liquidity ratio on the series of variables mentioned earlier (with the exception of those included in the calculation of the ratio itself). The regression function appears as follows:

$$\begin{aligned} HHL_{it} = {} & \alpha_0 \, \text{US Index}_t + \alpha_1 \, \text{US Volatility}_t + \alpha_2 \, \text{European Index}_t + \alpha_3 \, \text{European Volatility}_t \\ & + \alpha_{6\text{-}17} \, \text{Per-month Binary}_t + \lambda_t \, \text{Announcement Binaries}_t + \varphi_t \, \text{Merger Binaries}_t \\ & + \theta_i \, \text{Per-stock Binaries}_i \end{aligned}$$

To conduct tests of the robustness of both our model of transaction cost-based liquidity and volume-based liquidity, we restrict both regressions to a few specific time intervals.

B. Competition

As with any merger, the two companies involved may increase the sum of their market shares post-merger, by creating a more efficient organization. We explained earlier that stock exchanges primarily compete regionally, and that new listings are particularly relevant to assessing market dominance. Thus, we use the Securities and Data Corporation's record of new listings in each nation and calculate an exchange's market share as a proportion of the new listings in each country that appear on that exchange. We isolate NYSE and Euronext's market shares and calculate the following regression:

$$\begin{aligned} \text{Market Share}_{it} = {} & \alpha_0 \, \text{US Index}_t + \alpha_1 \, \text{US Volatility}_t + \alpha_2 \, \text{European Index}_t \\ & + \alpha_3 \, \text{European Volatility}_t + \lambda_t \, \text{Announcement Binaries}_t + \varphi_t \, \text{Merger Binaries}_t \end{aligned}$$

After evaluating individual market shares for the relevant exchanges, we find the Herfindahl–Hirschman Index (HHI) in each region, to evaluate whether the merger negatively affected overall competition. We calculate monthly HHI as the sum of squared market shares. Our regression for this statistic will be as follows:

$$HHI_t = \alpha_0 \text{ US Index}_t + \alpha_1 \text{ US Volatility}_t + \alpha_2 \text{ European Index}_t + \alpha_3 \text{ European Volatility}_t$$
$$+ \alpha_{4\text{-}13} \text{ Per-month Binary}_t + \lambda_t \text{ Announcement Binaries}_t + \varphi_t \text{ Merger Binaries}_t$$
$$+ \theta_i \text{ Per-stock Binaries}_i$$

Following an exploration of those regressions individually, we compare their outcomes, in order to gain a more holistic understanding of the merger's effects.

V. Results

We utilize the empirical strategy outlined above and produce the following results. All tables and figures can be found in the appendix, at the end of the paper. We first examine the effect of the merger and announcement on the liquidity of stocks traded on each exchange. We separate the stocks by exchange for the purposes of our analysis, as the events played different roles for traders and listing companies in different locations. We also look at whether and how the market shares of the two companies changed, as well as how the announcement and merger affected overall competition.

A. Liquidity

1. Bid-Ask Percentage Spread

We begin by evaluating bid-ask spread percentage (hereafter referred to as "bid-ask spread"), using it as our first indicator of an equity's liquidity. Table 1 contains relevant regressions for New York Stock Exchange-listed stocks. On the whole, these equities witnessed their bid-ask spreads change in only minor, and often statistically insignificant, ways during the merger's June

2006 announcement process. In all four regressions, some of the coefficients on the announcement-related time dummies are positive, some are negative, and few are statistically significant at even the 10% level. The combination indicates a lack of definitive change associated with the announcement. These statements are particularly true of our first and most inclusive regression (Regression 1), wherein none of the announcement-related variables show statistical significance. Figures 1 and 2 demonstrate the high variability and seeming lack of trend in the average NYSE bid-ask spread surrounding this event. Nonetheless, as we increase the specificity of our regressors, a more coherent pattern develops. The coefficients on the variables indicating the 4^{th} week before and after the announcement are positive and significant at the 5% level (Regression 2). These coefficients retain significance during the first robustness check (Regression 3), and the coefficient on the variable indicating the 4^{th} week prior to the merger is significant during the second robustness check (Regression 4). The change in bid-ask spread associated with the announcement is below .001 for all variables in all 4 regressions, and below .0005 for close to half of them. For reference, the NYSE bid-ask spread has a median of .0020855 and averages .007278. In addition to the low levels of change, we find it difficult to be certain of our announcement-related results due to the small number of observations prior to the event. With little baseline for comparison, our regressions may indicate a statistically significant difference from the norm, when one is not truly present. Similarly, we feel more comfortable with our assessment of significance regarding the effects of the merger, because of the fairly extensive time period for which we have data before and after the event. Regression 1 indicates that the merger generally decreased stocks' bid-ask spread. The binary variables for one month before, one week before and the day of the merger are all negative and statistically significant at the 1% level, as is the dummy for all time after the merger's one-month anniversary. Regression

2 goes a bit further and demonstrates that the merger resulted in lower bid-ask spreads both prior to and following the event. The coefficients on nearly all the binary variables representing dates between 4 weeks prior to and 3 weeks after the merger are negative and significant at the 1% level. These coefficients retain significance, even as we constrict the time period of our data, as in Regressions 3 and 4. Moreover, the absolute value of nearly all merger-related coefficients generally exceeds .0005. The absolute value of the coefficient on the binary variable indicating the 4^{th} week prior to the merger consistently exceeds .001, displaying a relatively large downward effect on the bid-ask spread of most stocks. The graph of average bid-ask spread for one month before and one month after the merger confirms what the regressions indicate, that the average value of the statistic declined around the time of the event (Figure 3). The F-Statistic for Regression 1 is close to 93, meaning that combination of regressors provides a strong explanation for the variance of the bid-ask spread. The F-statistics for the three other regressions are all above 50, so Regressions 2-4 provide acceptable explanatory value, if somewhat lower than that of Regression 1.

We conduct the same regressions with bid-ask spread data for stocks listed on Euronext (Table 2). In Regression 1, excluding the binary variable for the month prior to the merger's announcement, the coefficients on all time dummies are positive and statistically significant at the 1% level. Thus, stocks listed on Euronext generally witnessed an increase in their bid-ask spreads during the week prior to, on the day of and during the week and month after the announcement. Regression 1 also indicates the same effect during the month and week prior to, day of and week and month after the merger. Each of the coefficients is at least .002. For reference, the median Euronext bid-ask spread is .0103854 and average is .032841. The graph of average bid-ask spreads, however, shows the value of this statistic rising prior to the

announcement, falling between the announcement and the merger, and then rising again after the merger (Figure 4). The reason for this will be addressed later. Week binaries in regressions involving Euronext stocks are largely statistically insignificant. The implication is that the effect of these event on Euronext-listed stocks' bid-ask spreads occurs over longer (month-length) periods of time. This interpretation is confirmed by the large disparity in F-statistics between Regression 1 (F-statistic: 148.94), which accounts for larger time intervals, and Regressions 2-4 (F-statistics: 101.52; 98.93 and 99.33), which does not. Figures 5 and 6 show that little trend in bid-ask spread is to be found during the few weeks prior to and after both events. The weekly binaries related to the merger increase in significance and, for the most part, in value, as we constrict the time interval for the regression. That manner of change indicates that the average of the more specific time interval is lower, and thus the merger is a greater deviation from the norm.

2. Hui-Hubel Liquidity Ratio

Next, we examine the ways in which the announcement and merger affected the Hui-Hubel Liquidity Ratio. Relevant regressions for NYSE can be found in Table 3. Regression 1 constitutes the best explanation of changes in HHL, as its F-statistic is greater than 5, while the F-Statistics of the other three regressions are less than 3. In the first regression, all but 4 time dummies (week after announcement, day of announcement, week prior to merger and day of merger) are significant at the 5% level, and all except one of those is significant at the 1% level. All time dummies, excluding the one representing the month prior to the announcement, are negative. Thus, the HHL of NYSE-listed stocks generally rose in the month prior to the announcement and declined for all time periods thereafter. Because a lower HHL indicates a higher liquidity, these figures lead us to believe liquidity decreased before the announcement, after which it increased consistently. The corresponding graph (Figure 7) does not completely

align itself with this interpretation. It shows HHL declining immediately prior to the announcement, rising immediately after and the leveling out in the few months following. It also depicts two sharp upticks a few months prior to the merger, and an upward trend after it. The differences from our regressions are likely due to the relatively low numbers of the time dummy coefficients and the rising S&P index. The coefficients on the time-related variables are generally less than .05, while the mean NYSE HHL is .2524 and the median is .0124061. The regressions involving weekly binary variables (Regressions 2-4) are also not heavily explanatory. In Regression 2, the coefficients on temporal variables are both positive and negative around the announcement, entirely negative for the merger, and largely statistically insignificant. Figures 8 and 9 confirm that HHL neither exhibits a clear trend around the time of the announcement, nor the merger. Figure 8 does display an immediate decrease during the second week after the announcement, and then an uptick during the following week. The significance and sign of the relevant binary variables in Regressions 1 and 2 confirm that these movements may be related to the merger, but they are not robust across different time specifications (Regressions 3 and 4). All in all, our explanation of HHL movement is not strong. As in other regressions we've explored, certain coefficients become more significant as we constrict the data's time period. Regressions 3 and 4 result in mostly positive coefficients, during the announcement, and mostly negative coefficients during the merger. Those results suggest that tightening of the time periods produce a lower average HHL before and after our announcement time dummies and a higher average HHL before and after our merger time dummies. Excluding the binaries related to specific days and 4 weeks after the merger, all event-related coefficients are significant at the 5% level in our regression using the most narrow time span (Regression 4).

We use the same method for evaluating the change in HHL of Euronext-listed stocks. All 4 regressions result in relatively small F-statistics, consistently less than 7. Few of the time dummies in any regression are significant at even the 10% level. The variable indicating all time after the month anniversary of the announcement is, nonetheless, negative and robust at the 1% level. Thus, after the announcement, HHL decreased, meaning that liquidity increased. The coefficient is still relatively small, at -.35, compared to the Euronext average of 7.05653 and median of .0592422. Figure 10 seems to confirm that HHL fell after the announcement, but not for an extended period of time. Only one other coefficient is significant at the 1% level: the variable indicating the second week after the merger in Regression 3 (data 6 months before announcement and after merger). The variable is not robust across specifications and the related graphs (Figures 11 and 12) provide very little in the way of confirmation of a dramatic increase at the associated point in time.

B. Competition

In addition to the possible benefits of increased stock liquidity, the merger comes with the possible disadvantage of creating an anti-competitive market place. The Herfindahl–Hirschman Index (HHI) displays significant volatility, likely as a result of the relatively low numbers of listings per month. We first examine the market shares of the two exchanges involved. Regression 1 of Table 5 indicates the manner in which NYSE's market share changes with the announcement and merger. Few variables possess statistically significant effects, however, the few that do are of great importance to us. Immediately following the merger's announcement, the New York Stock Exchange's market share increased sizably. The coefficient on the binary variable indicating the month after the merger is approximately .25 and is statistically significant at the 1% level. Figure 13 confirms a moderate increase in NYSE's market dominance, during

that month. Market share also increases during the month of the merger, which Figure 13 displays, as well. The coefficient on the associated binary variable is approximately .23 and is statistically significant at the 5% level, which provides evidence that the merger explains that variation in HHI. Our confidence in the accuracy of this regression is relatively high, given an R^2 of .67. In spite of NYSE's obvious market share increases as a result of the announcement of the merger and the merger itself, the United States' Herfindahl–Hirschman Index (HHI, a common measure of market concentration) remains relatively unaffected. Our regression concerning US HHI displays no statistically significant variables associated with the events in question (Table 6). In fact, after the announcement, Figure 14 shows a decline in HHI. A change in the market shares of other exchanges explains the lack of anti-competitive effect from the NYSE-Euronext merger. Both during the month after the announcement and during the month of the merger, as NYSE's market share increases, NASDAQ's falls by roughly as much (Figure 15).

We conduct the same regressions for Euronext's market share in each of the countries in which it controls an exchange and average HHI among them. Few statistically significant variables exist in this regression, as well. The coefficient on the binary variable indicating the time after the merger is statistically significant at the 5% level and has a weight of .54. An R^2 value of about .4 decreases our relative faith in these numbers. Figure 16, however, does confirm that after the merger Euronext experienced fewer periods of relatively low market share, and a greater time dominating the market (ie: all new listings were made on Euronext). Likely due to the already high market concentration, our regressions show that the average HHI of nations with a Euronext branch did not change radically. The coefficient on the temporal binary indicating the month after the merger is .18, and shows statistical significance at the 5% level. Figure 17 confirms that is likely accurate, given the seeming downswing during the relevant time period.

VI. Discussion

After thoroughly reviewing our results, we feel comfortable making limited assessments of why specific changes occurred at certain points in time. First, we look at liquidity-related changes. As established in Section V, the stocks listed on the New York Stock Exchange generally experienced a mild increase in bid-ask spread during the time period surrounding the announcement of the merger. The associated coefficients are relatively low, compared to average NYSE bid-ask spreads and our regression may be adversely affected by a lack of data for the time before the announcement. Nonetheless, the announcement-related coefficients are highly statistically significant, and we can posit a logical explanation for the changes they indicate. On June 2, 2006, in addition to informing the press that the exchanges would soon be owned by the same holding company, NYSE and Euronext announced their intention to integrate the technology used by the exchanges. As a result, the NYSE-based traders may have feared an increase in the cost to make trades (as the NYSE Group financed its overhaul), and thus, preemptively raised their profit margin on each transaction. As we mentioned earlier, traders face sizeable difficulty transitioning from trading on one exchange to another; increasing the ask price of each trade is, therefore, their primary recourse. We note that the increase in bid-ask spread begins before the date on which NYSE and Euronext issued their joint press release. Research shows that exchange mergers are poorly held secrets, so it is likely that market participants were simply reacting to information they already possessed (Keown 1981).

The merger itself also affected the bid-ask spread of stocks trading on NYSE, but in the opposite direction. The figure likely decreased in anticipation of simplification processes promised by the two companies. NYSE and Euronext said they would make it easier and less costly for traders to access information and trade internationally. Reducing the cost to access information reduces the

expenditures of all traders, and simplifying overseas trades makes it easier for individuals in other nations to participate in trades on the New York Stock Exchange, thereby increasing the competition traders face. The merger produced a large downward effect on bid-ask spreads, indicating that the merger was an important event in traders' minds. The statistical change begins to occur slightly before the merger. We suspect this is the case for two reasons: 1) The build-up to the event reminded all market participants of its occurrence. 2) As the date approached, it became increasingly clear that the merger would, in fact, take place and generate changes in the way individuals interact with exchanges.

During the time around the merger's announcement, stocks listed on Euronext experienced a similarly definitive and statistically significant rise in their bid-ask spreads. We believe this change occurred for reasons similar to those responsible for NYSE-listed stocks' change. After the announcement and prior to the merger Euronext's bid-ask spread decreased. Because the corresponding regression displays positive coefficients associated with the post-announcement time binaries, we conclude that the decrease is not due to the announcement, but other factors, such as the stock indices included in the regression. In contrast to New York-based stocks, those listed on Euronext did not witness a major alteration in bid-ask spreads over the course of the months before, during, and after the merger. We presume that the exchange simply did not possess a large enough draw for individuals trading on NYSE to expand their trading scope. If any change in bid-ask change occurred, it was in the opposite direction of NYSE's, ie: bid-ask spread increased. This change is potentially the result of movement away from Euronext, but may also simply have occurred for the same reasons bid-ask spread increased during the announcement phase. Unlike the NYSE stocks, Euronext stocks did not experience the subsequent increase in liquidity, and so bid-ask spread remained high. Greater effect on NYSE

than Euronext fits our intuitive sense of the merger's results, because the direction of flow is toward NYSE. It is the "gold standard" of exchanges, and given the opportunity to trade there more easily, more individuals would likely utilize it. Such movement provides for greater competition among the parties involved, and thus a competitive incentive to reduce one's sales price, and, as an effect, the difference between one's bid price and one's ask price. With Euronext-listed stock, change also seems to occur over months, rather than individual weeks, something which is also indicative of a smaller direct effect on that exchange.

In addition to bid-ask spread analysis, we also utilize a volume-based measure of liquidity, the Hui-Hubel Liquidity Ratio (HHL). Neither stocks listed on NYSE, nor those found on Euronext displayed large changes in their HHL during the time periods in which we are interested. Basic volume data confirms that neither the announcement nor the merger resulted in a dramatic uptick in the volume traded on each exchange (Figures 18 and 19). The average HHL of stocks listed on NYSE did, however, rise in the month immediately prior to the announcement. Such movement is in line with our theories of bid-ask spread-based liquidity, as higher HHL indicates lower liquidity. NYSE-listed stocks' HHL decreased for nearly all time periods following the merger. The contrast with bid-ask spread changes proves that, while "tightness" increased, "depth," "breadth," and "resiliency," largely did not. Monthly scale better explains HHL movements, which appears logical given that HHL is calculated on a weekly basis, and thus locating a clear trend requires looking at a longer timeframe. Euronext, in contrast, saw lower HHL, but not for an extended period, once again, confirming our theory that the announcement and merger affected NYSE far more than it did Euronext.

We also make note of two sharp increases in the HHL of NYSE-based stocks, and one increase in the HHL of Euronext-based stocks, during the first ten weeks of 2007. We believe that these

are related to sharp upticks in American stock exchange volatility during those weeks. During the first week of 2007 (the time of the first American spike in HHL), the VIX weekly average went from about 10 to about 14. It returned to around 10, during the week after. In week 9 of the same year (the time of the second American spike), the VIX weekly average jumped from around 10 to above 15. Theories and empirical evidence both conclude that liquidity is negatively associated with volatility (Huberman and Halka 2001), thus we feel comfortable attributing the HHL movement to changes in volatility.

Finally, we evaluate the competitive implications of the merger. NYSE's market share benefited significantly. The strong home-bias discussed earlier means that it is unlikely Euronext and NYSE were competitors prior to the merger. The event did, however, help them attract a greater market share in other ways. Both immediately after the announcement of the merger and during the month of the merger itself. Our data indicates that during both months, the exchange's market share rose nearly a quarter from its previous value. It appears that NYSE largely captured new listings that otherwise would have appeared on NASDAQ. The sum of NYSE and NASDAQ's market shares regularly exceeds 80%, with the remaining 20% covered by firms like the American Stock Exchange, as well as Over the Counter and Pink Sheet trading. It is unlikely that the merger incentivized companies to go public, but highly likely that they made the decision to list with NYSE over NASDAQ due to the seemingly high probability of NYSE's quick transatlantic expansion. Because of the trade-off in market share, we are not as much concerned that the NYSE-Euronext merger created an anti-competitive market in the United States. The US HHI regression confirms this for us. It shows nearly no change in market concentration in the United States during the relevant time periods. This is true primarily because NYSE's market share was lower than NASDAQ's prior to the merger, and so capturing some of

NASDAQ's ultimately just evened out the market share distribution. In countries with a Euronext exchange, however, immediately after the announcement, market concentration increased sizably. Our regressions indicate that, during the time after the merger, Euronext became more dominant in each of the relevant countries. Its few competitors are OMX and various country-specific exchanges. A market response similar to the one we identified in the United States may have been at work in these nations. Simply put, Euronext was perceived as a better option for new listings, given its recent expansion.

VII. Conclusion

From the results that we acquire, we draw some significant conclusions, which we believe are applicable to other mergers of this variety. Given the trajectory of exchange markets, it is particularly pertinent that we establish certain basic expectations about their effects, such that we may predict what each new one will bring. Essentially, we find that the merger produced increased liquidity, at least temporarily, on the New York Stock Exchange. Our research suggests that this was a result of possible trader movement to NYSE. We take this to indicate that, when a merger is likely to produce movement from one financial market to another, stocks listed on the destination exchange will generally see lower bid-ask spreads (and possibly lower Hui-Hubel Liquidity Ratios). In addition, our results show a rise in market share for both exchanges involved, but not much change in the Herfindahl–Hirschman Index of either the United States or relevant countries in Europe. We, therefore, believe that stock exchange mergers will increase the percentage of stocks listed on the exchanges involved, but are unlikely to affect the market concentration in the region. This conclusion only holds if it is the non-dominant exchange (in terms of proportion of listings) that engages in the merger. Had NASDAQ, rather than NYSE been involved, more competition issues would have likely arisen. However, high

levels of market concentration appear to be the norm in the market for exchanges, and policy makers may want to avoid any actions which could exacerbate those problems. We also uncovered interesting information regarding the way listing companies think about mergers and how they affect the company's future wellbeing. It seems listing companies will opt for the exchange that engaged in the merger, due to improved perception of that exchange. The decision-makers in charge of listing stocks do not tend to make the binary decision of whether to list a stock or not, based on the merger, but will adjust where they find it appropriate to list based on that event.

We also would like to note a few possible future research projects, relating to this one. Due to data constraints, we did not pursue a volume-based measure of competition. We do, however, believe that an analysis of changes in the value and volume traded surrounding the merger might advance our understanding of the integration's effects. We might also like to explore how many trading firms began attempting to move from NYSE to Euronext or vice versa after the merger. This might provide us better insight into how those firms make decisions about which exchanges to utilize. Another project of value might be to compare the changes that occurred on NYSE and Euronext to another unrelated exchange. This may enable us a more substantive look into how NYSE and Euronext compared to other exchanges operating during the time of the NYSE-Euronext merger. Ultimately, we believe we have laid the foundation for exploring another aspect of financial markets, which has previously gone unanalyzed.

We hope that our analysis may also serve as a guide for individuals with the power to generate change in regulatory policies. We believe that they should utilize empirical evidence, but keep in mind that every merger must be assessed in its specific context. For example, had the NYSE-Euronext merger not promised to make international trading easier, the benefits of the

companies' union may not have outweighed the risks of creating an anti-competitive situation. Regulators, ultimately, need a framework for dealing with international mergers. Such mergers are, by their nature, distinct from solely domestic mergers, and require a distinct method of analysis in order to guarantee that they will not adversely affect consumers.

Appendix

Figure 1: Weekly Average Bid-Ask Spread – NYSE

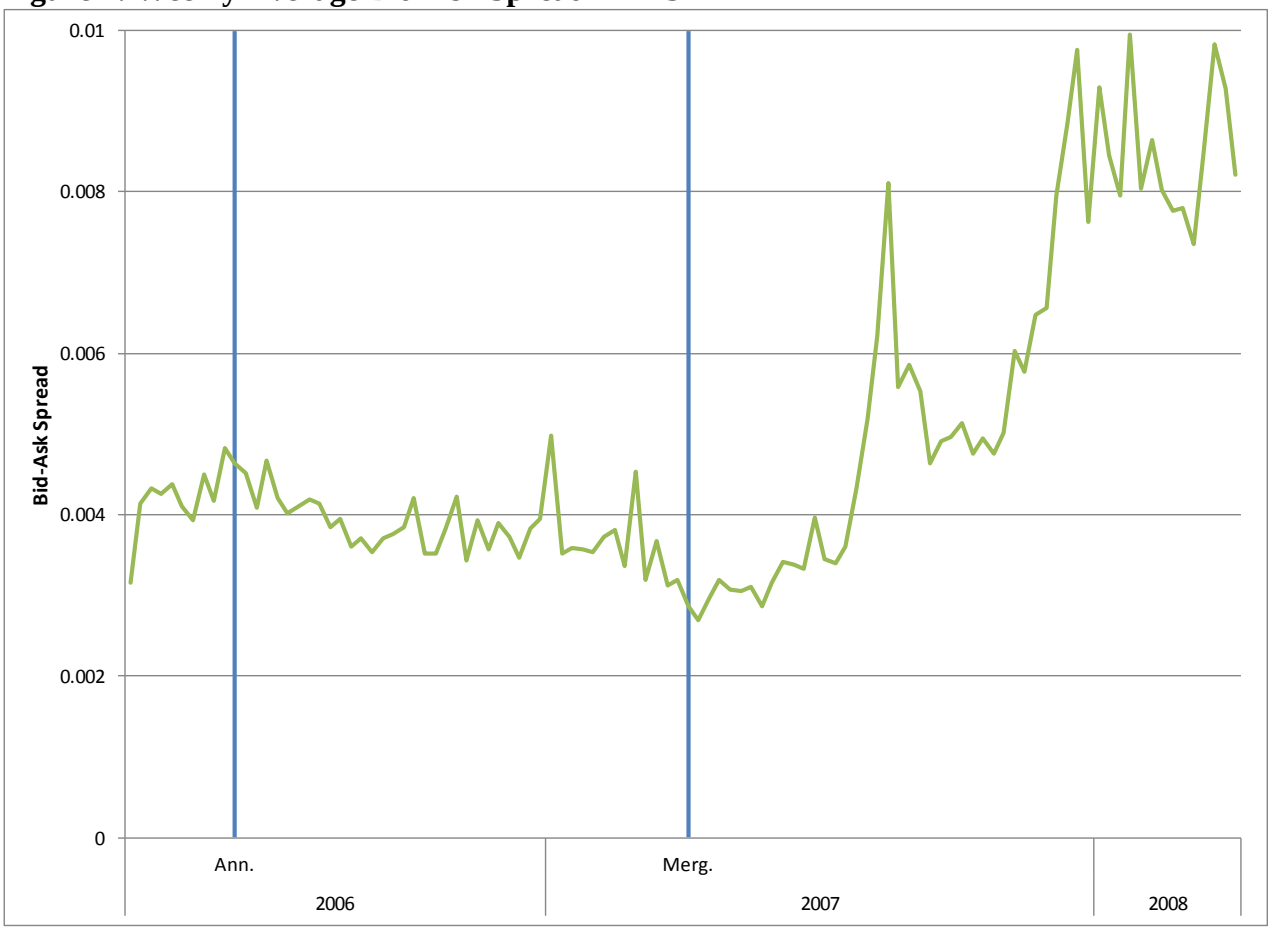

Figure 2: Daily Average Bid-Ask Spread (Months Before and After Announcement) – NYSE

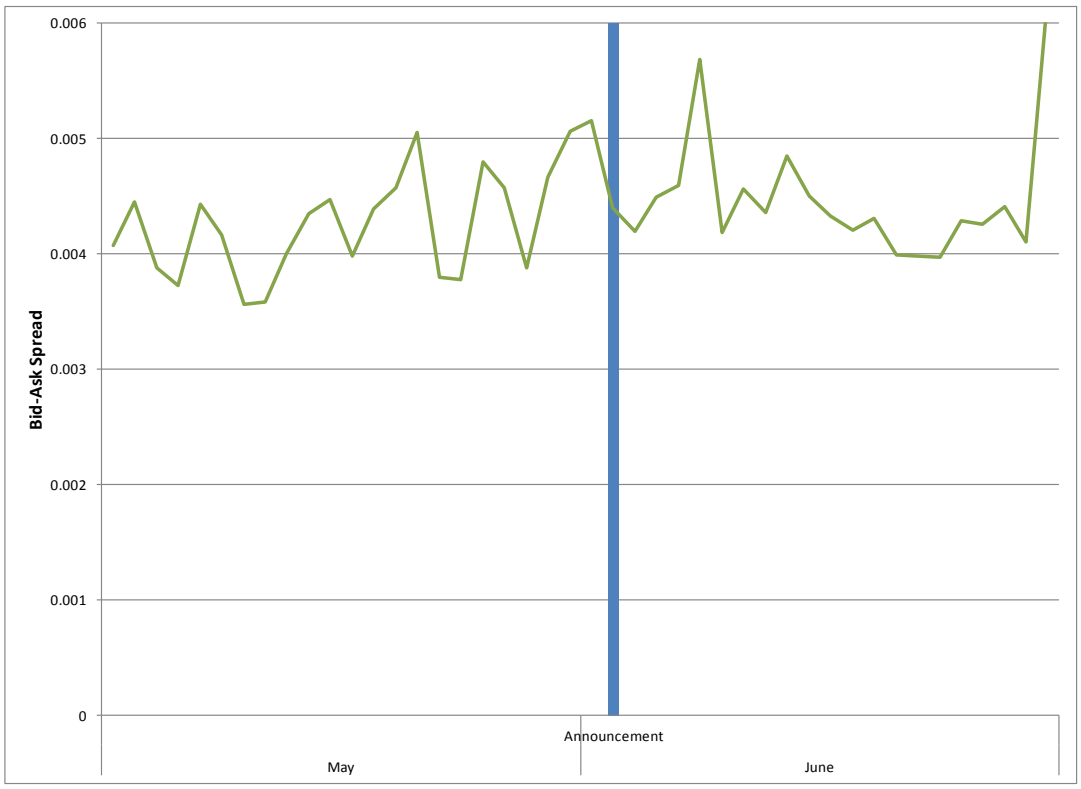

Figure 3: Daily Average Bid-Ask Spread (Months Before and After Merger) – NYSE

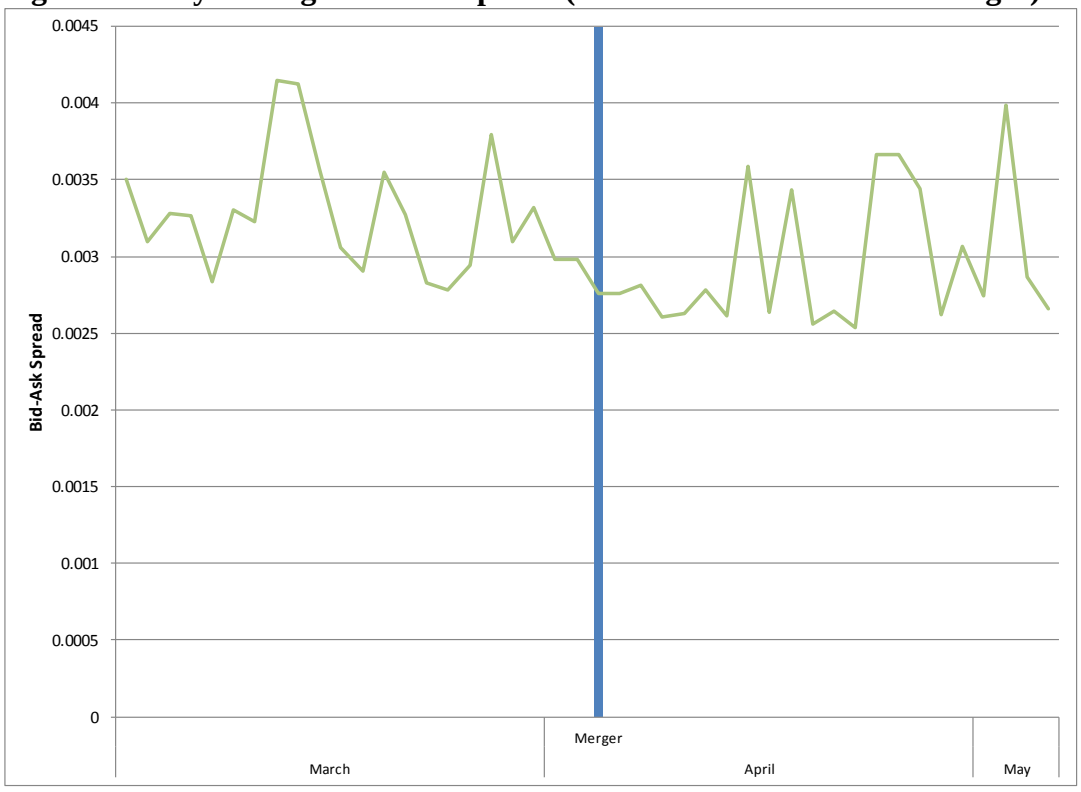

Figure 4: Weekly Average Bid-Ask Spread – Euronext

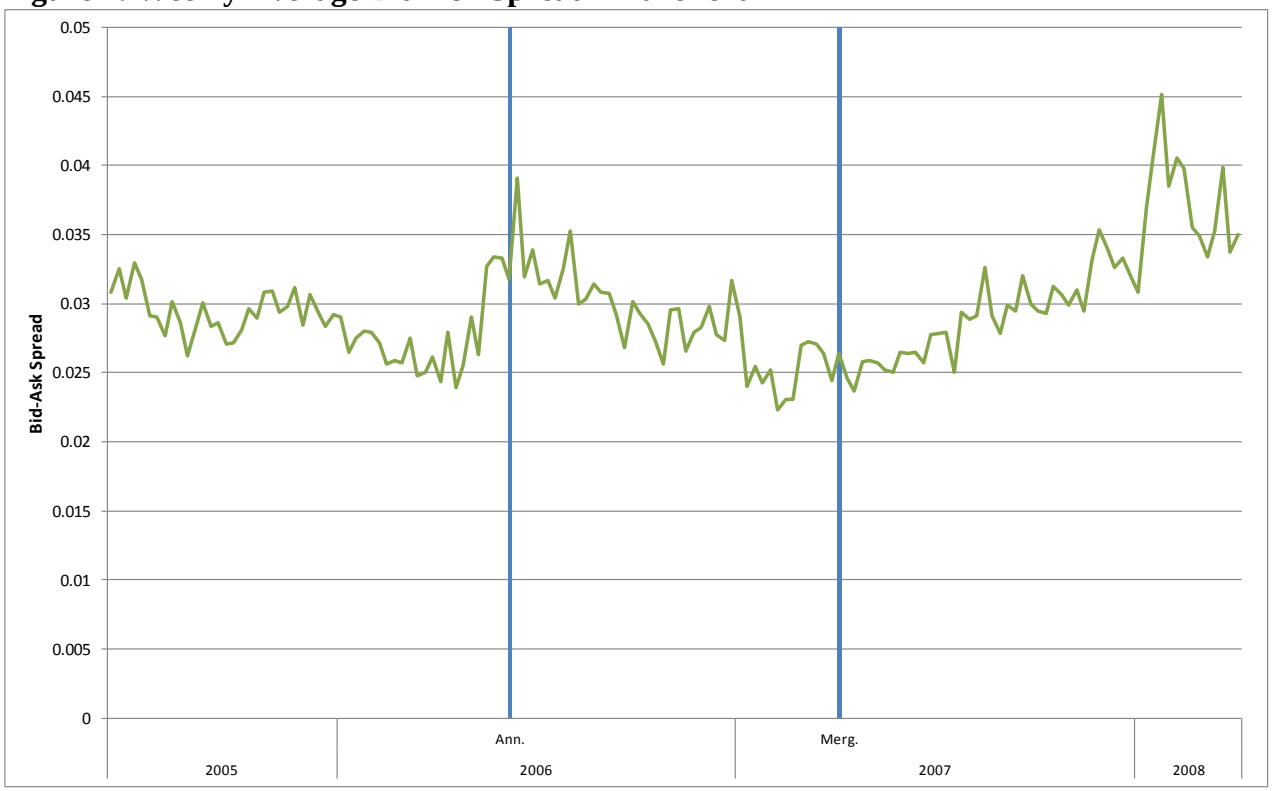

Figure 5: Daily Average Bid-Ask Spread (Months Before and After Announcement) – Euronext

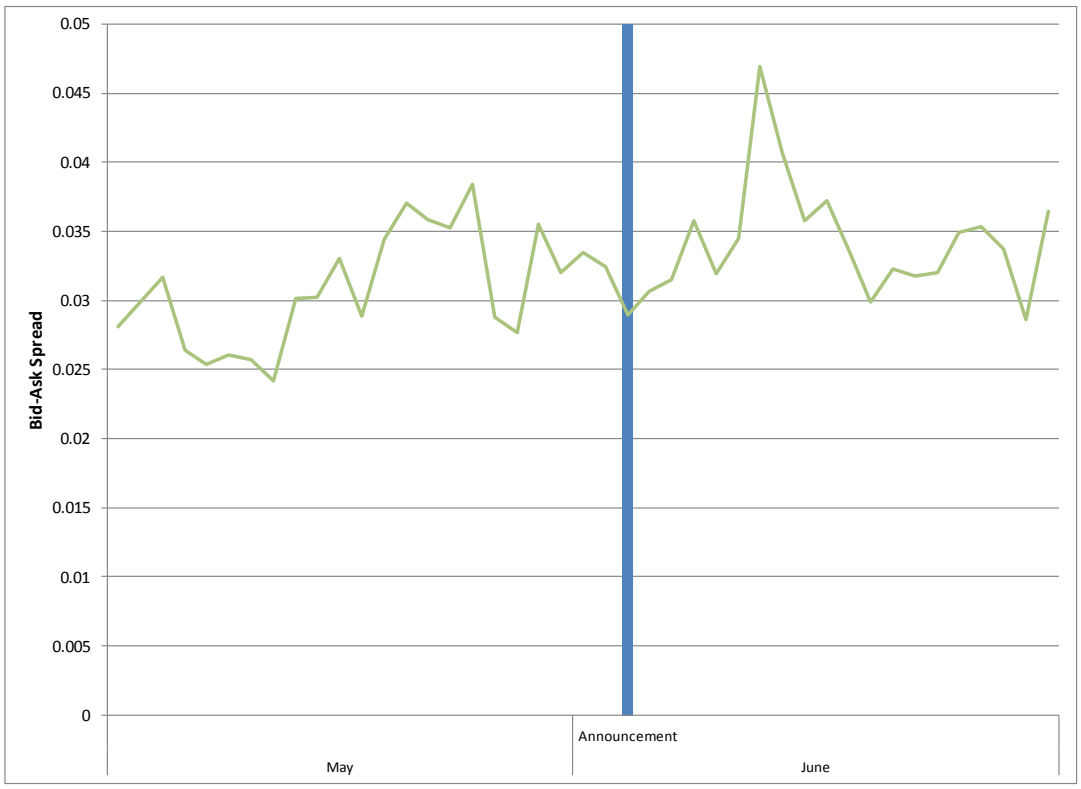

Figure 6: Daily Average Bid-Ask Spread (Months Before and After Merger) – Euronext

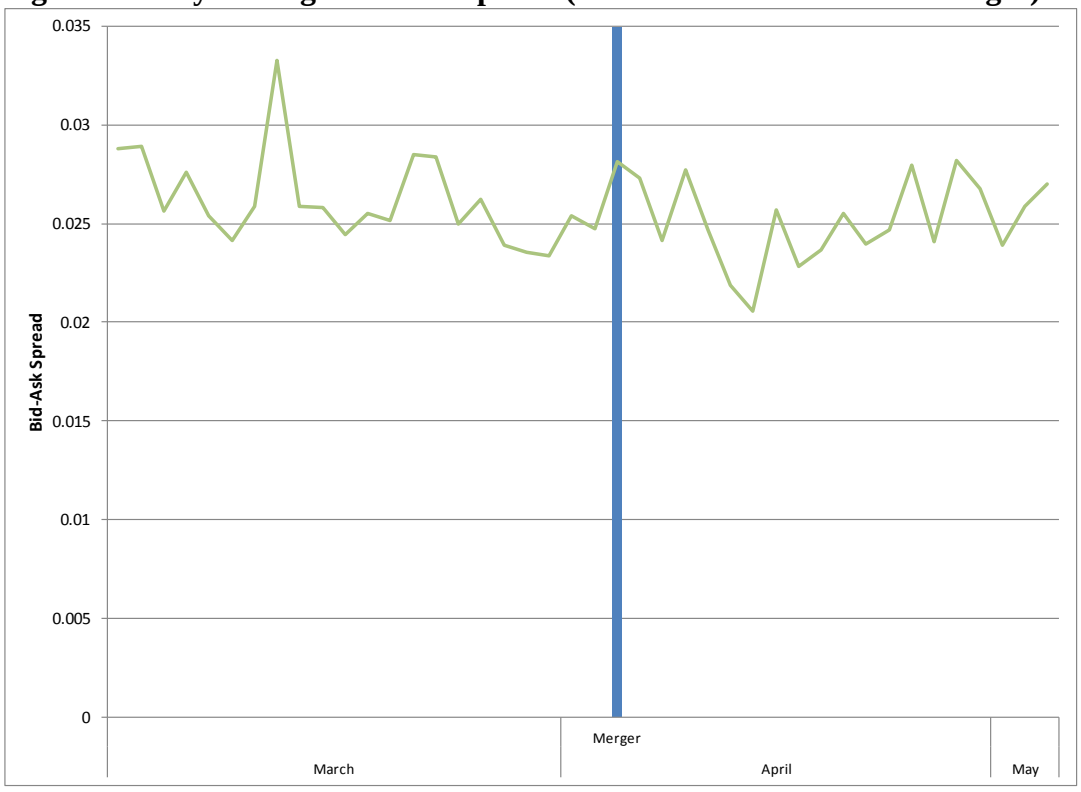

Figure 7: Weekly Average Hui Hubel Liquidity Ratio – NYSE

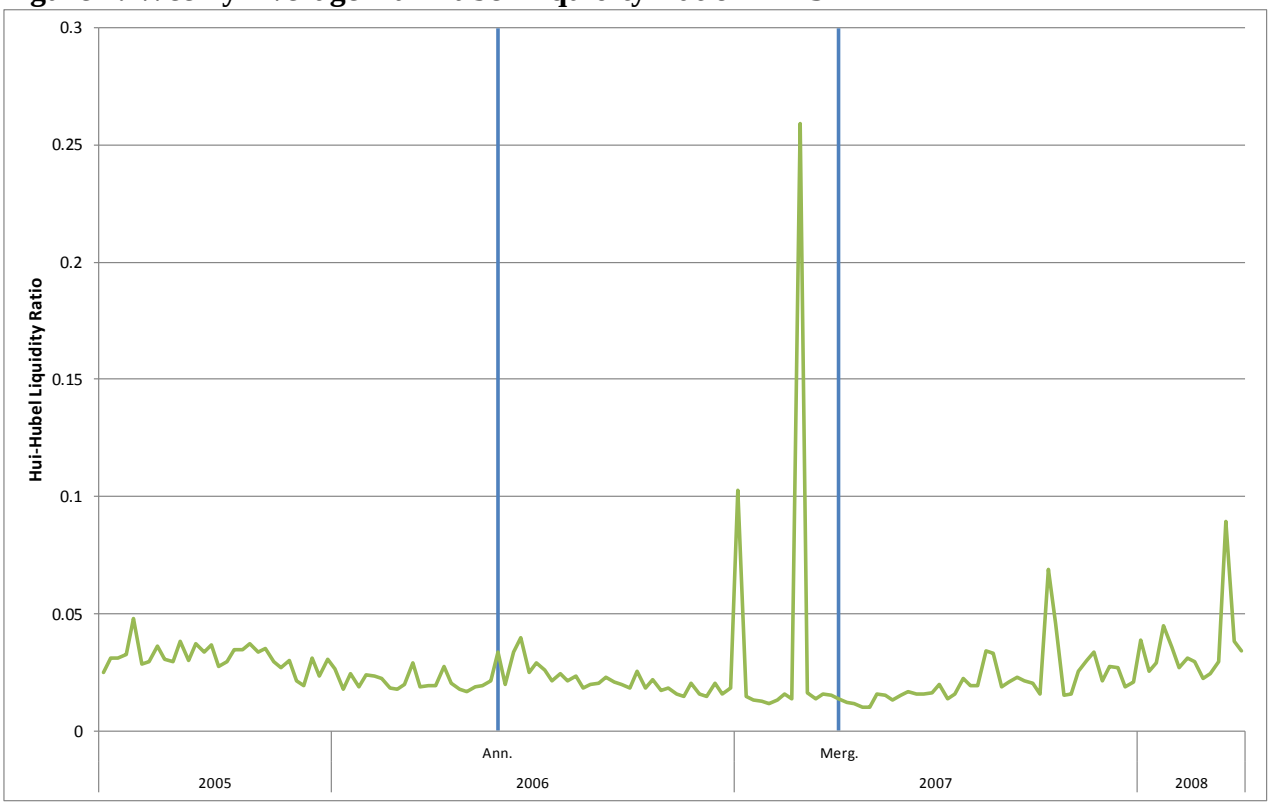

Figure 8: Daily Average Hui Hubel Liquidity Ratio (Months Before and After Announcement) – NYSE

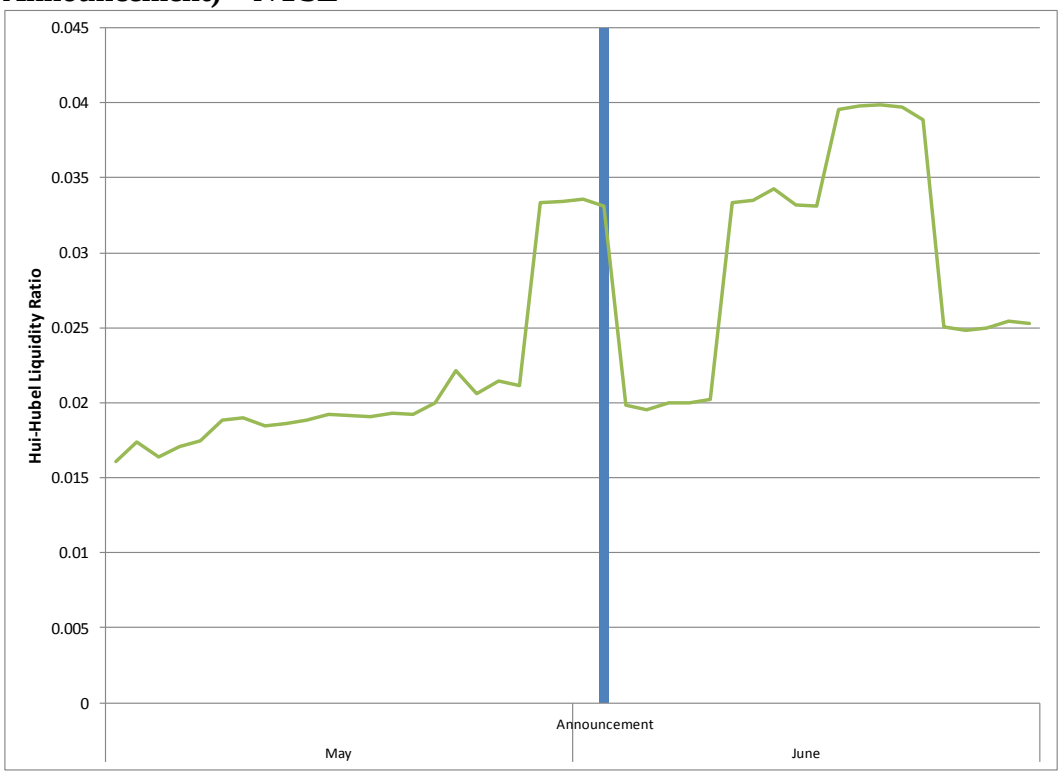

Figure 9: Daily Average Hui Hubel Liquidity Ratio (Months Before and After Merger) – NYSE

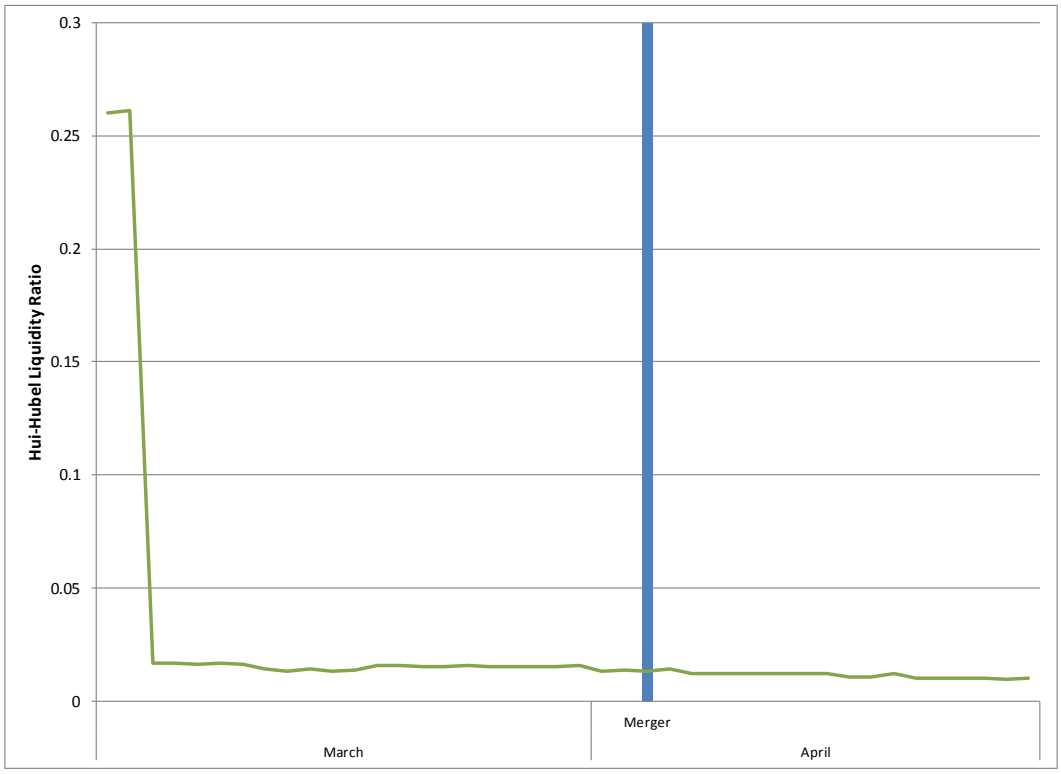

Figure 10: Weekly Average Hui Hubel Liquidity Ratio – Euronext

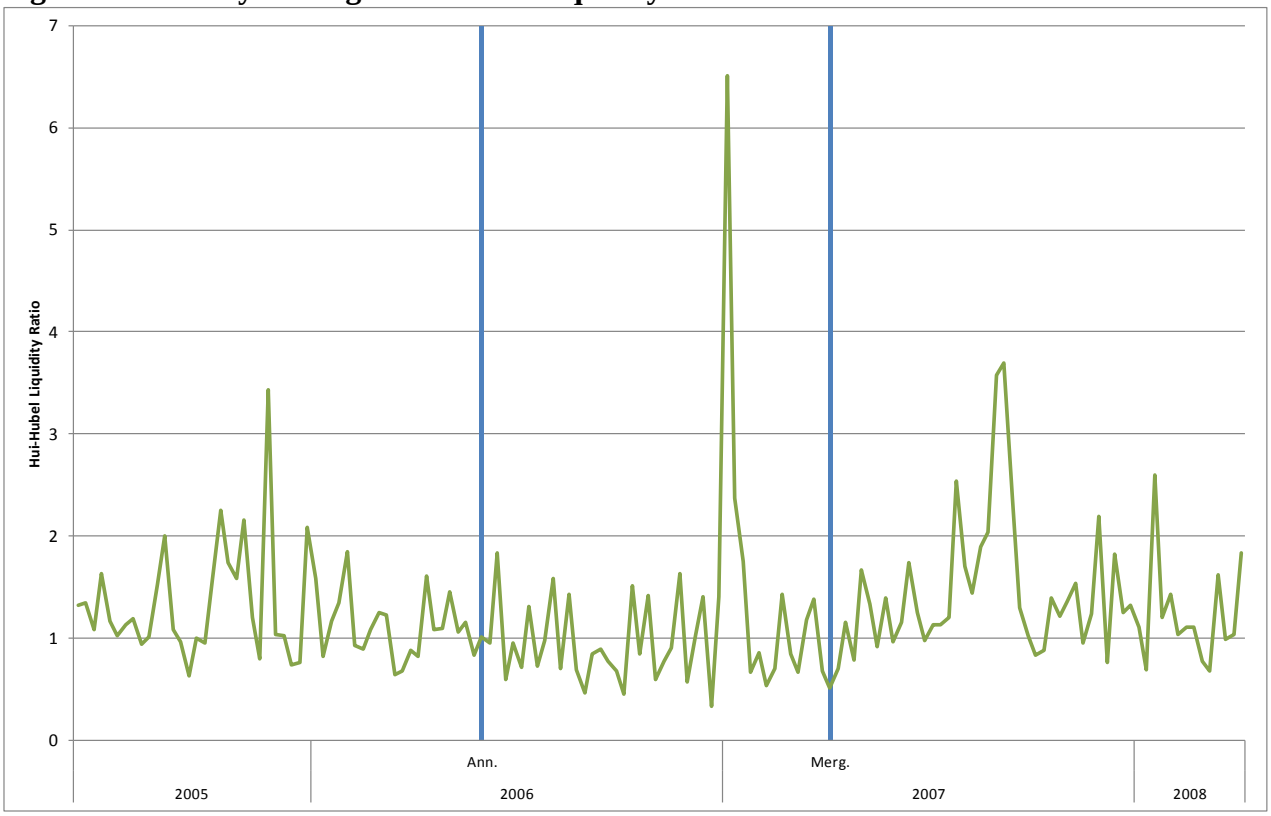

Figure 11: Daily Average Hui Hubel Liquidity Ratio (Months Before and After Announcement) – Euronext

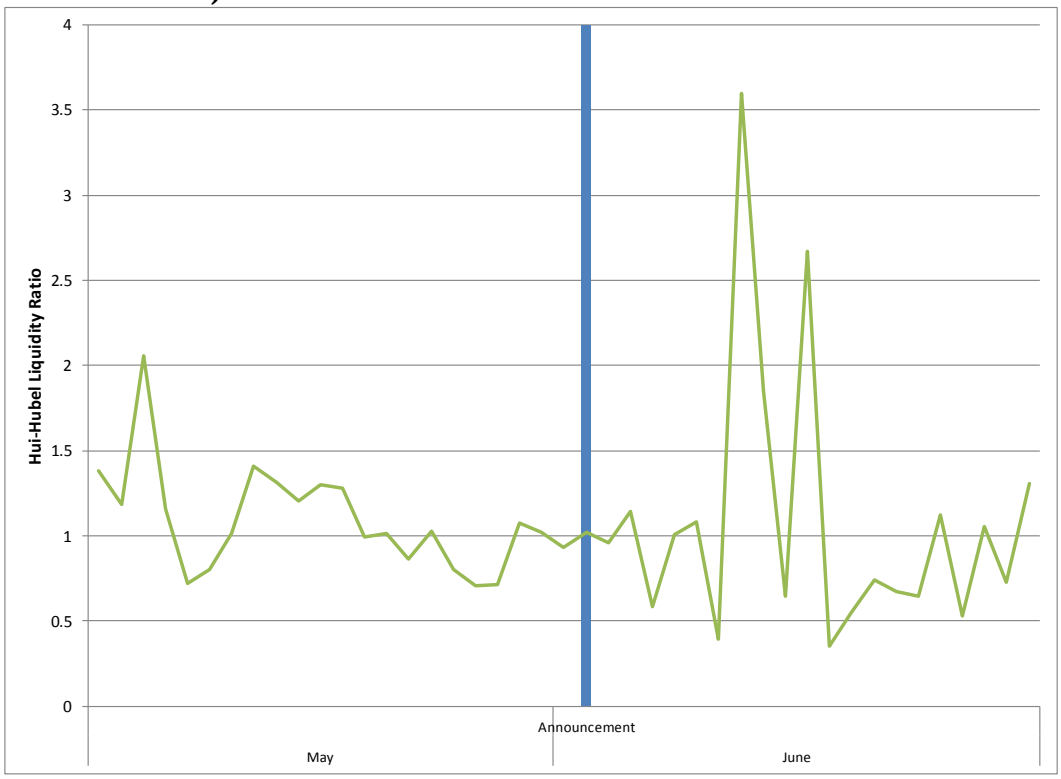

Figure 12: Daily Average Hui Hubel Liquidity Ratio (Months Before and After Merger) – Euronext

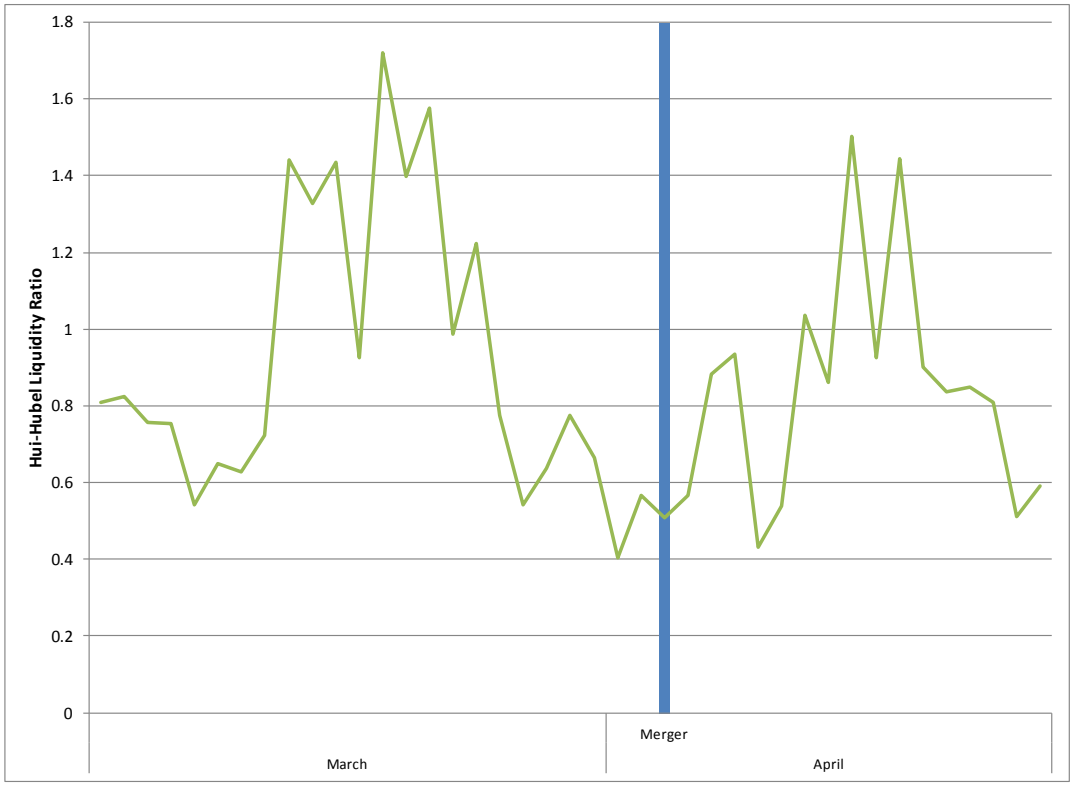

Figure 13: Market Share – NYSE

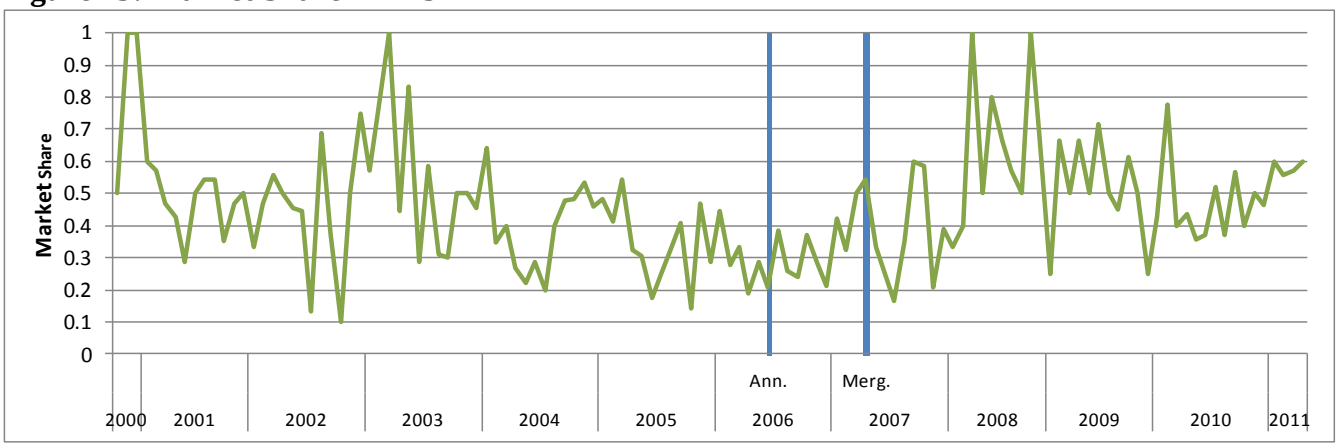

Figure 14: Hershman-Herfindhal Index – United States

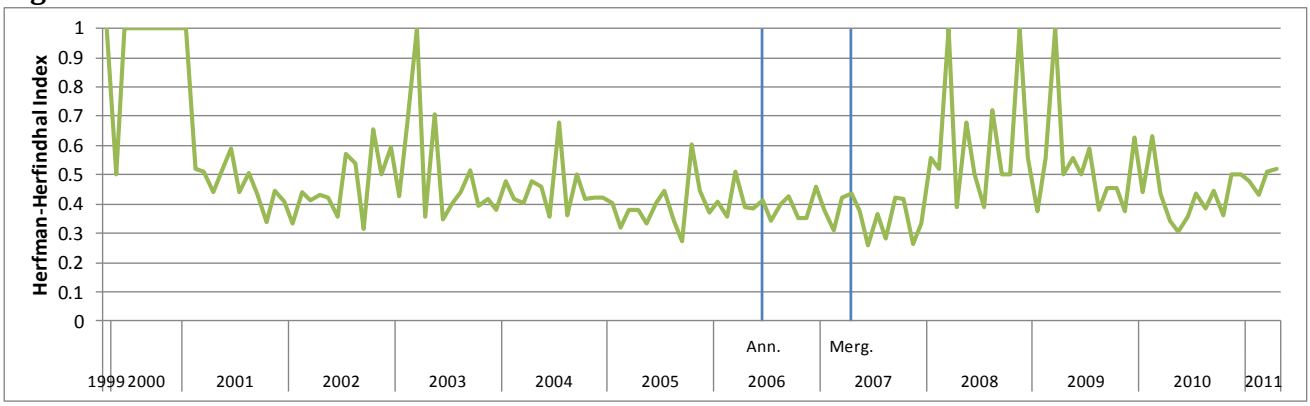

Figure 15: Market Share – NYSE vs. NASDAQ

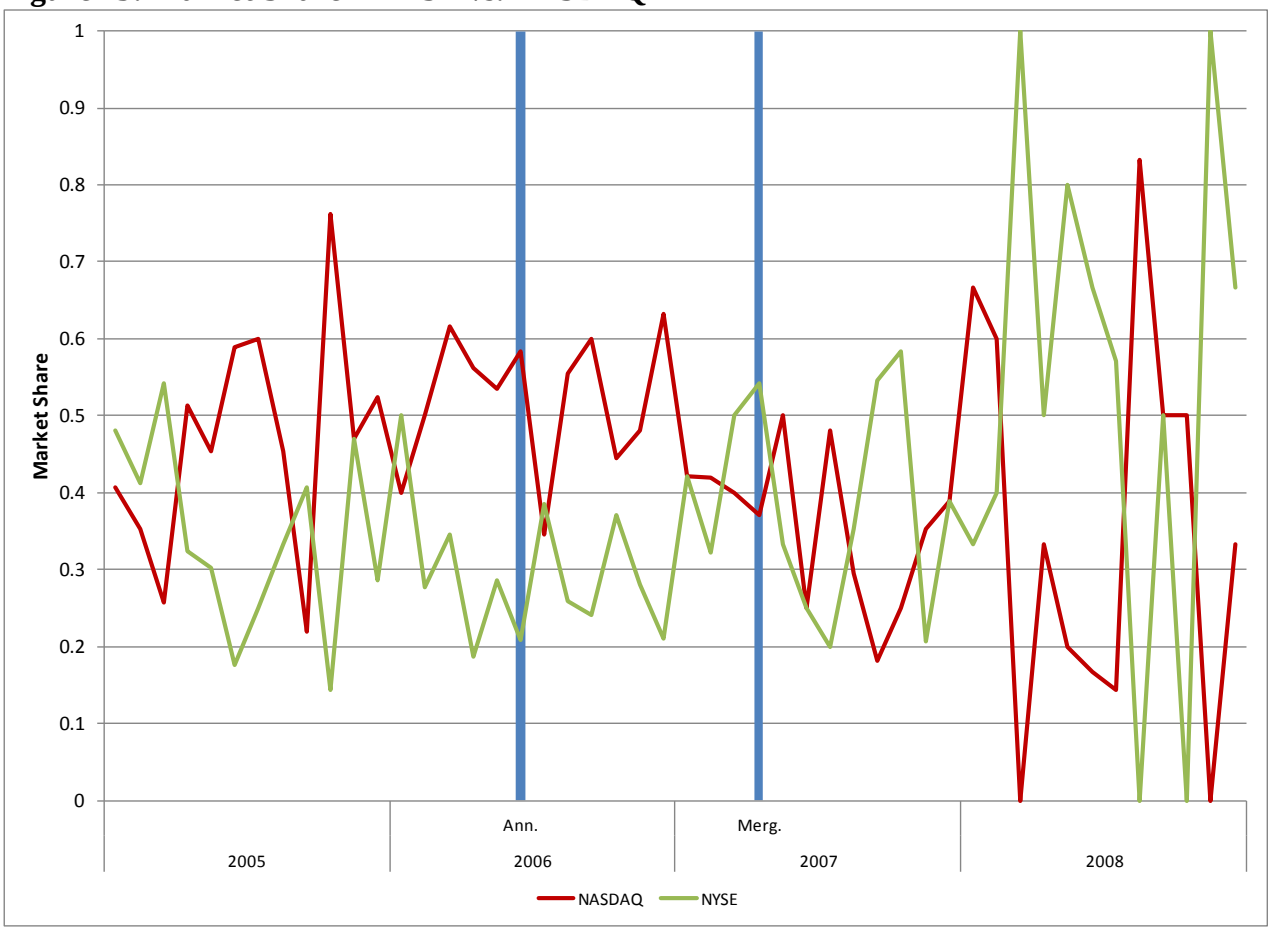

Figure 16: Market Share – Euronext

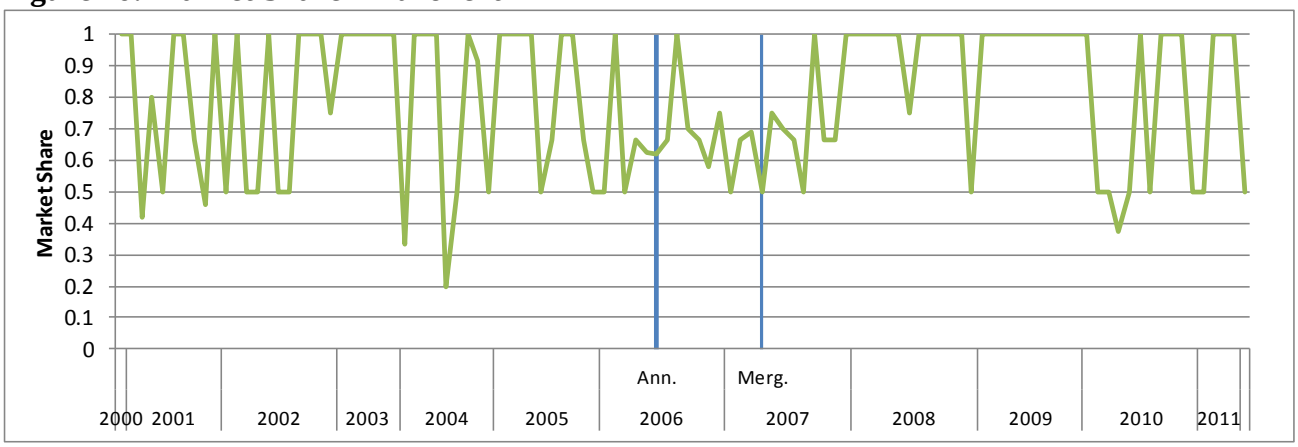

Figure 17: Hershman-Herfindhal Index – European Nations with Euronext Branches

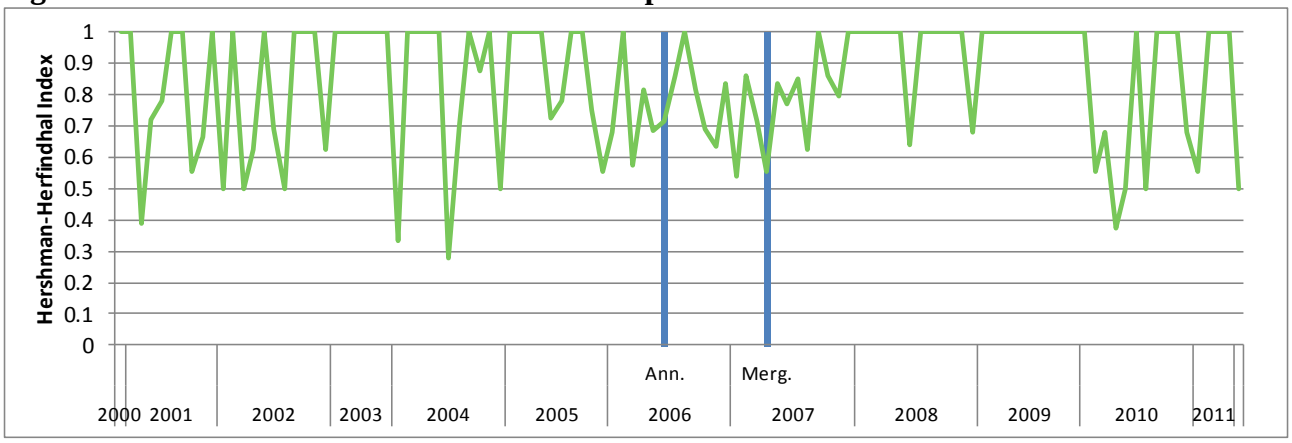

Figure 18: NYSE's Daily Volume Traded

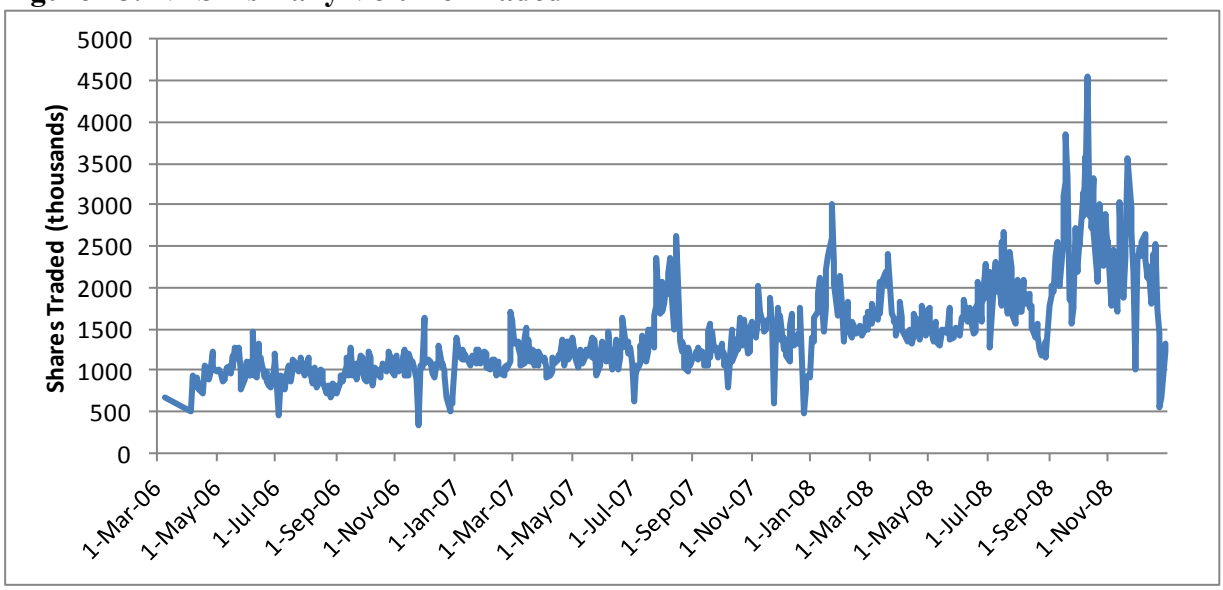

Figure 19: Euronext's Daily Volume Traded

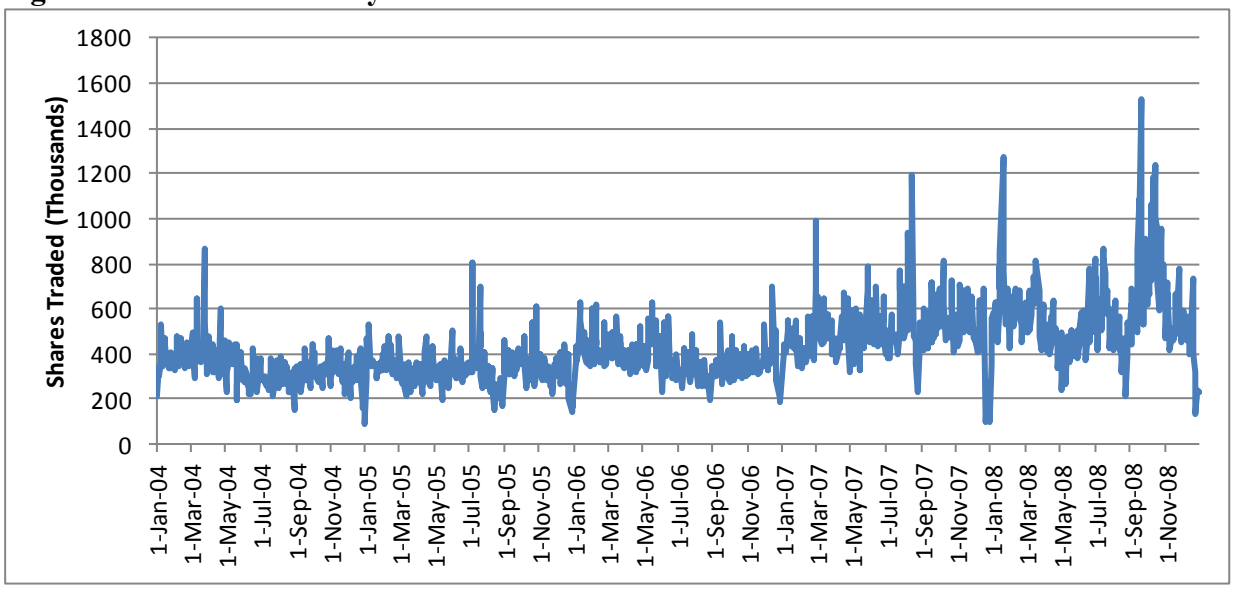

Table 1: Bid-Ask Spread Regressions – NYSE

	(1) Year Before Announcement through Year After Merger	(2) Year Before Announcement through Year After Merger	(3) 6 Months Before Announcement through 6 Months After Merger	(4) 3 Months Before Announcement through 3 Months After Merger
S&P 500	-1.64e-06 (1.84e-06)	2.04e-06 (1.70e-06)	3.36e-06* (1.84e-06)	6.62e-06*** (2.61e-06)
VIX	.0001238*** (.0000131)	.0001704*** (7.55e-06)	.0001507*** (9.24e-06)	.0001631*** (.000014)
FTSEurofirst 100	-1.22e-06 (1.05e-06)	-7.83e-07 (9.45e-07)	-2.50e-06** (1.02e-06)	-9.34e-07 (1.30e-06)
Eurostoxx	8.04e-06 (.0000124)	-2.08e-06 (.000012)	9.11e-06 (.0000127)	-.0000103 (.0000167)
Shares Outstanding	-5.28e-10 (4.25e-10)	-5.21e-10 (4.25e-10)	-4.80e-10 (4.49e-10)	-4.73e-10 (4.82e-10)
Volume Traded	-1.62e-08 (1.01e-08)	-1.67e-08* (1.01e-08)	-1.82e-08* (1.02e-08)	-1.94e-08* (1.09e-08)
Month prior to announcement	1.23e-06 (.000291)			
4th week prior to announcement		.0005666** (.0002606)	.000655*** (.0002522)	.0008572*** (.0003037)
3rd week prior to announcement		.0004269* (.0002588)	.0005007** (.0002504)	.0007082** (.000301)
2nd week prior to announcement		.0005236* (.0002682)	.0005773** (.0002596)	.0007962** (.0003185)
Week prior to announcement	.0004353 (.0003608)	.0001715 (.0002751)	.0002292 (.0002664)	.0004301 (.0003261)
Day of announcement	.0003108 (.000583)	-.0005312 (.0005686)	-.0006405 (.0005492)	-.0006076 (.0005477)
Week of announcement		.0006727** (.0003144)	.0007031** (.0003039)	.000931*** (.0003584)
Week after announcement	.000471 (.0003975)	0001903 (.0002729)	.0001596 (.000264)	.0004117 (.0003376)
2nd week after announcement		-.0005928** (.0002828)	-.0005684** (.0002737)	-.0003177 (.0003468)
3rd week after announcement		-.0000459 (.0002694)	-.0000806 (.0002608)	.0002162 (.0003491)
4th week after announcement		.0007493*** (.000266)	.000683*** (.000258)	.0009948 (.0003487)
Month after announcement	.000257 (.0003485)			
After announcement (all other time after)	-.0001976 (.0002758)			

Month prior to merger	-.0007592*** (.0001963)			
4th week prior to merger		-.0011792*** (.0002656)	-.0011411*** (.0002568)	-.0012186*** (.0002577)
3rd week prior to merger		-.0009147*** (.0002628)	-.0009205*** (.0002538)	-.0009905*** (.0002549)
2nd week prior to merger		-.0006941*** (.0002677)	-.0007212*** (.0002586)	-.0008017*** (.000261)
Week prior to merger	-.0007223*** (.0002788)	-.0007208*** (.000271)	-.0007044*** (.0002619)	-.0007986*** (.0002657)
Day of merger	-.0009871*** (.0005561)	-.0001693 (.0005793)	-.0001788 (.0005589)	-.0001657 (.0005563)
Week of merger		-.0011301*** (.0003254)	-.0012024*** (.0003153)	-.0012316*** (.0003318)
Week after merger	-.0005617 (.0003474)	-.0009494*** (.0002727)	-.0010329*** (.000265)	-.0010637*** (.0002873)
2nd week after merger		-.0006332** (.000264)	-.0006878*** (.0002552)	-.0008144*** (.000283)
3rd week after merger		-.0009351*** (.0002639)	-.0010106*** (.0002552)	-.0011545*** (.0002894)
4th week after merger		-.000096 (.0002469)	-.000136 (.0002385)	-.0001293 (.0002394)
Month after merger	-.0004955* (.0002775)			
After merger (all other time)	.0006914*** (.0001992)			
F-Statistic	92.76	72.84	66.64	54.39
σ_μ	.05817376	.05817492	.05615764	.05483716
σ_ε	.02331689	.02331692	.02249331	.02238691

This table does not report the monthly binaries, and per-stock binaries used in each regression. "*", "**", "***" indicate significance at the 10%, 5% and 1% levels respectively. Binaries labeled "month before" are equal to one between the beginning of the month before the event and the start of the week before it and zero otherwise. Binaries labeled "month after" are equal to one beginning at the end of the week following the event and the end of the month following it. Binaries indicating "all other time" after an event are equal to one beginning one month after the event and zero before that point.

Table 2: Bid-Ask Spread Regressions – Euronext

	(1) Year Before Announcement through Year After Merger	(2) Year Before Announcement through Year After Merger	(3) 6 Months Before Announcement through 6 Months After Merger	(4) 3 Months Before Announcement through 3 Months After Merger
S&P 500	1.81e-06 (4.98e-06)	-9.39e-06** (3.98e-06)	-.000013** (6.16e-06)	.0000437*** (.0000107)
VIX	.0003601*** (.0000481)	.0006251*** (.0000259)	.0005607*** (.0000357)	.0010706*** (.0000567)
FTSEurofirst 100	.0000253*** (3.19e-06)	-.0000266*** (2.36e-06)	-.0000341*** (3.03e-06)	7.47e-06 (4.89e-06)
Eurostoxx	-.0003906*** (.000037)	.000221*** (.0000262)	.0002607*** (.0000368)	-.0002225*** (.0000645)
Shares Outstanding	1.00e-09 (7.43e-10)	1.16e-09 (7.43e-10)	-1.96e-09* (1.13e-09)	-3.34e-09** (1.38e-09)
Volume Traded	-1.29e-07*** (4.62e-08)	-1.42e-07*** (4.63e-08)	-1.39e-07** (5.62e-08)	-1.58e-07** (6.88e-08)
Month prior to announcement	.0008746 (.0007102)			
4th week prior to announcement		.0028421*** (.0010802)	0006943 (.0010876)	.0022694* (.001263)
3rd week prior to announcement		-.0010396 (.0009929)	-.0033529*** (.0010014)	-.0013453 (.0011882)
2nd week prior to announcement		.0026248*** (.0009983)	-.0004776 (.0010233)	.0008127 (.0012562)
Week prior to announcement	.0027941*** (.0010585)	.002371** (.0010128)	-.000723 (.0010474)	-.0000815 (.0012905)
Day of announcement	.0095239*** (0019983)	-.0006317 (.0022682)	.0006436 (.0022514)	.0013329 (.0022604)
Week of announcement		.0019384 (.0011881)	-.0012267 (.0012193)	.0000545 (.0014383)
Week after announcement	.0081524*** (.0010415)	.0002289 (.0009437)	-.0028108*** (.0010462)	-.000697 (.0013495)
2nd week after announcement		.0050887*** (.0009525)	.0020308* (.0010703)	.0030423** (.0013792)
3rd week after announcement		.0019242** (.0009588)	-.0013298 (.0010514)	.0019583 (.0013981)
4th week after announcement		.0033675*** (.0009447)	.0002184 (.0010357)	.004041*** (.0013939)
Month after announcement	.0108584*** (.0007358)			
Announcement (all other time after)	.0105243*** (.0004362)			

Month prior to merger	.0030143*** (.0006318)			
4th week prior to merger		.0011752 (.0009371)	.0026549*** (.0009397)	.0030337*** (.0009896)
3rd week prior to merger		.0007992 (.0009416)	.0019728** (.0009439)	.0029321*** (.0009926)
2nd week prior to merger		.0024135** (.0009496)	.0041191*** (.0009574)	.0052095*** (.0010177)
Week prior to merger	.0029459*** (.0009675)	.0007533 (.0009468)	.0024719*** (.0009594)	.0033053*** (.0010385)
Day of merger	.0062468*** (.0020373)	.0023475 (.0022868)	.0024076 (.00226)	.0027603 (.0022638)
Week of merger		.0022414* (.0012293)	.0036255*** (.0012366)	.0045528*** (.0013225)
Week after merger	.0037102*** (.001241)	.0012225 (.0010822)	.0027755** (.0010993)	.0039603*** (.0012082)
2nd week after merger		.0021714** (.0009842)	.0040692*** (.0009952)	.0034774*** (.0011204)
3rd week after merger		.0026442*** (.00099)	.0044211*** (.0009987)	.0032859*** (.0011415)
4th week after merger		.0015638 (.0010523)	.0019288* (.0010427)	.0024828** (.0010547)
Month after merger	.0035683*** (.0007554)			
Merger (all other time after)	.0083598*** (.0007272)			
F-Statistic	148.94	101.52	98.93	99.33
σ_μ	.15486259	.15480591	.15684625	.15534923
σ_ε	.06042029	.06044593	.05973191	.05982512

This table does not report the monthly binaries, and per-stock binaries used in each regression. "*", "**", "***" indicate significance at the 10%, 5% and 1% levels respectively. Binaries labeled "month before" are equal to one between the beginning of the month before the event and the start of the week before it and zero otherwise. Binaries labeled "month after" are equal to one beginning at the end of the week following the event and the end of the month following it. Binaries indicating "all other time" after an event are equal to one beginning one month after the event and zero before that point.

Table 3: Hui-Hubel Liquidity Ratio Regressions – NYSE

	(1) Year Before Announcement through Year After Merger	(2) Year Before Announcement through Year After Merger	(3) 6 Months Before Announcement through 6 Months After Merger	(4) 3 Months Before Announcement through 6 Months After Merger
S&P 500	.0002676*** (.0000485)	.0000187 (.0000389)	-.0002217*** (.0000664)	-.0002966** (.0001267)
VIX	.0036328*** (.0004695)	-.0000329 (.0000231)	-.0001947 (.0003881)	.0007018 (.0006892)
FTSEurofirst 100	-.0000488 (.0000313)	.0002414 (.0002574)	-.0000971*** (.000033)	-.0001009* (.0000594)
Eurostoxx	.00014 (.0003638)	-.0000788 (.000254)	.001568*** (.000404)	.0021816*** (.000779)
Month prior to announcement	.0224864*** (.0068588)			
4th week prior to announcement		-.0017141 (.0099288)	.0064661 (.0111862)	.0310986** (.0147383)
3rd week prior to announcement		.0005181 (.0099291)	.0076391 (.0111696)	.0313441** (.0146698
2nd week prior to announcement		.0012998 (.0100045)	.0135069 (.0114343)	.0435513*** (.0155201)
Week prior to announcement	.0167647 (.0104407)	.0020745 (.010074)	.0162637 (.0116196)	.0479817*** (.0158672)
Day of announcement	-.0154158 (.0200207)	-.0023251 (.0226897)	.0016098 (.0251293)	.0058528 (.0281479)
Week of announcement		.0132908 (.0118045)	.027945** (.0135162)	.059875*** (.0177052)
Week after announcement	-.0375192*** (.0102986)	-.0035106 (.0093554)	.0154641 (.0115504)	.0517777*** (.0165461)
2nd week after merger		.0107404 (.0094355)	.0318355*** (.011815)	.069704*** (.0169098)
3rd week after merger		.016462* (.0094002)	.0329231*** (.0115095)	.0699801*** (.0170503)
4th week after merger		.0019463 (.0093547)	.0183847 (.0114278)	.0558734*** (.0170774)
Month after announcement	-.0193339*** (.0072442)			
Announcement (all other time)	-.0088881** (.0042708)			
Month prior to merger	-.0404558*** (.0062216)			
4th week prior to merger		-.01592* (.0093132)	-.0264007** (.010431)	-.0414352*** (.0122168)

3rd week prior to merger		-.0198913** (.0093085)	-.0306056*** (.0104251)	-.0451346*** (.0121999)
2nd week prior to merger		-.0175649* (.0094004)	-.0277779*** (.0105853)	-.0435041*** (.012511)
Week prior to merger	-.0351505*** (.0095459)	-.0172377* (.009371)	-.0301272*** (.0106084)	-.049178*** (.012761)
Day of merger	-.0260226 (.0203117)	-.000465 (.0227664)	-.0013118 (.0251147)	-.00183 (.0280715)
Week of merger		-.0043313 (.0121459)	-.018309 (.0136403)	-.0383656** (.0162461)
Week after merger	-.026669 (.0109901)	-.0053652 (.0098186)	-.0204757* (.0111859)	-.0417235*** (.0138576)
2nd week after merger		-.0054925 (.0097814)	-.0167177 (.0110396)	-.0388182*** (.0138083)
3rd week after merger		-.0078598 (.0098184)	-.0172986 (.011056)	-.0396653*** (.0140364)
4th week after merger		-.0050434 (.0095862)	-.0092975 (.010609)	-.0140134 (.0119786)
Month after merger	-.0324976*** (.0074548)			
Merger (all other time)	-.0639647*** (.0070509)			
F-Statistic	5.25	1.64	2.22	2.35
σ_μ	.38292881	.38286767	.31625461	.33926445
σ_ε	.85276098	.85278968	.94072004	1.051393
ρ	.16780553	.16775154	.10154305	.09430379
R^2 within	0.0001	0.0000	0.0001	0.0001
R^2 between	0.0014	0.0398	0.0145	0.0403
R^2 overall	0.0001	0.0001	0.0001	0.0001

This table does not report the monthly binaries, and per-stock binaries used in each regression. "*", "**", "***" indicate significance at the 10%, 5% and 1% levels respectively. Binaries labeled "month before" are equal to one between the beginning of the month before the event and the start of the week before it and zero otherwise. Binaries labeled "month after" are equal to one beginning at the end of the week following the event and the end of the month following it. Binaries indicating "all other time" after an event are equal to one beginning one month after the event and zero before that point.

Table 4: Hui-Hubel Liquidity Ratio Regressions – Euronext

	(1) Year Before Announcement through Year After Merger	(2) Year Before Announcement through Year After Merger	(3) 6 Months Before Announcement through 6 Months After Merger	(4) 3 Months Before Announcement through 3 Months After Merger
S&P 500	.0022368 (.0016748)	.0020525 (.0013366)	.0000997 (.001954)	-.0022157 (.0031718)
VIX	.0674495*** (.0160598)	.0524033*** (.0086465)	.0507574*** (.0113124)	-.0301489* (.0168364)
FTSEurofirst 100	-.0015098 (.0010775)	.0003209 (.0007895)	-.0002293 (.0009626)	-.0043936*** (.0014552)
Eurostoxx	.0114869 (.0124859)	-.0093996 (.0087849)	.0054732 (.0117301)	.038152** (.0191892)
Month prior to announcement	.0606431 (.2388471)			
4th week prior to announcement		.5487083 (.367004)	.8005119** (.3525811)	.1537528 (.3811486)
3rd week prior to announcement		.0951364 (.3354034)	.3807934 (.3227945)	-.2527572 (.3569184)
2nd week prior to announcement		.0028778 (.3374078)	.3750455 (.3299144)	-.2925026 (.3768687)
Week prior to announcement	.0214769 (.3603458)	-.366932 (.3418194)	.0771026 (.3371997)	-.580898 (.3867016)
Day of announcement	-.0699254 (.6839945)	.142295 (.7757734)	.1909315 (.734851)	-.1040092 (.6910018)
Week of announcement		.1150313 (.4049564)	.531589 (.3960519)	-.2229146 (.4343523)
Week after announcement	-.7407601** (.3558893)	-.4146314 (.3234443)	.1652411 (.3393858)	-.6955237* (.4059077)
2nd week after merger		.4859585 (.3239202)	1.073683*** (.3449265)	.2910513 (.4131097)
3rd week after merger		-.5663987* (.3242856)	-.0345132 (.3375287)	-1.050851** (.4177885)
4th week after merger		-.343711 (.3215026)	.1841466 (.3342004)	-.9142483** (.4176604)
Month after announcement	-.4359229* (.2490252)			
Announcement (all other time)	-.3921224*** (.1468191)			
Month prior to merger	.0784629 (.2109987)			
4th week prior to merger		-.1050669 (.3137925)	-.3752879 (.3004748)	-.1112974 (.2955303)

3rd week prior to merger		.1967898 (.3133892)	-.004738 (.3000392)	.204934 (.2948698)
2nd week prior to merger		.5521819* (.31584)	.2906826 (.3041329)	.4704247 (.3020767)
Week prior to merger	-.2171092 (.3230037)	-.0569013 (.3150654)	-.374807 (.3049412)	-.0531332 (.3081883)
Day of merger	-.2475398 (.6795778)	.1034757 (.7615533)	.1058114 (.7185866)	.0678951 (.6742627)
Week of merger		-.2311598 (.4097826)	-.5491469 (.39364)	-.2212841 (.3935476)
Week after merger	-.3825791 (.4148275)	-.3262576 (.3615522)	-.663246* (.3507567)	-.3247503 (.3599207)
2nd week after merger		-.1502074 (.3281447)	-.4065298 (.316877)	.1299563 (.3330086)
3rd week after merger		-.1679815 (.3289675)	-.4545906 (.3168937)	.0600252 (.3383409)
4th week after merger		.392682 (.3494517)	.283892 (.330632)	.4246181 (.3132172)
Month after merger	-.3391615 (.252807)			
Announcement (all other time)	-.3949704 (.2425635)			
F-Statistic	6.22	5.02	5.90	4.18
σ_μ	17.459362	17.459934	17.388079	17.610816
σ_ε	17.891728	17.891729	16.881025	15.83798
ρ	.48777121	.48778753	.514793	.55285303
R^2 within	0.0003	0.0003	0.0006	0.0005
R^2 between	0.0012	0.0018	0.0015	0.0027
R^2 overall	0.0001	0.0001	0.0003	0.0002

This table does not report the monthly binaries, and per-stock binaries used in each regression. "*", "**", "***" indicate significance at the 10%, 5% and 1% levels respectively. Binaries labeled "month before" are equal to one between the beginning of the month before the event and the start of the week before it and zero otherwise. Binaries labeled "month after" are equal to one beginning at the end of the week following the event and the end of the month following it. Binaries indicating "all other time" after an event are equal to one beginning one month after the event and zero before that point.

Table 5: Market Share

	(1) NYSE Market Share	(2) Euronext Market Share
S&P 500	.0011386 (.001168)	-.0012897 (.0018235)
VIX	.0034671 (.0130219)	-.0171113 (.0129175)
FTSEurofirst 100	-.0014128** (.000617)	.0010556 (.0008809)
Eurostoxx	.0110676* (.0064916)	-.010916 (.0092699)
Month prior to announcement	-.020304 (.1339007)	-.0958672 (.1861687)
Month of announcement	-.0388555 (.0979146)	.3881231 (.2404327)
Month after announcement	.2593385*** (.092188)	.2435042 (.2686034)
Announcement (all other time)	-.0789133 (.1035245)	.246847 (.1885133)
Month prior to merger	-.0621694 (.1232829)	.0775563 (.1998101)
Month of merger	.2251993** (.1031946)	-.0397076 (.2309873)
Month after merger	-.0864954 (.1786264)	.2184874 (.2705694)
Merger (all other time)	-.0357738 (.2108587)	.5873443** (.274371)
R^2	0.6711	0.2390
Root MSE	.13639	.29278

"*", "**", "***" indicate significance at the 10%, 5% and 1% levels respectively. Binaries labeled "month before" are equal to one between the beginning of the month before the event and the start of the week before it and zero otherwise. Binaries labeled "month after" are equal to one beginning at the end of the week following the event and the end of the month following it. Binaries indicating "all other time" after an event are equal to one beginning one month after the event and zero before that point.

Table 6: Hershman-Herfindhal Index Regressions

	(1) United States	(2) European Countries with Euronext branch
S&P 500	-.0011863 (.0011398)	-.0007009 (.0015107)
VIX	-.0078477 (.0091)	-.0073998 (.0103497)
FTSEurofirst 100	-.0006779 (.0004348)	.000933 (.0008212)
Eurostoxx	.0079759* (.0047149)	-.0097646 (.0084266)
Month prior to announcement	-.0402232 (.0979422)	-.1247786 (.1204446)
Month of announcement	.0954969 (.0765488)	.2986316* (.160423)
Month after announcement	-.0415106 (.1025007)	.1856869** (.0899883)
Announcement (all other time)	.022094 (.0771393)	.1554531 (.1729003)
Month prior to merger	-.1186534 (.146172)	.0312779 (.1635603)
Month of merger	.0794005 (.0928067)	-.1444387 (.1602327)
Month after merger	-.0049332 (.1448867)	.1777165 (.2188582)
Merger (all other time)	.1142066 (.1603451)	.3909061 (.2531933)
R^2	0.4793	0.5204
Root MSE	.13054	.16997

"*", "**", "***" indicate significance at the 10%, 5% and 1% levels respectively. Binaries labeled "month before" are equal to one between the beginning of the month before the event and the start of the week before it and zero otherwise. Binaries labeled "month after" are equal to one beginning at the end of the week following the event and the end of the month following it. Binaries indicating "all other time" after an event are equal to one beginning one month after the event and zero before that point.

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