Journal of Business Finance & Accounting, 29(5) & (6), June/July 2002, 0306-686X

Is the Adverse Selection Component Really Higher on the NYSE/Amex than on the Nasdaq?

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1. INTRODUCTION

Affleck-Graves, Hegde and Miller (1994) (A-GHM) estimate spread components for a matched sample of NYSE/Amex and Nasdaq stocks using models by Stoll (1989) and George, Kaul and Nimalendran (1991) and examine the differences in the resulting components. They find that the order-processing component is smaller and the adverse selection component is greater on the NYSE/Amex trading systems than on the Nasdaq. Their findings imply that the Nasdaq is more efficient in generating information from stock trades than the NYSE. This result has important implications regarding the design of security trading systems, in that adverse selection is impacted by the structure of the trading system and the stocks listed in that system.[1]

Since the original study by A-GHM, Huang and Stoll (1997) have developed a newer and arguably superior method of decomposing the bid-ask spread. In this paper, we revisit the original A-GHM study and use the newer Huang and Stoll model to examine if their results are merely a function of model choice. In addition, we examine the markets after the two major market reforms that have impacted the relative costs of trading on the NYSE/Amex and Nasdaq since the original A-GHM study.

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2. BACKGROUND AND HYPOTHESIS

(i) The Huang and Stoll (1997) Model

A-GHM use the Stoll (1989) and George, Kaul and Nimalendran (1991) spread decomposition models. The original Stoll (1989) model infers the components of the spread using the bid-ask spread at the close of trading. The model is based on the serial covariance of buy and sell transactions. Specifically, it infers the spread components from the slope coefficients of regressions of the serial covariance in the percentage price change series on the bid-ask spread. The George, Kaul and Nimalendran (1991) model modifies the Stoll specification to correct for bias due to the non-linearity of the spread components. However, in their modification, George, Kaul and Nimalendran assume that inventory costs are zero. Both of these serial covariance models estimate the components of the spread using daily data.

The Huang and Stoll (1997) model improves on the Stoll (1989) method by using a transaction approach that examines the serial correlation in trade flows to determine the components of the spread. The newer model assumes that when quote adjustments reverse, they indicate an adjustment made for inventory purposes, while quote adjustments that do not reverse indicate adjustments made for information reasons. Therefore, by using a transactions approach, Huang and Stoll are able to more accurately determine the components of the spread. The Huang and Stoll (1997) model is fundamentally different to the earlier models in that it is a trade indicator model that uses transactions level data, and takes into account the effects of price improvement on a transaction by transaction basis. For these reasons, we believe that it better captures the true cost of trading. The key disadvantage of the Huang and Stoll model is that it only generates reliable spread components for very heavily traded stocks.

(ii) Market Reforms

Since the A-GHM study, several major market reforms have taken place that collectively have resulted in a decline in spreads and may have also changed the relative components of the spread.

The goal of these reforms is to reduce trading costs on all markets and to bring the trading costs of the Nasdaq more in line with those of the NYSE/Amex. Our paper uses the Huang and Stoll (1997) model to compare the adverse selection components for stocks on the NYSE and Nasdaq after these market reforms have been implemented.

Christie and Schultz (1994) claim that Nasdaq market makers were implicitly colluding to widen Nasdaq spreads. The resulting media and regulatory attention brought about several Nasdaq reforms. NASD Regulation, Inc. was created to takeover regulatory responsibilities of the National Association of Securities Dealers (NASD). Also, the SEC made several changes to Nasdaq's order handling rules. Two SEC rules, the 'Limit Order Display Rule' and the 'Quote Rule',[2] dramatically diminish the differences in the Nasdaq and the NYSE. The 'Limit Order Display Rule' requires Nasdaq dealers to display public limit orders in the BBO (best bid or offer) when the limit orders are better than the market makers' quotes. The 'Quote Rule' requires market makers to publicly display their most competitive quotes (previously, Nasdaq dealers could post superior quotes on proprietary Electronic Communication Networks). Barclay et al. (1999) and McInish, Van Ness and Van Ness (1998) study the impact of the changes of the order handling rules on Nasdaq. Barclay et al. examine the first 100 stocks subject to the new rules. They find a 30 percent decline in quoted and effective spreads. McInish, Van Ness and Van Ness (1998) report similar decreases in Nasdaq spreads.

Another major change for both markets is the reduction in tick size. The minimum tick size on the Nasdaq was reduced from one eighth to one sixteenth for stocks with prices greater than $10 on June 2, 1997. A similar reduction in tick size occurred for Amex stocks on May 7, 1997 and for NYSE stocks on June 24, 1997. Researchers find significant decreases in spreads following these tick size changes (See Goldstein and Kavajecz, 1998; Ricker, 1998; and Jones and Lipson, 1998).

(iii) Information Production on Nasdaq vs. NYSE/Amex

Using the Huang and Stoll (1997) model, we find that, contrary to Affleck-Graves, Hegde and Miller (1994), the adverse selection component for NYSE/Amex stocks is smaller than that for Nasdaq stocks. However, we confirm that the inventory holding costs are larger and the order processing costs are smaller for NYSE/Amex stocks. Our results appear to be a function of model choice and not due to the reforms that took place in the Nasdaq and NYSE/Amex markets.

There are several possible explanations for why the Nasdaq is poorer at mitigating adverse selection costs compared to the NYSE/Amex.

(a) Economic Differences in the Stocks Traded

An obvious difference in NYSE and Nasdaq listed stocks is the more relaxed listing requirements of the Nasdaq compared to the NYSE. This results in a greater preponderance of small and regional firms on the Nasdaq, indeed, Van Ness, Van Ness and Warr (2001) find that adverse selection components are negatively related to firm size.[3] However, in the current study we match firms based on the major determinants of the spread, as documented by McInish and Wood (1992). In doing so, we control for firm specific microstructure characteristics, thus enabling us to focus on the impact of the market systems on spread component estimates. Additionally, as our sample is restricted to the most actively traded stocks on both exchanges any size issues are minimized.

(b) Dealer vs. Auction Market Structure

The NYSE and Amex, as auction markets, rely on a single specialist to make a market in the stock. The specialist structure results in all information about order flow, supply, and demand for the stock being channeled through this one individual who is required to maintain an orderly market in the stock. The Nasdaq market, being a dealer based market, can have several dealers making a market in a given stock, thus order flow is broken up across these dealers. Such a structure provides greater opportunity for an informed trader to distribute his trades across a number of dealers. Additionally, the NYSE has the advantage of having direct face-to-face interaction between the market participants and the specialist, while no such interaction occurs on the

Nasdaq. This repeated direct interaction provides additional information to the market maker about the parties with whom she is trading, and thus serves to reduce the adverse selection that she faces (Stoll and Whaley, 1990; and Biais, 1993). Additionally, due to her limited monopoly position, the specialist is better able to spread adverse selection risk across trades as suggested by Glosten (1989).

All of these factors are likely to impact the amount of adverse selection cost that is impounded in the bid-ask spread. From the point of view of designing and implementing stock trading systems, the factors discussed above are to a large extent under the control of the designers and regulators of the system. For example, whether or not to use a dealer based market or an auction market. However, minimizing adverse selection costs is not the only goal of trading systems. For example, while the more relaxed listing requirements of the Nasdaq may result in greater adverse selection costs due to the smaller firms that list, providing these small firms with access to relatively cheap equity capital may have social and economic benefits. Additionally, while we speculate that the presence of a single specialist goes a long way to reduce adverse selection costs, such a system requires the presence of extremely well capitalized individuals to reliably make markets. A dealer market imposes much smaller hurdles in terms of costs of entry for market makers. Ultimately the design of trading systems requires consideration of many factors. This paper provides further information about the relative cost of one of those factors, namely adverse selection.

We proceed as follows, Section 3 discusses our data and methodology, Section 4 presents our results and analysis and Section 5 concludes.

3. DATA AND METHODOLOGY

(i) *Full Sample*

Our initial data set consists of transaction level data for the months of February, March and April 1998 from the NYSE Trade and Quote (TAQ) database.[4] We precondition our data to minimize errors by omitting trades and quotes that are out of sequence or involving an error or a correction. We also remove quotes that have non-positive ask or bid prices, quotes where the bid or ask depth is not greater than zero, and trades where the price or volume is not greater than zero. As in Huang and Stoll (1997), we omit the following:

1. quotes when the spread is greater than $4 or less than zero;
2. before-the-open and after-the-close trades and quotes;
3. trade price, p_t, when $(p_t - p_{t-1})/p_{t-1} > 0.10$;
4. ask quote, a_t, when $(a_t - a_{t-1})/a_{t-1} > 0.10$;
5. bid quote, b_t, when $(b_t - b_{t-1})/b_{t-1} > 0.10$.

Since Huang and Stoll (1997) use the 20 stocks included in the 1992 Major Market Index to test their component estimation model, we identify the most actively traded Nasdaq stocks and the most active NYSE stocks for our sample selection. To focus on the most active stocks, we set a sample selection criteria of at least 25,000 trades, and a minimum price of $10. We also eliminate stocks that are identified as warrants or preferred stock and Nasdaq stocks that have five or more ticker symbols (such as lower classes of stock or ADRs). This results in an initial sample of 124 Nasdaq stocks and 123 NYSE/Amex stocks.

Huang and Stoll (1997) find that stocks that have a probability of price reversal of less than 50% tend not to yield good component estimates. They also note that while a probability of price reversal of less than 50% is empirically possible, it is theoretically impermissible, as 50% is consistent with no inventory holding costs. We use 50% as a lower bound on the probability of price reversal. Imposition of this lower bound results in 12 Nasdaq and 8 NYSE/Amex stocks being dropped. The final set of firms available for matching are 112 Nasdaq stocks and 115 NYSE/Amex stocks.

(ii) Matched Sample

To form a matched sample to allow a comparison of the two trading systems, we match each stock in the Nasdaq sample with a NYSE counterpart on the basis of three stock attributes that previous work has found to be important determinants of inter-stock spread differences. These are share price, trade size, and return volatility. In previous studies (for example: McInish and

Wood, 1992, the number of trades has also been shown to be an important determinant of the spread. However, inter-dealer trades on the Nasdaq system exaggerate the true trading volume and make a direct comparison with the volume of the NYSE/Amex difficult. For this reason, we do not match on the basis of number of trades.

We calculate the following composite match score (CMS) for each Nasdaq stock in our sample with each of our selected NYSE stocks:

$$CMS = \sum_{k=1}^{3}\left[\frac{2(Y_k^N - Y_k^Y)}{(Y_k^N + Y_k^Y)}\right]^2. \tag{1}$$

Where Y_k represents one of the three stock attributes, and the superscripts, N and Y, refer to Nasdaq and NYSE, respectively. For each Nasdaq stock, we pick the NYSE stock with the smallest score – if the score is less than 2. This matching procedure results in 60 pairs of Nasdaq and NYSE stocks.

We report summary statistics for the matched sample in Table 1. The average stock price of our Nasdaq sample is \$43.44 and \$45.62 for the NYSE/Amex sample. The average dollar trade size for the Nasdaq sample is \$57,371, and for the NYSE matching sample is \$112,484. The mean values for volatility of returns are 0.0318 for Nasdaq and 0.0272 for the NYSE. Overall, the Nasdaq and NYSE samples are similar.

As a robustness check to ensure that we have not hard-coded our results by our choice of matching criteria, we examine whether any of these criteria play a significant role in the differences in spreads between the two samples. To do this, we regress the differences in spreads for each pair of stocks on the matching criteria. These results are presented in Table 2. We also include number of trades to aid comparison with A-GHM. Columns 1 and 2 of Table 2 show that, with the exception of trade size for Nasdaq stocks, all three of our matching criteria, as well as the number of trades, are significant determinants of spread. In column 3, we examine the difference in these criteria for the matched pairs and find that only number of trades is significant. This result should not come as a surprise since we did not include number of trades in our matching process.

Table 1

Descriptive Statistics for the Matched Samples

Variable	*Exchange*	*Mean*	*Standard Deviation*	*Min.*	*Percentile* 25	50	75	*Max.*
Share price ($)	Nasdaq	43.44	15.77	20.12	30.28	43.15	51.78	87.26
	NYSE	45.62	15.84	15.77	32.16	45.58	56.91	83.40
Number of Trades	Nasdaq	59,479	38974	25,239	29,707	48,037	69,759	197,291
	NYSE	39,151	19761	25,302	28,259	32,697	42,308	148,825
Trade size ($)	Nasdaq	57,371	22746	25,997	42,129	51,602	66,191	137,826
	NYSE	112,484	32133	53,797	89,390	113,752	132,751	218,087
Return Volatility	Nasdaq	0.0318	0.0111	0.0124	0.0254	0.0300	0.0351	0.0712
	NYSE	0.0272	0.0125	0.0131	0.0191	0.0242	0.0320	0.0750

Notes:
To obtain a matched sample of Nasdaq and NYSE stocks, we first calculate the following composite match score (CMS) for each Nasdaq stock in our sample against each of the NYSE potential matches:

$$\text{CMS} = \sum_{k=1}^{3}\left[\frac{2(Y_k^N - Y_k^Y)}{(Y_k^N + Y_k^Y)}\right]^2$$

where Y_k represents one of the three stock attributes, and the superscripts, N and Y, refer to Nasdaq and NYSE. For each Nasdaq stock, we pick the NYSE stock with the smallest score. We include in the study sample only those pairs (60) with a composite match score of less than two. We measure share price by the mean value of the trade prices, trade size by the average dollar transaction during the study period. The number of trades is the total number of transactions during the study. We measure return volatility by the standard deviation of daily returns calculated from closing midpoints of bid and ask prices. Data is from the TAQ data set from February 1998 through April 1998.

Table 2

Regression of the Spread and Difference in the Spread on the Matching Criteria

	Spread		
Independent Variable	*(1)* *Nasdaq*	*(2)* *NYSE*	*(3)* *Nasdaq – NYSE*
Intercept	0.0056	0.0050	0.0004
	(12.81)**	(14.88)**	(1.59)
Share Price	−0.0000	−0.0000	−0.0000
	(3.70)**	(8.63)**	(1.75)
$ Trade Size	−0.0000	−0.0000	−0.0000
	(1.67)	(3.01)**	(1.19)
Return Volatility	0.0257	0.0164	0.0323
	(2.96)**	(2.99)**	(1.60)
Number of Trades	−0.0000	−0.0000	−0.0000
	(8.35)**	(0.07)	(5.09)**
Adjusted R^2	0.7201	0.7468	0.4735
F-value	38.96	44.52	14.263

Notes:
* Significant at the 5% level.
** Significant at the 1% level.

The basic regression model is:

$$\text{Average Spread} = b_o + b_1(\text{Share Price}) + b_2(\text{Return Volatility}) + b_4(\text{Number of Trades}) + \varepsilon.$$

To assess the quality of our matched sample, we use two regression models. First, in regressions 1 and 2 , we regress the average spread against four stock attributes using our sample of Nasdaq stocks and the matched sample of NYSE stocks. The results of the regressions help us to assess if the four stock attributes are important determinants of the cross-sectional variation in spreads for our sample. Second, in regression 3, we regress the differences in the variables (spread and the four stock attributes) between the matched set of Nasdaq and NYSE stocks.

(iii) Spread Component Estimation

After the matching procedure, we restrict our datasets in preparation for component estimation. We include only trades and quotes from the listing exchange and, as in Huang and Stoll (1997), we pair each trade with the last quote posted at least five seconds earlier but within the same trading day. Huang and Stoll note that a possible source of positive serial correlation in trade flows and a corresponding probability of a trade flow reversal, π, of less than 0.50 is that orders are broken up as they are executed. That is, a large order may be negotiated at a single price, but reported as a sequence of smaller trades. Hence, we further restrict our sample by collapsing a sequence of trades at the same price with no quote adjustments into a single order.

We decompose the spread into its three components using the Huang and Stoll (1997) model based on serial correlation in trade flows (equation (23) in their paper). We solve the following equation system for α, the adverse selection component of the spread, β, the inventory holding component, and π, the probability of a trade flow reversal:

$$\begin{aligned} \Delta M_t &= (\alpha + \beta)\frac{S_{t-1}}{2}Q_{t-1} - \alpha(1 - 2\pi)\frac{S_{t-2}}{2}Q_{t-2} + \varepsilon_t \\ E(Q_{t-1}/Q_{t-2}) &= (1 - 2\pi)Q_{t-2} \end{aligned} \quad (2)$$

where:

S_t = the observed spread that prevails just prior to a transaction at time t;
M_t = the bid-ask quote midpoint just prior to a transaction at time t;
Δ = a first difference operator;
Q_t = a buy/sell indicator variable for the transaction at time t;
Q_t = 1 if the transaction is buyer initiated and occurs above the midpoint;
Q_t = -1 if the transaction is seller initiated and occurs below the midpoint; and
Q_t = 0 if the transaction occurs at the midpoint.

4. RESULTS

(i) Component Estimates

Table 3 presents the component estimates for matched sample of NYSE and Nasdaq stocks. Panel A, shows the component estimations of A-GHM for the NYSE/Amex and the Nasdaq using the Stoll (1989) and George, Kaul and Nimalendran (1991) methodologies. These results are obtained directly from Tables II and III of their paper. In Panel B we seek to replicate the original work of A-GHM, by estimating the components of the spread using the models of Stoll (1989) and George, Kaul

Table 3

Spread Components for Stoll (1989) and GKN (1991) Models Estimated by A-GHM (1994) and Using the Current Data Set

Panel A: A-GHM (1994)
Mar–Apr 1985

	Nasdaq	*NYSE/Amex*	*Nasdaq − NYSE/Amex*	*p-value*
Stoll (1989)				
Adverse Selection	0.35	0.59	−0.24	0.032
Order Processing	0.41	0.12	0.29	0.003
Inventory	0.24	0.29	−0.06	0.359
GKN (1991)				*t-stat.*
Adverse Selection	0.072	0.258	−0.186	−5.29
Order Processing	0.928	0.742	0.186	5.29

Panel B: Current Data
Feb–Apr 1998

	Nasdaq	*NYSE/Amex*	*Nasdaq − NYSE/Amex*	*t-stat.* *p-value*
Stoll (1989)				
Adverse Selection	0.46	0.53	−0.07	−3.12 (0.003)
Order Processing	0.39	0.25	0.14	5.01 (<0.001)
Inventory	0.15	0.22	−0.12	2.71 (0.009)
GKN (1991)				
Adverse Selection	0.14	0.28	−0.14	4.97 (<0.001)
Order Processing	0.86	0.72	0.08	4.97 (<0.001)

Notes:
Panel A reports the findings from A-GHM (1994) Tables II and III of their paper, in which they estimate the spread components using the Stoll (1989) and George, Kaul and Nimalendran (1991) approaches. Their analysis was based on a matched sample of firms. In Table II they provide *p*-values, while in Table III they provide *t*-stats. Panel B presents our results using our matched samples, again examining the spread components using the Stoll and GKN models. Our estimations use data from February through April 1998, following the two market reforms.

and Nimalendran (1991). Our estimations of the spread components are similar to those of A-GHM, even though the time periods used in the estimations are different. In particular, using the Stoll and George, Kaul and Nimalendran models, we find that adverse selection component is higher for the NYSE/Amex than for the Nasdaq. We interpret these results as evidence that the market reforms did not result in significant changes in the spread components, even though, as previous literature has indicated, they did affect overall spreads. These results are confirmed by Weston (2000) who finds that while overall spreads fell on Nasdaq stocks following the rule changes, the decline in spreads cannot be attributed to a decline in information costs. Additionally, our choice of sample does not significantly impact the nature of the results, as we use the same matched sample for estimation of all the spread models.

Table 4, Panel A presents the results of our component estimations using the Huang and Stoll (1997) approach. Here we find that the adverse selection component for the NYSE/Amex is lower than that for the Nasdaq. This result is in direct contrast to the adverse selection estimation using the Stoll (1989) and George, Kaul and Nimalendran (1991) approaches. We in contrast, consider this to be the major result of the paper. The inventory cost component for the Nasdaq is slightly negative, a result that, while theoretically impossible, is more likely a function of the estimation procedure. To the extent that the model does not impose the restriction that the inventory cost be positive and that the coefficient is a normally distributed random variable, we can expect to see negative values from time to time.

(ii) The Effect of Trade Size

Huang and Stoll (1997) provide evidence that the adverse selection and inventory cost components are a function of trade size. In order to do this, Huang and Stoll combine the adverse selection and inventory components into one parameter α (equation (15) of their paper). To examine the effects of size on adverse selection, we modified our equation (2) to incorporate indicator variables for different trade sizes:

$$\Delta M_t = \sum_{k=1}^{3}\left[(\alpha+\beta)\frac{S_{t-1}}{2}D_k Q_{t-1} - \alpha(1-2\pi)\frac{S_{t-2}}{2}D_k Q_{t-2}\right] + \varepsilon_t$$

$$E(D_k Q_{t-1}/D_k Q_{t-2}) = (1 = 2\pi)D_k Q_{t-2} \quad |k = 1, 3| \tag{3}$$

where:

$D_1 = 1$ if share volume at time $t \leq 1{,}000$ and zero otherwise;
$D_2 = 1$ if share volume at time $t > 1{,}000$ and $t \leq 10{,}000$ and zero otherwise;
$D_3 = 1$ if share volume at time $t > 10{,}000$ and zero otherwise.

These results are presented in Panel B of Table 4. They indicate that the adverse selection component is increasing in trade size, and is larger for the Nasdaq stocks compared to NYSE/Amex stocks. We therefore conclude that our results are robust to trade size. Additionally the broad magnitude of these estimates is in line with the overall estimates for the full sample.

Panel C examines the overall spreads and percentage spreads for the matched pairs and finds that consistent with previous work, the Nasdaq stocks have higher spreads. This is further evidence consistent with these stocks having higher information costs.

(iii) Robustness Checks

In Table 4 Panel A, both the dollar adverse selection component and the percentage adverse selection component are significantly greater for Nasdaq stocks than for NYSE/Amex stocks. Nasdaq stocks have 9% more adverse selection costs than the matched NYSE/Amex stocks. This translates into approximately 1.5 cents per stock. In 1998 the total volume on the Nasdaq was 202 billion shares,[5] an additional 1.5 cents per share translates into $3 billion in extra cost due to adverse selection that is paid by investors trading on the Nasdaq. We consider this cost to be economically significant. The inventory holding component is significantly lower for Nasdaq stocks, although this result is harder to interpret because of the predicted negative value. Consistent with A-GHM, we also find the order processing cost significantly higher for Nasdaq stocks than for NYSE/Amex stocks.

As a further check of the robustness of our results, we regress the adverse selection components against various stock characteristics, including a dummy variable for the listing exchange.[6] These results are presented in Table 5. In the adverse selection regression, the coefficient on the dummy variable is significantly negative indicating that adverse selection is smaller for NYSE/

Table 4

Component Comparisons for Huang and Stoll (1997) Model

Panel A				
Variable	*Nasdaq*	*NYSE*	*Nasdaq – NYSE*	*t-stat. (p-value)*
Adverse Selection				
Percentage	0.1659	0.0728	0.0931	2.69 (0.009)
$ of Spread	0.0248	0.0087	0.0161	2.29 (0.026)
Inventory Holding				
Percentage	−0.0267	0.3658	−0.3925	11.43 (<0.001)
$ of Spread	−0.0040	0.0438	−0.0478	6.34 (<0.001)
Order Processing				
Percentage	0.8607	0.5614	0.2993	19.44 (<0.001)
$ of Spread	0.1284	0.0673	0.0611	11.87 (<0.001)
Panel B				
By Trade Size	*Nasdaq*	*NYSE*	*Nasdaq – NYSE*	*t-stat. (p-value)*
Small 1–1,000	0.1429	0.0482	0.0947	3.91 (<0.001)
Medium 1,001–9,999	0.1772	0.0803	0.0969	4.03 (<0.001)
Large >10,000	0.2020	0.0849	0.1171	5.22 (<0.001)
Panel C				
Bid Ask Spread	*Nasdaq*	*NYSE*	*Nasdaq – NYSE*	*t-stat. (p-value)*
Spread	0.1492	0.1198	0.0294	4.28 (<0.001)
% Spread	0.0033	0.0027	0.0006	2.91 (0.005)
Probability of Price Reversal	0.6812	0.6548	0.0264	1.67 (0.100)

Notes:
Panel A reports the average Nasdaq and NYSE spread components estimated for our matched sample using the Huang and Stoll (1997) method, and the difference between these components. Panel B breaks down the adverse selection component computed using the Huang and Stoll (1997) model by trade size. Panel C presents the average dollar spread, the spread as a percentage of the price, and probability of price reversals for our matched sample.

Amex (dummy = 1) stocks. Economically, the magnitude of this coefficient implies that adverse selection is smaller by 11 percentage points on the NYSE/Amex than on the Nasdaq, after controlling for several variables that are known to impact spreads. This result is broadly consistent with the 9.3 percentage points difference in Table 4.

Table 5

Regressions of Spread Components on Stock Characteristics

	Adverse Selection	*Order Processing*	*Inventory Holding*
Intercept	−0.0512	0.8550	0.1962
	(−0.66)	(36.58)**	(2.43)*
Share Price	0.0058	−0.0014	−0.0043
	(4.88)**	(−4.01)**	(−3.57)**
$ Trade Size	−0.0000	0.0000	−0.0000
	(−0.35)	(3.35)**	(−0.64)
Return Volatility	1.7515	0.1264	−1.8719
	(1.27)	(0.31)	(−1.32)
Number of Trades	−0.0000	0.0000	0.0000
	(−2.17)*	(3.49)**	(1.38)
Exchange Dummy	−0.1110	−0.3278	0.4390
(NYSE = 1, Nasdaq = 0)	(−2.26)*	(−22.28)**	(8.66)**
Adjusted R^2	0.2403	0.9041	0.5915
F-value	8.53	225.39	35.47
N	120	120	120

Notes:
* Significant at the 5% level.
** Significant at the 1% level.
The basic regression model is:

$$\text{spread component} = b_o + b_1(\text{Share Price}) + b_2(\text{Trade Size}) + b_3(\text{Return Volatility}) + b_4(\text{Number of Trades}) + b_5 D + \varepsilon$$

where D is a dummy variable ($D = 1$ for NYSE/Amex stocks, $D = 0$ for Nasdaq stocks.) Please see Table 1 for the other variable definitions.

5. SUMMARY AND CONCLUSIONS

In this paper we find that the adverse selection component is smaller on the NYSE and Amex than on the Nasdaq. This result is in contradiction to the findings of A-GHM. The difference between our results and theirs could be due to one or more of three factors – market reforms, sample selection, or model choice. In order to distinguish between these three possible causes, we first repeat the A-GHM study using a new sample formed after the market reforms. Using this sample we estimate the components of the spread using the Stoll (1989) and George, Kaul and Nimalendran (1991) models and arrive at component estimates that are very similar to those of A-GHM. From this similarity we conclude that neither our sample nor the market reforms have had much effect on spread components.

Using the Huang and Stoll (1997) model and the same sample as before, we find a different story. The adverse selection component is smaller on the NYSE and Amex than on the Nasdaq. We therefore conclude that our results are due to model choice and not market reform or sample selection. Given the conceptual and practical superiority of the Huang and Stoll model, our results reopen the debate on the relative abilities of dealer and auction markets in information production.

NOTES

1 Studies of market microstructure find larger spreads and execution costs on Nasdaq than on the NYSE (for example Goldstein, 1993; Christie and Schultz, 1994; Huang and Stoll, 1996; and Bessembinder and Kaufman, 1997). O'Hara and Macey (1997) provide a survey of many of these studies. Others find that spreads for Nasdaq listed stocks decline when the company changes its listing to the NYSE (see Christie and Huang, 1994; and Barclay, 1997).

2 Stocks subject to the Nasdaq order handling rules were gradually phased-in. The rules' phase-in began on January 20, 1997 and was complete on October 13, 1997.

3 Bessembinder (1999) finds that while trading costs (he does not examine adverse selection costs) are larger on Nasdaq compared to NYSE, the difference in average trading costs is not attributable to the variation in the observable economic characteristics of the stocks listed.

4 We restrict our sample to three months of 1998 for several reasons. First, even though we only examine three months, this provides us with over 45 million trades. Second, A-GHM use two months of data in their analysis (March and April 1985). Third, recent work by Weston (2000), finds that the rule change actually had little effect on adverse selection costs. Finally, the aim of this paper is to examine the relative costs of information on the Nasdaq versus the NYSE/Amex using as recent data as possible, and not examine the impact of the changes in information costs surrounding the rule change. However, as a robustness check we compute the spread components for the matched sample for May, June and July 1998 and get very similar results.

5 Source: Nasdaq website.

6 We would like to thank the referee for suggesting this approach.

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