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Online stock trading using electronic communication networks: A qualitative analysis of how it works

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Online stock trading using electronic communication networks:

A qualitative analysis of how it works

by

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Signatures have been redacted for privacy

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ABSTRACT

This paper provides a detailed description of placing and matching orders for National Association of Securities Dealers Automated Quotation (Nasdaq) stocks using online brokers and Electronic Communications Networks (ECNs). The primary purpose of the paper is to provide a source of information on how online trading brokerages and ECNs work together. To collect some of this information, I traded over $5 million worth of stock in late 1999 and early 2000. I placed hundreds of orders and actually did about 250 trades. Gathering information this way provided insights into the trading system that were not available through other research.

1. INTRODUCTION

Online stock trading continues to grow as more people become familiar with the Internet, and comfortable with using it. As of mid 2000, investors have opened almost 10 million accounts with online brokers. About 3.85 million of those investors qualify as "active," making about 25-50 trades per year. An estimated 50,000 semi-professional (day) traders make 25-40 trades per day. Those 3.85 million investors account for about 97% of all online trading ("Small Band," 2000). Many online brokers connect to Electronic Communications Networks (ECNs) to facilitate trading for their clients.

In 1999, ECNs accounted for about 26.5 billion shares worth approximately $1.56 trillion. That is about one third of the total trading volume for Nasdaq (Burns 2000). The Island ECN alone is responsible for about one in eight trades on Nasdaq, or approximately 180 million shares each business day (Island, 2000).

While there are over 150 brokers who offer online trading and ten ECNs, very little is written about how they work together. The motivation of this thesis is to help fill that gap and serve as a source of information for people who invest in stocks online and want to have a better understanding of the online trading system. A better understanding how things work allows for faster decision making and more timely results. This is important to help avoid losses and increase gains.

This thesis provides a description of placing and matching orders for Nasdaq stocks using online brokers and ECNs. Its primary purpose is to provide a source of information on how online trading brokerages and ECNs work together. Its scope covers trading through Datek (an online broker) and the Island ECN (to which Datek routes all of its orders). Information and data for this thesis comes primarily from three sources: web sites on the Internet, business periodicals such as The Wall Street Journal and Business Week, and personal experience.

To collect some of this information, I traded over $5 million worth of stock in late 1999 and early 2000. I placed hundreds of orders and actually did about 250 trades. Gathering information this way provided insights into the trading system that were not available through other research. This paper does not discuss what happens after a trade takes place. Specifically, it does not discuss how stock ownership and money transfers

occur. It also does not cover the activity of how stock pricing information (quotes) is disseminated. This paper assumes only Nasdaq stocks (for a description of trading for NYSE stocks, see Hasbrouck 1993).

The paper proceeds as follows: Section 2 Description of the Electronic Trading System Layout; Section 3 Placing Orders Electronically; Section 4 The Electronic Communication Network; Section 5 How it all Works Together, and Section 6 Conclusions.

2. THE ELECTRONIC TRADING SYSTEM LAYOUT

From an investor's point of view, buying and selling stocks online is a simple process of opening an account, putting money in and placing the order. When the systems all work properly, an investor can get confirmation of an executed order literally within seconds of placing it. The speed with which it works is amazing when it works.

Actually, online trading is a multi-step process of sophisticated systems that all must work in order for the investor to be able to buy or sell stock. The investor's home system must work in order for him to reach his Internet Service Provider (ISP). The ISP must be working to reach the Internet. The Internet must be working to reach the online broker. The broker has many steps in its system that must be working to allow for an order to get placed. Also, it must have working connection to an ECN and/or to the rest of the marketplace. Finally, the ECN and the market systems must be working. Of course this assumes all the telephone lines and power systems work (see Appendix 1).

There are two primary types of orders: market and limit. Market orders simply take the best price offered at the moment of the order. Limit orders are when the investor states what price is acceptable. They define an outline of pricing structure for a stock.

The following sections describe the details of online trading with brokers using ECNs.

3. PLACING ORDERS ELECTRONICALLY

3.1 Introduction

The process of placing an order electronically is very simple when viewed from a macro level. At a macro level, all that needs to be done is to enter the information and hit the key to place the order. If anything is wrong the system refuses the order and states why it is doing so. The user may then either enter the order again or not. The following sections discuss more of the details of placing an order. To see a specific description from one of the larger online brokers, see (Datek, 2000).

This section will cover the entire process from placing the order initially through filling the order. It will also cover a the process of canceling an order and some of the issues of trading outside of normal hours of operation.

3.2 Check for Valid Order

After the user enters an order, it must be checked for completeness and validity. Each order contains several fields. Each field must be checked individually. Every online brokerage has the power to set constraints on some of these fields. The contents of a typical order are listed below. This list is assuming orders placed during normal trading hours or placed with the intention of being acted on during normal trading hours (that covers such cases as orders being placed at night for the next day). The variations that come about for trading outside normal trading hours are discussed in Section 3.8. Each online brokerage may have some slight variations. This example comes from Datek's system. Datek also offers "stop market" and "stop limit" order types. These order types are described in the glossary, but are not included here.

The fields of an order include Buy or Sell, Quantity, Symbol, Price, Order Type (Market or Limit), Expiration (Day, GTC, Day + Extended Hours, or GTC + Extended Hours). To determine validity of an order, the broker must consider each of the fields individually and check for conformance with some predetermined criteria.

Buy or Sell: This is a field that must be filled in. The user must tell the system to do one or the other.

Quantity: This is a field that must be filled in. Some brokers may have ceilings on the number of shares that can be placed in one order. This limit is independent of the money that is in the trading account. For example, Datek has an upper limit of 5000 shares per order regardless of the account balance. Other brokers either have no limits or different limits.

Symbol: This is a field that must be filled in. The user has to tell the system which stock is the subject of the order. The system will check to see that the symbol is a valid symbol for a stock trading on one of the exchanges. It is possible that the symbol entered is for a different stock than desired. It is the user's responsibility to correctly identify the target stock.

Price: This field must be filled in for limit orders (it is irrelevant for market orders). It must be a valid fraction or a decimal. For example, Datek allows orders to be placed to the granularity of 1/32 for fractions (for Nasdaq stocks) or to the penny for decimals.

Order Type: This is a field that must be filled in. Choices are listed below.

Market: A market order tells the system to take the best price available at the moment.

Limit: For this choice the investor tells the computer which price is acceptable. If the price is at the market (or better) the order is routed directly to Nasdaq. If the price is out of the money, the order is placed on the book.

Expiration: By default, the order expires at the close of the normal trading day.

Day: This is the default expiration. It means the order will expire at the normal close of trading (which is 4:00 pm EST).

GTC: Good Till Cancel. If this order is not filled today, it will live on tomorrow. It is up to the broker to determine how long a GTC order is valid but most are in the range of 30 to 90 days. Under certain circumstances, the broker may cancel a GTC order (e.g., a halt in stock trading, a stock split).

Day + Extended Hours: This is the choice that allows the order to be valid outside normal trading hours. With Datek, a user must go through a brief but distinct authorization process to allow the account to handle orders outside normal hours.

GTC + Extended Hours: This is the choice that allows the order to be valid through the normal trading day, after hours and before hours tomorrow up till the time it is either cancelled by the user, filled, or expires. Under certain circumstances, the broker may cancel a GTC + Extended Hours order (e.g., a halt in stock trading, a stock split).

At this point, all the system has done is check to see if the individual fields of the order are valid. It has not done any checking to see if the account has sufficient buying (or selling) power to cover the transaction. The system also has not done any checking regarding usage of margin or availability of shares to cover shorting. It has only checked for a valid order.

3.3 Determining Account Value

On the surface, calculating the value of an account is a simple matter of getting the value of any stock holdings, multiplying by the number of shares and adding in any other cash. From a practical standpoint though, it is a lot more difficult. For example,

Datek is one of the largest online brokers in the country and has a very sophisticated system. Its system calculates account balances on demand during the day and every night (this is when the dreaded margin call gets initiated, if necessary). Since July of this year the software they use to figure account values occasionally comes up with wrong information. Interestingly, that is when the company started allowing trading in decimal amounts.

During the day, if the investor makes any trades and then asks the system about his balance, he gets information that is off by several dollars. For example, on September 18, 2000 my account was sitting in cash by late afternoon. It had no stock holdings at all. The 'cash balance' figure showed $1,313.54 less than the 'available cash' figure. The numbers should have matched and the correct figure was the lower one. The account information was corrected the next day (still off by a penny but otherwise reconciled). It is not a stretch of the imagination to see that accounts could show balances lower than they actually should be showing.

Datek is not alone in facing the difficulty of getting account information right. E*Trade reported to one customer that his $12,000 account grew to $2.4 million while it was actually losing money (Ip 6/13/00). For more information on customer complaints against brokers, see (Stein, 2000).

For a first attempt at calculating account value, assume the simple situation of an account opened with cash. The investor then buys some shares of stock. The system remembers the initial price of the stock. Subtract the price of the stock from the total cash balance to get the remaining cash balance. At this point, the account holds some stock and some cash that was not used in to buy stock. For future calculations of account value, get current information for the value of the stock, multiply it by the number of shares held, and add in the unused cash from before. If the stock has increased in price, then the value will be higher. If it has decreased, then it will be lower. The sum of the value of the stock plus the cash comes to the account value. Normally the broker will not forget to charge the cost of a commission in the purchase of the stock. The article (Brown 2000) shows that the Charles Schwab failed to charge fees to several mutual fund investors at the time of the transaction. Now it is trying to re-coup those fees.

Ordinarily, this money is charged and removed from the account (and added to the broker's account) at the time of the transaction.

Over time the stock price will fluctuate and that will cause the account value to fluctuate as well. As for the cash, many online brokerages sweep unused cash into money market accounts. That way the account earns some interest on unused funds. That is probably a simple enticement to keep customers from pulling idle cash out of their accounts to put into other interest bearing accounts. This interest is calculated periodically and added in to the account. Also, any stocks held for long term might receive a dividend. All such dividends are added to the account value.

Now for added complication, consider the case of an account that has the margin enabled and the investor is buying a stock 'on margin.' This means that the investor is using borrowed funds from the broker to buy more stock than his account balance would ordinarily allow. Assume an investor has $10,000 in his account. He buys $18,000 worth of stock in a company. His account now shows a cash balance of -$8,000 and an account value of $10,000 (minus commissions of course). If the stock increases in price to $22,000, then the account has a value of $14,000. That is calculated as a $4,000 profit in the stock plus $10,000 in the account. If the stock sits at this value and the investor does not close out of it, the system will periodically charge interest against the account to cover the borrowed funds of $8,000. Different brokers charge different rates and those rates change over time and with the amount borrowed.

If the stock drops to a value of $14,000, then his account is worth $6,000. That is calculated as $4,000 loss in value of the stock, plus the $10,000 in the account. Again, the investor is charged interest on the borrowed $8,000 in funds, even though the account has dropped in value. At this point, the account has a value of $6,000 by borrowing $8,000 to hold a total of $14,000 worth of stock. Most brokers have margin rules that force a borrower to have at least 50% equity in the account at the initiation of the transaction and a 30% maintenance margin. The maintenance margin amount means that the account must not drop below 30% equity, or else the accountholder must either send in more funds immediately, or the brokerage may liquidate some holdings to get the

account back within predefined limits -- that is, unless the stock value sees some immediate improvement.

The 30% number is not written in stone. Nasdaq requires 25%, but different brokerages use different numbers. Some even use different numbers for different stocks. For some historically volatile stocks, some brokers require a 40% margin or even a 50% margin. Some stocks require a 100% margin. That means that while they allow the stock to be bought in a margin account, the investor must use all cash to do so. In this case, the investor is buying stock in a margin-enabled account but is not using the margin capabilities to do so. The reason that brokers even care about maintenance levels is that they have some responsibility (and liability) when they set up an account with margin capabilities. If the stock value drops (or rises in the case of a short transaction) so far that a margin call is issued, and cannot be met, the broker is responsible to close out the transaction.

Buying stock on margin is risky. Over the past year or so, Engineering Animation (EAII) has had two days when the stock price dropped 45%. Proctor & Gamble (PG) experienced a similar loss in early March 2000 when the stock dropped from almost $90 to $60. In early December 1999 Visx (VISX) dropped from $90 to the low $50's. Many other companies experienced large drops too. Investors who owned stock in those companies on margin got lessons in the negative aspects of market volatility coupled with leverage.

Now assume the investor decided that instead of buying stock, he was going to sell some short. Assuming all the requirements are met for shorting a stock, he sells the stock. The cash from the sale is deposited into his account. Now the account shows a larger 'cash balance' than 'account value' because the extra cash from this short sale is in it. Again, when the transaction takes place, the system remembers the original price of the stock at the time of the sale and the remaining cash balance. In the future, the account is valued in a very similar way as explained above. To get the value of the account, get the current price of the stock and multiply it by the number of shares sold. Now instead of hoping the price increases, the investor hopes the price decreases. Since he has already sold the shares, he must look at buying them back. A lower price indicates that

the stock investment is worth more money. Again, the broker will not forget to charge a commission for services rendered and deduct that money from the account. Also, in the event an investor is short in a stock when it pays a dividend, he is responsible for covering that expense as well. As far as the periodic calculations of interest when an investor is short in a stock, that remains at the discretion of the brokerage. Some brokers pay interest to the investor because the extra cash is in the account. Some charge interest because the investor is using the margin account to borrow stock. Some brokers might do a combination of both charge interest and pay interest (Ingebretsen 2000).

Selling stock short is a risky investment strategy. On August 21, 2000 Micro Strategy (MSTR) announced a business arrangement with IBM. The price of its stock jumped from $21.00 to $30 1/2 before settling at $29 1/8. An investor who shorted the stock the previous business day would have experienced a terrible loss. For example, the investor has $22,000 in his account. He shorts 1000 shares at $21.00 per share. The account now sits with a short position of $21,000 and another $1,000 in cash. The 'cash position' of the account would show the original $22,000 plus the $21,000 from selling 1000 shares for a total of $43,000. The 'account value' would show $22,000 with a position of short 1000 shares (sometimes shown as -1000 shares). At the close of business the next day, the investor would have lost $8,125.00 on his one-day investment ($29 1/8 minus $21.00 multiplied by 1000 shares). His account would now show a value of $13,875.00 (which is $22,000 minus $8,125).

Now suppose the investor had just $11,000 in his account. He enables the margin capabilities of the account so he can do trades up to $22,000. He shorts 1000 shares at $21.00 per share. The 'cash position' is $32,000 (which is $11,000 plus $21,000 from the short sale). The 'account value' is $11,000 with a short position of 1000 shares. This investor would also experience a $8,125 loss the next day leaving him with an account worth $2,875.00 (which is $11,000 minus $8125).

Another example of this kind of potential devastation happened starting Friday November 12, 1999. An investor who shorted Ameritrade stock at $20 per share saw his investment decimated in the next couple of days. On that Friday President Clinton signed legislation to repeal the Glass-Stegall act. Over the next two business days the stock

surged 50% to $30 per share. Also, on September 20, 2000, Ebay shot up from $65.68 to $76.56. That $10.88 gain cost short sellers a bundle quickly. Short selling on margin puts even more money at risk. That situation is discussed below under CASES 15 and 16.

Margin interest is charged based on the number of days the account is in debt. Datek charges based on the number of days margin is used instead of based on the number of times it is used. For an active trader who uses margin several times per day, he is charged once. For an investor who places one margin trade then closes out of it ten minutes later, he is still charged for one day.

Table 1 shows the ways in which money moves in and out of accounts. The brokerage software tracks every transaction.

Table 1: Money Into and Out of an Account

MONEY IN:	MONEY OUT:
Deposit of funds (initial deposit or an addition to funds),	Withdrawn by account holder,
Dividends,	Payment of dividends for stock that was shorted,
Interest on unused funds,	Payment of margin interest,
Money from a promotion ("open an account and we'll put $75 in to get started"),	Purchase of stock, or
Short sale of stock (this money isn't at the disposal of the account holder though),	Administrative (Online Investor, pp 24, 2000)
Interest from cash sitting in account from short sale of stock, or	
Rebate of "payment for order flow" (Buckman, 2000)	
Sale of stock (whether profitable or not).	

3.4 Calculating Buying Power

Determining the account value is only part of the order placing process. When an investor wants to buy stock, the system must check to see that the account has enough buying power to cover the desired transaction. This calculation is a rather easy process of determining the account's current value and subtracting that from the account's total buying power. That is one reason why day traders normally enable the margin capabilities of their accounts. That action doubles their buying power. At least one broker allows 90% margin instead of the more typical 50%. One way they do this is to treat all the traders with the firm as partners in a partnership. The SEC frowns on this practice. The SEC wants to avoid the situation where these partnerships are formed and broken on a daily basis. It wants to mandate that they stay in force for at least one year (Lieber, 2000). Individual brokerage policies toward margin lending vary and change over time.

The process of calculating buying power for an account takes place every time an investor places an order or checks his account balance. The broker's system also does this calculation each night to see if a margin call is necessary. There are four different situations under which the software must operate in order to make these calculations: the account is all cash, part cash and part long stock holdings, part cash and part short stock holdings, and part cash, part long stock and part short stock. Each of these cases is described below.

3.4.1 All cash

This is the simplest case. The buying power is the amount of cash in the account. If the account is enabled for margin trading then the buying power is two times the amount of cash on deposit.

3.4.2 Part cash and part long stock holdings

Assume an investor bought $9,000 worth of stock. · The account had $10,000 in it so now it holds $9,000 in stock and $1,000 cash. Three months from now the stock has risen to $12,000. The account now has a value of $14,000 (which is $3,000 profit in the stock plus $1,000 of unused cash). The unused cash of $1,000 represents the remaining buying power for the account.

If the account had margin enabled, the picture would look like this instead. The account with $10,000 cash in it would have had a buying power of $20,000. The investor used $9,000 of that buying power to buy stock. The remaining buying power is $11,000. Three months later with the stock worth $12,000 the total buying power would be $26,000. With $9,000 used to make the initial stock purchase the account has remaining buying power of $17,000. That is calculated as the original $20,000, plus the $3,000 profit on the stock times two (since the account is enabled for margin trading), minus the $9,000 stock price.

3.4.3 Part cash and part short stock holdings

As an example similar to the one above, assume an account has $10,000 cash in it and the margin is enabled. The account has $20,000 worth of buying power (it is still called buying power even though the account is going to be used for selling now). An investor sells $9,000 worth of stock. The account has a value of $10,000 and remaining buying power of $11,000.

Three months from now the stock is worth $12,000 and the short position is sitting at a loss of $3,000. The account has a value of $7,000 and buying power of $7,000. The value is calculated as $10,000 original investment minus $3,000 loss on the stock transaction. The buying power is calculated as the original $9,000 worth of cash used to sell the stock minus the $3,000 loss, (which equals $6,000), plus the $1,000 cash left unused (for a total of $7,000) times two because margin is enabled.

Alternatively, assume that three months from now the stock is worth $6,000 and the short position is sitting with a gain of $3,000. The account has a value of $13,000 and a total buying power of $26,000. That total buying power would be available if the investor closed out of the short position and left the account with $13,000 cash (less modifications like commissions and interest). The value is calculated as the $10,000 original investment plus the $3,000 profit in the short transaction. The buying power is calculated as two times the account value of $13,000. The remaining buying power is $20,000, which is the $26,000 figure minus the $6,000 commitment to buy stock to close the short position.

3.4.4 Part cash, part long stock and part short stock

This calculation is a combination of the previous two situations. Assume the same $10,000 account with the margin enabled. The investor sells short $9,000 worth of stock. At the same time he buys $3,000 worth of a different stock. At the moment, the account is still worth $10,000 (less commissions of course).

Three months down the road assume that both positions are profitable. The stock in the short position has dropped to $6,000 in value, and the stock in the long position has increased to $4,000. The value of the account is the original $10,000, plus the $3,000 profit in the short transaction, plus the $1,000 profit in the long transaction, for a total account value of $14,000. The total buying power of the account is $28,000 but some of that is used by the two positions. The remaining buying power is calculated as follows. Take $28,000 total buying power, minus $6,000 committed to buy back the short position, minus $3,000 spent to buy the long position. That leaves remaining buying power of $19,000 (not counting commissions and interest).

Now assume instead that three months down the road both positions are sitting with losses. The stock that was sold short has risen from $9,000 to $12,000. That position is sitting with a $3,000 loss. The stock that was bought for $3,000 has dropped to $2,000 for a loss of $1,000. The account now has a value of $6,000. That is figured as, $10,000 minus the $3,000 loss on the short position, minus the $1,000 loss on the long

position. The account has a total buying power of $12,000. That is figured as follows. Take the $10,000 original deposit and subtract the two losses totaling $4,000 to arrive at the account value of $6,000. Since the account is enabled for margin trading, multiple by two to arrive at $12,000. The remaining buying power is $2,000. One way to figure that is as the difference between the $12,000 current total buying power and the $10,000 deposited.

It is possible of course that buying power drops to a negative number. That is when margin maintenance percentages start getting calculated. It is not difficult to see that with stock prices moving around minute by minute and subtracting commissions, adding dividends, adding deposits, subtracting withdrawals, and interest in or out, that calculating the proper account balance and buying power is not as easy as it would appear on the surface.

3.5 Different Kinds of Orders

When placing orders, there are four different variables to be considered. They are Buy or Sell, Market or Limit, No margin or Margin, and Long or Short. Some of the differences are minor and show up mostly in the accounting but for completeness, they are all included anyway. Variants within the limit orders include an order at or better than the market price and out of the money order. This assumes trading during normal trading hours. The variations for trading outside of normal hours are minimal once this list is described (and they are discussed later in the Section 3.8 Trading Outside Normal Hours). The different possibilities are listed in Table 2.

Table 2: Listing of Different Kinds of Orders

LONG:

	BUY No Margin	BUY Margin	SELL No Margin	SELL Margin
Market Order	CASE 1	CASE 3	CASE 5	CASE 7
Limit Order	CASE 2	CASE 4	CASE 6	CASE 8

SHORT:

	BUY No Margin	BUY Margin	SELL No Margin	SELL Margin
Market Order	CASE 9	CASE 11	CASE 13	CASE 15
Limit Order	CASE 10	CASE 12	CASE 14	CASE 16

Each of the 16 cases listed above in Table 2 is described below. For all orders, it is assumed the system first goes through the same process of checking to see that all the fields of the order are valid and also that the account has sufficient buying/selling power to cover the transaction.

CASE 1: Buy (long) without margin with market order.

The investor is placing an order to buy stock using cash in the account and paying whatever is the current best national price. The ultimate price paid may be higher or lower than the price when he started the ordering process. If the order gets stuck in a computer for a time, or delayed due to traffic on the Internet, the price could be substantially different than originally intended (for the better or for the worse).

CASE 2: Buy (long) without margin with limit order.

CASE 2a: At market price or better

Placing a limit order at the market price protects the buyer from paying a price far in excess of what he intended. A limit order at the market price will usually get filled, in full or in part, at the specified price. If the market price is moving down, the order will get filled in full. If the market price is moving up, the order may get filled in full, part, or not at all. In the event the price moves up out of range before the order is filled completely, the unfilled portion gets listed on the book.

CASE 2b: Out of the money

In this case, the investor is placing an order to buy a stock at a price lower than the prevailing one. The difference could be a quarter point, a point, or several points. Since stock prices tend to fluctuate during the day, it is possible this order will get filled on a down swing. For example, On January 10, 2000, E-Trade (EGRP) stock experienced a large, but brief, sell off. All the buy orders on the Island book were filled within moments. Orders that were sitting at 20-30% below the prevailing market rate were filled. A few minutes later, the stock price was back to where it was before.

CASE 3: Buy (long) with margin with market order.

The investor is placing an order to buy stock but the total cost of the transaction exceeds the amount of cash in the account. Since buying on margin entails some measure of risk, many (if not all) online brokerages require the investor to go through a special process to enable margin trading. For Datek this was as simple as clicking through a couple a screens and giving the password to authorize the ability to trade on margin. In this way the broker is able to warn the investor about some of the risks and try to gain some protection in the process. The broker may also have a minimum account balance

before allowing such trading.   If the order gets filled, or at least filled enough that some of the buying power in the margin is used, the interest meter starts running. If the price of the stock goes up, the investor makes a better return on his equity. If it goes down, he loses money at a faster rate and risks getting a margin call if the drop is very big.

CASE 4: Buy (long) with margin with limit order.

CASE 4a: At market price or better

This case is something of a combination of CASE 2a and CASE 3. The investor gets the protection of using a limit order but faces the risks of buying with borrowed funds.

CASE 4b: Out of the money

This case is something of a combination of CASE 2b and CASE 3. The investor is placing a large order that is below the prevailing price. If the order is filled on a temporary down swing in the price, his gains are amplified as the price swings back up. Placing an order below the market price though also means that the order may never get filled.

CASE 5: Sell (long) without margin with a market order.

This is a simple case of the account holding some stock and the investor selling at the current best price available.

CASE 6: Sell (long) without margin with a limit order.

CASE 6a: At market price or better

This case allows the investor to specify the price of the stock to be sold. If the price moves upward during this time, it will sell at the market price. If the price moves down, the order may or may not get filled. Or it may get partially filled.

CASE 6b: Out of the money

The investor places an order specifying a price that is above the prevailing market price at the time. Just as in CASE 2b above where the investor was waiting for a dip in the price, this time he is waiting for an upward movement. On December 28, 1999, Xing (XING) jumped from the low 20's to almost 70 on news that the Chinese government might allow it a lucrative business arrangement. A month earlier the stock was at 3 but anyone who placed a GTC limit order to sell, at say 60, had the order filled that day.

CASE 7: Sell (long) with margin with market order.

The investor holds stock that he bought using margin. This case is almost identical to CASE 5 above except the dollar amount of the stock is higher. Once the stock is sold, the interest meter stops running and any margin calls that were outstanding are cancelled (unless of course the price of the stock had dropped so much that even selling it does not satisfy the margin call. In that situation, the investor can count on getting a bill from the brokerage for more money.)

CASE 8: Sell (long) with margin with limit order.

CASE 8a: At market price or better

This is a combination of CASE 6a and CASE 7 above. The investor is selling a large order of stock and should get his price met unless the market moves out of range too quickly.

CASE 8b: Out of the money

This is a combination of CASE 6b and CASE 7 above. The investor places a limit order to sell stock hoping the price will bounce up at least long enough to fill the order.

Consider the case where the investor places a combined order to close out a long stock position and sell additional stock (go short). While this can be treated as a single order, Datek separates the two parts into separate orders to Island. For example, assume an investor who was long 1000 shares managed to sell all but 50 shares before the price moved back down. He cancels his order for the remaining 50 shares and places a new sell order for 1050 shares. Datek transmits this information to Island as a sell order for 50 shares and as another sell order for 1000 shares. The 1000 shares is treated the same as CASE 16 below.

CASE 9: Buy (short) without margin with market order.

Buying stock that was previously sold short is called a "cover buy." This case is almost identical to CASE 1 above except the stock has already been sold. This transaction simply completes the buy-sell round trip.

CASE 10: Buy (short) without margin with limit order.

CASE 10a: At market price or better

This is almost identical to CASE 2a above except the stock had already been sold. This transaction simply completes the buy-sell round trip.

CASE 10b: Out of the money

This is almost identical to CASE 2b above except the stock had already been sold. This transaction simply completes the buy-sell round trip.

CASE 11: Buy (short) with margin with market order.

This is almost identical to CASE 3 above except the stock had already been sold. This transaction simply completes the buy-sell round trip.

CASE 12: Buy (short) with margin with limit order.

CASE 12a: At market price or better

This is almost identical to CASE 4a above except the stock had already been sold. This transaction simply completes the buy-sell round trip.

CASE 12b: Out of the money

This is almost identical to CASE 4b above except the stock had already been sold. This transaction simply completes the buy-sell round trip.

Consider the case where the investor places a combined order to close out a short stock position and acquire stock (go long). While this can be treated as a single order, Datek separates the two parts into separate orders to Island. For example, assume an investor who was short 1000 shares managed to buy back all but 50 shares before the price moved back up. He cancels his order for the remaining 50 shares and places a new buy order for 1050 shares. Datek transmits this information to Island as a buy order for 50 shares and as another buy order for 1000 shares. The 1000 shares is treated the same as CASE 4 above.

CASE 13: Sell (short) without margin with a market order.

Some special circumstances come into play when an investor tries to sell stock short (meaning that he does not already own it). The brokerage firm has some requirements that must be met. Those requirements are listed in Table 3.

Table 3: Requirements for Selling Stock Short

1) The account has to be enabled for margin trading whether or not the amount of money reaches into the margin range (this is necessary so that the broker can extend credit),
2) The account may need to have some minimum value,
3) The stock price may need to be above some minimum level, and
4) The stock must be available to be borrowed so it can be sold. Stock may be borrowed from the broker's own account, from another investor, or from another broker. The broker handles the details automatically.
5) For some particularly volatile stocks, shorting may not be allowed. This is a decision of the brokerage and stocks on such a list may change over time.

Selling stock short with a market order is allowed by Nasdaq (individual brokers may or may not allow it). What happens in this situation is that the order is placed at $1/16^{th}$ above the current market price. When a market (or limit) buy order comes in at the specified price, the orders are matched. If the market price drops, the market short order is automatically dropped to the new market price plus $1/16^{th}$ (Redibook, 1999).

CASE 14: Sell (short) without margin with a limit order.

CASE 14a: At market price or better

An order to sell stock short with a limit order at the market price is allowed only if the bid tick is Up. That is, the last direction of the stock bid price has to have been in the upward direction. For other requirements of a short sale, see CASE 13 above.

CASE 14b: Out of the money

An order to sell stock short with a limit order above the market price is allowed regardless of the bid tick. In order for this order to get filled, the bid price for the stock must move up to reach it. The bid tick will be up when, and if, the price moves to match the order price. For other requirements of a short sale, see CASE 13 above. As a note, on August 7, 2000 Datek would not allow an order to short E-Trade (EGRP) when the bid = 15.00, the ask = 15.0625, bid tick was down, and I tried to place an order to short at 15.05. If I would have placed the short order when the price was below 15, I could have done so. Datek did not allow this order to be placed even though a buyer would have had to place a market, or limit, buy order to hit it. Apparently the spread of less than 1/16th was too close.

CASE 15: Sell (short) with margin with market order.

This case is almost identical to CASE 13 above except it is for an amount of stock that exceeds the amount of cash in the account. This is a risky kind of order to place because it entails the combined risks of shorting and using margin.

CASE 16: Sell (short) with margin with limit order.

CASE 16a: At market price or better

This case is almost identical to CASE 14a above except it is for an amount of stock that exceeds the amount of cash in the account. This is a risky kind of order to place because it entails the combined risks of shorting and using margin.

CASE 16b: Out of the money

This case is almost identical to CASE 14b above except it is for an amount of stock that exceeds the amount of cash in the account. This is a risky kind of order to place because it entails the combined risks of shorting and using margin.

3.6 Filling Orders

When an investor places an order, it is assigned a tracking number by the brokerage. Brokerages track every order and its status. If the order is invalid for some reason (e.g., invalid price, invalid symbol, incorrect password, etc) it is rejected but it is still tracked. Online brokerages track every order to create a record in case a dispute ever arises.

Datek uses tracking numbers in this format:

A-NNN-AAAA-NNNN

In this format, "A" is an alphabetic character and "N" is numeric. To calculate the possible range of tracking numbers using this format, substitute 26 for each "A" and 10 for each "N" and work through the math.

$$26 * (10*10*10)*(26*26*26*26)*(10*10*10*10)$$

That result is approximately equal to 1.2 x 10^15, which is a very large number indeed.

It is very possible that, like credit card numbers where the first four digits have a reserved meaning, some of these fields are also reserved. Some of the possible meanings could be initial deposit, additional deposits, buy, cover buy, sell, sell short, charge margin interest, pay interest, administrative, etc.

For example, the first trade I ever made with Datek was to buy 100 shares of Engineering Animation (EAII) on 12/28/98 for a price of $49 15/16. The tracking number for this transaction was C-300-AAAQ-6334. The next day I sold the same 100 shares for a price of $53 7/8. The tracking number was C-300-AAAT-4741. Assuming Datek was using a simple system of incrementing the order count by one from "Q-6334" to "T-4741" it would be possible to figure that there were approximately

	Q:	9999 - 6334	=	3665
+	R:			10000
+	S:			10000
+	T:			4741
				28406

orders between the buy order one day and the sell order a day later.

In case the order gets filled in more than one part, it still has the same tracking number but a different number of remaining shares. For example, on August 9, 2000 I placed an order to buy some shares of E-Trade (EGRP) at $15.01. The order was filled in three separate pieces but the tracking number remained the same. The tracking number was C-200-AAXC-4844 for all three parts. Filling an order in multiple pieces is not uncommon at all. My personal record is having an 800 share buy order filled in eight separate parts on April 6, 2000.

On occasion, orders are filled at prices slightly better than specified by the investor. This is called price improvement. For example, the investor places an order to buy 100 shares of Micro Strategy, Inc. (MSTR) at a price of $28 1/4. This is a very volatile stock having touched $313 per share the week of March 10 this year and having traded below $20 since then. At the time this order was placed, $28 1/4 is about fair market price. Now, assume the market has a rapid sell off. A larger seller places an order to sell 10,000 shares at $28 3/16. It is possible this order to buy 100 shares will get filled at $28 3/16, instead of the $28 1/4 specified by the buyer. Since the buyer was willing to pay the higher price for the stock, but he got it at a slightly lower price, his order experienced price improvement. There is no such thing as price improvement on market orders.

Datek passes all of its Nasdaq orders to the Island ECN. The actual matching of buy orders and sell orders takes place through Island. Information about the transaction passes back to the broker. When the broker is notified by the ECN that the order has been filled, the broker completes the record by updating the user's account information with a record of the transaction (e.g., number of shares of stock purchased, full or partial fill) and any remaining cash. Of course it also handles accounting issues such as the charge for commission. A more detailed discussion of matching orders on an ECN is covered below in Section 4.4 Matching Orders in the Limit Book.

3.7 Canceling orders

Once an investor places an order, it goes through the approval process at the broker and, assuming it passes, gets passed on to the ECN. When the ECN accepts the order, it either gets passed on to Nasdaq, to a market maker immediately (if it is a market order or if the price is at or better than the prevailing market price), or it gets placed on the book. At this point in time, the order exists on both the broker's system and on the ECN.

Assume the investor wants to cancel the order. He goes through the broker's process to cancel the order. In the normal course of operations, canceling an order is simple. All the investor has to do is identify the order he wishes to cancel and give the appropriate password authentication for approval. Typically the next feedback he gets from the system is that the order was cancelled. A look at this process in a step by step fashion shows that there are a couple of things that can go wrong.

Once placed, the order gets sent from the broker's system to the ECN. The ECN accepts the order and sends back an acknowledgment to the broker. The ECN then passes the order on to Nasdaq, a market maker, or places it on its book. Table 4 below analyzes this in more detail showing the following path for the order to cancel:

Table 4: Path to Cancel an Order

1)	Goes over the Internet to the broker,
2)	Goes through the broker's system,
3)	Goes over a communication line to the ECN,
4)	Gets processed by the ECN, then
5)	Goes out to Nasdaq or market makers.

A problem could develop anywhere along this path that would complicate the cancellation process (see Appendix 1). First, delays in the Internet happen all the time. The Internet operates through a series of servers and communication lines. A very common problem is a server that is too busy to handle traffic. This situation usually works itself out quickly, but not always. Second, the broker's system could experience problems. This could range from problems with a software upgrade, to communication line problems, to just simply being too busy to handle the request to cancel. Third, lines between brokers and ECN are usually leased lines. The message still has to go through telephone company switching systems. Problems could also develop if a construction company cuts a line. Fourth, the ECN could experience problems or delays. Finally, Nasdaq itself sometimes has computer problems. From what I have seen over the past year and a half, problems rarely develop in the last three of these steps. Any problem is almost assuredly either the first or the second.

For example, on August 17 this year, I placed a limit order that was out of the money. It should have shown up on Island within seconds. After a while, the order still had not shown up so I decided to cancel it. My order to cancel got stuck in the "Trying to Cancel" mode. After several minutes, the original order popped up on Island and almost immediately dropped off. Apparently my order to buy stock got stuck within Datek and did not get transmitted to Island. Since all Datek orders go to Island, they would not cancel it without the "cancelled order" signal from Island. Island could not give that signal because it had not yet received the order. Fortunately, by the time the delays got sorted out, the market price moved away from my limit price. That allowed the order to be cancelled as soon as it surfaced. If the market price had moved the other way, my order would have arrived at Island and been sent out immediately as a marketable order, despite my desire and attempt to cancel it. Though frustrating for the investor, it is understandable why Datek would wait for a "cancelled order" signal from Island. The following example highlights the risk in case Datek would have cancelled my order before it was cancelled on Island.

In the article (Aidikoff 2000) the investor cancelled an order that later got filled anyway. He had documentation to prove that E-Trade told him his order was cancelled. Later when the order went through anyway and the stock price dropped, he filed for arbitration when E-Trade would not reverse the trade (if the price would have increased and he made money, it is doubtful he would have filed arbitration). This happened in February 1999. The arbitration process took over a year to settle and for the investor to finally get a judgement in his favor. Though the internal code for E-Trade's system is proprietary, it is entirely possible that E-Trade flagged the order as cancelled before the cancellation signal came back.

3.8 Trading Outside Normal Hours

Trading outside of normal hours has a few differences than trading during the day. By default, orders placed during the day expire at the 4:00 pm close of business. For orders placed through Datek (and probably other brokers as well), the investor must read

through a special disclosure to make the order valid for after-hours and/or before hours trading. During the normal trading day, stock price spreads are typically $1/16^{th}$, $1/8^{th}$ or maybe up to $1/4^{th}$ point. It is unusual that spreads get larger than that because someone will jump in between the bid and ask prices. In the hours after the market closes, the spreads can get large. For that reason, Datek does not allow a 'market' order after hours. The investor must specifically enter the price at which he is placing the order.

For example, on September 15th Network Associates (NETA) showed the following information for the stock after the normal close of trading.

NETA:	Bid	20 1/8	200 shares
	Ask	24 5/16	200 shares
	Last	22 13/16	
	High	24 7/16	
	Low	22 3/8	

Volume: over 2.6 million shares during the day.

As this shows, the spread was over 4 points on a roughly $22 stock (or about 18%). Here is another even more extreme example from August 17th for Engineering Animation (EAII).

EAII:	Bid	3.00
	Ask	12.00
	Last	8 1/2 at 4:09pm EST.

Some brokers use the Bid/Ask information to do their calculations for placing values on accounts and for determining margin calls (some use the Last price). In this case, an investor who bought 1000 shares of EAII at $8.50 would see his account valued at just $3,000 even though he just spent $8,500 to buy the stock. He might even receive a margin call. The next morning though, the price for the stock probably opened right close to the last price.

Another concern with trading outside normal hours is liquidity. During the day, orders entered through a broker, such as Datek, go to Nasdaq to reach the widest possible audience. After hours though, Datek represents orders only on the Island ECN. Island gets orders from more than a dozen brokers but that is not nearly as many as trade on market during the day.

Table 5 shows examples of swings in stock prices after the close of normal trading hours. This shows how company values can become skewed with trades of just a couple hundred shares (Pulliam 2000).

The article goes on to say that the actual last trade for Wal-Mart was at a price of $47.88. That price was $3.50 above the 4:00 pm closing price added some $15.5 billion in market capitalization to the company. The next morning it evaporated. The article also said the DJIA and the S&P 500 indexes are based on the 4pm closing price so they aren't affected by after-hours trading.

Table 5: Example Price Swings After Normal Trading Hours

Stock	Date	4 pm Close	After Hours Trade	Next Day Open
Wal-Mart	2/24/00	$44.38	$46.00	$44.31
Disney	2/25/00	$32.31	$31.00	$32.31
IBM	2/25/00	$105.63	$108.00	$105.56
GE	3/9/00	$131.38	$129.00	$130.88

Another difference in after-hours trading is in how orders to short stock are handled. The bid tick does not matter outside of normal business hours. That means an investor is free to short stock even if the bid tick is down. The Island ECN just matches orders as they become available. As will be discussed later, Island does not do any checking for compliance with exchange rules for shorting stock. That responsibility lies with the broker.

A logistics issue arises on how to handle charging commissions for trades that are partially filled when the trading finally wraps up for the day. As frequently happens on issues like this, it is up to the broker. Some may charge because they have performed a

service for the customer. Some may not charge because the order was not filled and the investor will have to place the order again to handle the rest of the shares.

Here is a story of how a market maker profited by knowing the order imbalance that was going to exist when the stock opened at 9:30 am EST. A trader at Knight/Trimark saw there was going to be an order imbalance of 100,000 shares in Egghead stock at the open; more buy orders than sell orders(Ip 3/3/00). He bought 50,000 shares from others in the pre-market activity. When the stock opened higher, he sold and made $15,000 profit for his position.

3.9 Summary

This section presented a qualitative overview of the numerous steps necessary to place orders electronically. It covered the process from initially checking to see if the order was valid, to determining if the account has the necessary buying power, to the 16 different kinds of orders that are possible, and to how orders are filled. It also covered the side topics of how to cancel an order once it is placed and some of the issues that arise from trading outside of normal Nasdaq hours.

4. THE ELECTRONIC COMMUNICATION NETWORK

4.1 Introduction

Electronic Communication Networks (ECNs) are screen-based trading systems that automatically match buyers and sellers without market makers or stock-exchange specialists as intermediaries. They are regulated like brokers but act more like exchanges (Ip 3/3/00, pp. C1). Their contents are passive limit books that help define and guide stock price movements in the markets

ECNs must meet three requirements in order to be approved to trade Nasdaq stocks (Nasdaq-Amex, 1999). They are:

1.   Each must be a registered broker/dealer and a NASD member.

2.   Each must be approved by the SEC as an Alternative Trading System (ATS).

3.   Each must agree to Nasdaq contractual terms on how to operate its link into the Nasdaq network.

The first and the third of these requirements are not as difficult to meet as is the second one. According to the NASD web site (NASD, 2000), it has members in more than 5,500 securities firms with more than 82,000 offices nationwide so gaining membership is not too difficult to achieve. Agreeing to Nasdaq contractual terms is a matter of reading, agreeing and signing. Getting approved by the SEC as an ATS is the most difficult requirement to meet. Currently there are only 45 ATS's approved (SEC, 1998). Only about ten ECNs are operating at present.

The Security and Exchange Commission (SEC) approved the first ECNs January 27, 1997 (Friedfertig 1998). ECNs register under SEC Rule 17a23. That rule establishes record keeping and reporting requirements ECNs must follow. An example 17a23 filing report is shown below in Section 4.2.3. At first, four such systems were approved. Since then, at least six more have started in business and more could start up any time. Prior to ECNs, market makers had three systems in place to trade stocks (Friedfertig 1998). First, they could use the telephone. These are called ACT orders. Second, they could use

SOES (Small Order Execution System) which is a system where all market makers are required to participate. Third, they could use SelectNet, which is a system that allows market makers to trade with other market makers.

ECNs have become a fourth way to trade stocks. They allow for the anonymous display of limit orders. Customers can now trade directly with one another without having to go through a market maker. In "the old days," market makers were always on the other side of a trade. This had the effect of keeping stock pricing spreads wider. The growth and popularity of ECNs is remarkable. They offer an organized and efficient way to trade NASDAQ stocks electronically. Not all brokerages are connected to an ECN. Those that are not connected must still trade stocks in one of the three ways mentioned above.

4.2 Description of How They Work

Though there are currently at least ten operating ECNs, public information about how they work is scarce. The Island ECN is one of the largest and seems to have the most information available about its operations. While most ECNs probably work in the same ways, this discussion focuses on Island simply because it is the most open for study. Much of the material below on communications comes from the Island O*U*C*H Version 1.05 specification for developers wanting to design systems to connect to Island ("O*U*C*H Version 1.05, 2000).

Island is open to accept orders by 6:45 am EST. The fifteen minutes from 6:45 am till 7:00 am are meant to allow its participating brokers to re-enter GTC orders from their systems. Island does not keep track of GTC orders. All orders must be entered each day and all orders expire at the end of the day (some expire at the normal 4:00 pm close of business and some stay active until Island stops making matches at 7:00 pm EST). The GTC orders could be either of two varieties. They might be good only during normal trading hours or they could be good for trading in the pre-market hours. Also,

there is no such thing as a 'market' order in the pre-market (or after market) hours. All orders must be limit orders.

As orders are placed and matched in the pre-market hours, a certain relationship between buyers and sellers is created. In the course of time, buy orders and sell orders match and the 9:30 am EST opening price for the stock becomes apparent. At the open of the market, the brokers transmit their orders to the ECN. Limit orders are placed on the book in a price-time prioritized arrangement. Market orders or limit orders that are immediately marketable are sent out to the marketplace.

4.2.1 Communications Between Broker and ECN

ECNs and broker systems communicate through a small set of signals called messages. At the beginning of each session, brokers login to the ECN. Each broker is uniquely identified with a six-character alphanumeric account name and up to a ten character alphanumeric password. During the course of the session, the ECN pings the broker periodically with 'heartbeat' messages. The purpose of that action is to make sure the broker's system is still active, or alive. If the broker does not respond to four consecutive heartbeat messages, it is automatically logged off. Naturally, at the normal end of a session, the broker logs off under it's own control.

During the course of the session, brokers and ECNs swap messages that pertain to orders. Brokers have two primary messages they send to ECNs. Both of these messages were discussed earlier. They are Enter Order and Cancel Order.

The Island ECN has six primary messages it sends back to broker systems. They are Accepted Order, Canceled Order, Executed Order, Broken Trade, Rejected Order, and Rejected Cancel. Each of these is discussed below.

4.2.1.1 Accepted Order

Island accepts orders with prices that are either fractions or decimals. It accepts orders in fractions down to a granularity of $1/256^{th}$. It accepts orders in decimals down to

a granularity of $0.001. It's participating brokers sometimes use different granularities but never anything smaller. For example, Datek uses 1/32nd and $0.01.

Island also sets the share limit per order (per account) at 10,000 by default but that can be raised to 999,999,999 by contacting Island.

An Accepted Order message acknowledges the receipt of a valid order. Every element of the order as transmitted from the broker is repeated back. This protects from the possibility of, say, a 1000 share order getting garbled in transmission into a 10000 share order. In addition, a unique order reference number is included.

4.2.1.2 Canceled Order

A Canceled Order message indicates that an order has been canceled at the request of the broker system or that it has timed out (expired) and is no longer valid. For orders that were partially filled, the unfilled portion of the order is canceled.

4.2.1.3 Executed Order

An Executed Order message gets sent to the broker when all or part of an order gets filled. In the case when an order gets filled in multiple parts, an Executed Order message gets sent for each partial fill.

4.2.1.4 Broken Trade

A Broken Trade message gets sent when a previously executed trade has been broken. The trade is no longer valid and the transaction will not clear. This is unusual but there are five different reasons why a trade may be broken.

1)   The trade was deemed clearly erroneous by the ECNs administrative procedure. For example, the Redibook ECN has "excessive price" as one their reasons to break a trade. Their web site, under 'customer center,'

includes a list of stock prices and executed prices that they use in determination of whether or not to break a trade. If a stock has a current bid price of $9.00 and the execution takes place at $12.00, that is over their threshold for a clearly erroneous execution (which is 30% for stock prices greater than $5.00 but less than or equal to $10.00).

2)　The trade was broken in response to a system problem.

3)　The trade was broken by mutual consent. Both parties agreed to the break.

4)　An ECN supervisory terminal manually broke the trade.

· 5)　Trade was broken by external influence. This may be by a regulator or by another marketplace.

4.2.1.5　Rejected Order

A Rejected Order message is sent in response to an Enter Order message if the order cannot be entered. Most of the reasons listed for rejecting an order have to do with some invalid data in the transmitted order. Another reason that an order might be rejected is a trading halt on that particular stock.

4.2.1.6　Rejected Cancel

A Rejected Cancel message is sent in response to a Cancel Order message that cannot be honored. Various reasons for rejecting a request to cancel include the possibility that the order was just filled or that the order, as specified, is not on record as being accepted this day.

4.2.2　Communications Between ECN and Marketplace

ECNs connect to the rest of the marketplace in a couple of different ways. They are linked to Nasdaq computers and to SelectNet for ready access to market makers. When ECNs receive market orders or limit orders that are immediately marketable, they

send those orders to market makers to be filled. When they receive word back that the orders are filled, they transmit that news back to the broker.

For each stock with limit orders on the book, they report the number of shares on order and the best price for both buy orders and sell orders. Table 6 illustrates a simple example using Network Associates (NETA).

Table 6: Simple Stock Limit Book Example

NETA			
BUY ORDERS		SELL ORDERS	
Shares	Price	Shares	Price
100	20.5010	75	20.5625
100	20.5000	350	20.7500
300	20.3750	400	20.7500

In this case, the ECN would report 200 shares on the buy side at a price of $20.50 and 425 shares on the sell side at a price of $20.75. It reports the odd lot order of 75 shares along with the next best price. On occasion, the market prices get crossed for odd lot orders. It is possible that the national best prices for the stock mentioned above could have active buy orders at $20.5625 and sell orders at $20.6875. The order for 75 shares will not get filled until either someone places an order on this ECN at $20.5625 (or better) or the market price moves up enough that an outside order comes in. That may seem unusual but because of Nasdaq display limitations, mixed and odd lots are never shown accurately (and large orders, over 10,000 shares, are displayed as "xx").

The ECN is in constant communication with Nasdaq computers so it knows the national best price on each stock for which it has orders. That is how it determines that a limit order may be immediately marketable.

Of course, the ECN must keep copious records of everything. The standard record keeping system is called OATS which stands for Order Audit Trail System (NASDR 1998).

4.2.3 ECN Record Keeping

In addition to keeping records for each individual stock (as shown in "The Book" sections below), Island compiles overall system totals. From their home web page, the system statistics contain the fields listed below.

TODAY'S TOTALS

    Orders booked

    Shares booked

    Shares matched (*)

    Stocks active

ON THE BOOK NOW

    Orders open

    Shares open

AS OF time in the format xx:xx:xx

DOLLAR VOLUME

(*) "Shares matched" is different than the information they report to Nasdaq. Specifically, shares matched covers both buy orders matched and sell orders matched. For counting Nasdaq volume, only buy orders count. That avoids the problem of double-counting shares. Say, one ECN says it supplied the buyer of 100 shares and another ECN says it supplied the seller of 100 shares. The two ECNs together could say that they each matched 100 shares but Nasdaq would consider it a total volume of 100 shares. The Island home page gives three examples under 'explanations' for these exact situations.

Periodically, each ECN must report activity to the SEC. The information below is an actual filing from Island for the first quarter of this year. This is known as a 17a23 filing and comes from (Island, 1999). It contains the following information:

Period:	1/1/99 - 3/31/99
Trading Days Included:	61
Number of Shares Executed:	5,478,851,934
Number of Executions:	15,685,546
Monetary Value:	$342,557,965,169.27
Total Number of Orders Entered:	32,470,739

4.3 The Book

At the most basic level, ECNs are just passive limit books. Books come in two varieties, a JAVA version and an HTML version.

4.3.1 JAVA version

The Java version of the Island book (which is available at www.island.com and runs on browsers that can run Java 1.1 applets) shows the following fields. The Java applet changes dynamically as orders get filled (in full or in part), cancelled, or added to the book.

Stock symbol XXXX

Last Match: Price in the format xx.xxxx

               Time of last match in the format xx:xx:xx

Today's Activity:

               Number of Orders

               Volume

Buy Orders: Lists the top 15 buy orders hierarchically by price then by time with a price level. It also shows number of shares per order.

Sell Orders: Lists the lowest priced 15 sell orders in a reverse hierarchical order by price and then by time placed within each price level. It also shows the number of shares per order.

Does not display orders that are outside of the best 15 on each of buy side and sell side but keeps track of them.

4.3.2 HTML version

The HTML (Hyper-Text Markup Language) version of the book shows the same information as the Java version, but in a static manner. See Appendix 2 for an actual HTML book listing for Yahoo from the Island ECN on 11/15/00. It is possible to click on an individual order and also see, in addition to the information displayed above:

Reference number #1234567

Entry time of order   xx:xx:xx

Buy/Sell

Shares entered   x,xxx

Shares remaining   x,xxx

Stock symbol   XXXX

Price   xx.xx

Display of the best 15 buy orders and the best 15 sell orders based on price and time.

4.4 Matching Orders in the Limit Book

Since July of this year, Island has offered the ability to place orders using decimal prices instead of the historic fractions only. Nasdaq and some of the other ECNs do not yet have the capability to trade in decimals, at least not for all stocks. When stocks were first allowed to trade in sixteenths instead of eighths (Smith 1998), a concern was that market makers would lose interest in performing the market-making function because they would not make money with the smaller spread. That fear turned out to be unfounded and now the spread is reducing to pennies or even tenths of pennies.

Not all of the brokers who direct orders to Island have the capability to allow for decimal-based trades. Investors who enter prices in decimals will get their order filled at their stated prices while investors who enter their orders in fractions will get their orders filled at their stated price. Island says that any difference will be donated to charity. (Ewing 2000). A transaction with both sides being decimal-based orders yields slightly different results than if one side is an Island decimal trade and the other side is a fraction trade coming in from outside Island.

Analyzing the different possibilities yields eight variations that occur when the first order is a buy order. The same variations occur when the first order is a sell order. These examples always use "1000 shares" but the same idea would apply if one side were 1000 shares and the other side was, say, 500 shares. That would mean that one side was just partially filled. SBUX is the symbol for Starbucks.

a) Fraction buy order placed on Island and fraction sell order from Island.
   Example: Buy order on Island for 1000 SBUX at $36 1/8. Sell order on Island for 1000 SBUX at $36 1/8. The prices match exactly so there is no unmatched money.

b) Fraction buy order placed on Island and fraction sell order from outside Island.
   Example: Buy order on Island for 1000 SBUX for $36 1/8. Sell order from outside Island for 1000 SBUX at $36 1/8. Prices match exactly so there is no unmatched money.

c) Fraction buy order on Island and decimal sell order from Island.

Example: Buy order on Island for 1000 SBUX at $36 1/8. Sell order on Island for 1000 SBUX at $36.10. The price difference is $0.025 per share. Unmatched money is $25.00. This situation could arise if one of the brokers connected to Island allows trading in decimals and another one does not. Or it could be that the second investor did not care about $25.00 so entered the order as stated above.

d) Fraction buy order on Island and decimal sell order from outside Island.

Example: Buy order on Island for 1000 SBUX at $36 1/8. Sell order from outside Island for 1000 SBUX at $36.10. The price difference is $0.025 per share. Unmatched money is $25.00. The only this could happen right now is for another ECN capable of trading in decimals to fill the order since Nasdaq does not do decimals yet.

e) Decimal buy order placed on Island and decimal sell order from Island.

Example: Buy order on Island for 1000 SBUX at $36.10. Sell order on Island for 1000 SBUX at $36.10. Prices match exactly so there is no unmatched money.

f) Decimal buy order placed on Island and decimal sell order from outside Island.

Example: Buy order on Island for 1000 SBUX at $36.10. Sell order from outside Island for 1000 SBUX at $36.10. Prices match exactly so there is no unmatched money.

g) Decimal buy order on Island and fractional sell order from Island.

Example: Buy order on Island for 1000 SBUX at $36.10. Sell order on Island for 1000 SBUX at $36 1/8. No match in the price means to trade. If instead the buy order was at a price of $36.15, then there is a match with a price difference of $0.025 per share. Unmatched money is $25.00.

h) Decimal buy order on Island and fractional sell order from outside Island.

Example: Buy order on Island for 1000 SBUX at $36.10. Sell order from outside Island for 1000 SBUX at $36 1/8. No match in the price means to trade. If instead the buy order was at a price of $36.15, then there is a trade with a price difference of $0.025 per share. Unmatched money is $25.00.

Apparently this information is not all that well known, or disclosed. On July 25 the SEC proposed rules that would force brokers, stock exchanges, and ECNs to spell out how they execute orders (McNamee 2000).

4.4 Summary

This section described how ECNs work. It covered descriptions of how communications take place between the online broker and the ECN and how the ECN communicates with Nasdaq and the market makers. It also showed an example of some of the extensive record keeping that ECNs must do for every transaction.

Examples of two styles of limit books were presented: a JAVA version and an HTML version. Finally, the section covered a detailed description of how orders are matched in an ECN. It specifically covered the situation of some orders being based in fractions and some orders being based in decimal.

5. HOW IT ALL WORKS TOGETHER

When things work properly, Table 7 shows what happens in a chronological order with the top being earliest in time. This is a generic example of trading during normal hours.

Note that the order takes a path toward the ECN and the market and the news about it comes back later. It is possible that the order goes forward into the market and news about it does not make it back to the ECN, broker, or ultimately the user. While most investors can wait for a while to learn the disposition of their orders, the more active ones need faster information.

Earlier this year when I was trading more actively, I discovered a situation with the Datek system that merits further discussion. When an investor places an order, Datek has the user enter his password as a form of authentication. A record of the order gets entered into the 'daily activity' listing. Sometimes a little hyperlink appears beside a part of the order saying "not confirmed." Clicking on that link takes the user back to the order page with an opportunity to re-enter the password.

At this point, one of two things is happening. First, the system is still in the process of verifying the password. It goes ahead and completes the verification and forwards the order. The user is back at the order page swearing that he entered the password properly the first time. He might just figure that somehow he typed it wrong so he goes ahead and re-enters it. In this case he has entered the order twice without knowing it, until later. The other possibility was that something was wrong and the system has not yet rejected the order. It is impossible to tell what the system is doing with the order without waiting for 'daily activity' to update. Sometimes those updates are almost instant and sometimes there is a delay that lasts for an unpredictable length of time (ranging from minutes to hours).

I sent Datek three different e-mails earlier this year describing this situation. I suggested they change the "not confirmed" comment to "still confirming" for the first scenario above. As of August 2000, nothing had changed.

Table 7: Example of Broker and ECN Working Together

USER	BROKER	ECN	MARKET
		Connects to market.	
	Connects to ECN.		
Logs on to broker.			
Places order.			
	Checks order and account info. Forwards order.		
		Checks order. Send message to broker about accepted order	
	Msg avail. to user.	Fills it if possible, puts it on book, or transfers it to market. Msg to broker if order is filled.	
	Msg avail. to user if order filled.		
			Matches order. Sends msg to ECN.
		Receives msg. Takes order off book. Updates records. Notifies broker.	
	Receives msg. Updates account. Msg avail. to user.		

6. CONCLUSIONS

This thesis provided a qualitative analysis of the system of trading stocks online. It started by examining the online brokers' system and how the user places orders electronically. That examination included initially validating the order, determining the buying power of the trading account, explaining the 16 different kinds of orders, through filling the order. It also discussed how to cancel an order and some of the differences that arise from trading outside of normal trading hours.

The next sections covered how ECNs work. It described the electronic communications between the online broker and the ECN. It also touched on how the ECN communicates with Nasdaq and the rest of the market. It also discussed some of the extensive record keeping that ECNs must satisfy. Examples of two different kinds of limit books were given (JAVA and HTML). Finally, the section covered a detailed description of how orders are matched in an ECN. It specifically covered the situation of some orders being based in fractions and some orders being based in decimal.

APPENDIX 1: LIST OF POSSIBLE THINGS THAT CAN GO WRONG IN THE SYSTEM

This appendix contains a list of possible things that can fail in an electronic trading environment. Every item on below happens from time to time with some happening frequently. This list covers a wide range of possibilities but is not comprehensive.

Power outage anywhere along the way.

Construction company cuts a cable.

Home operating system crashes (Windows 95/98 blue screen of death.)

Telephone company problems.

Internet Service Provider (ISP) problems.

Problems with the Internet itself. For example, the root servers could fail to resolve domain names (Bridis 2000). This condition lasted for just a few minutes but when it happened in July 1997, it lasted four hours and Internet traffic ground to a halt.

Online broker problems: ordering servers busy/down, testing new software, delayed info, "not confirmed" bug. Note: online brokerages not required to report down times (Simon 1999)

Company supplying quotes fails in whole or in part.

ECN freezes.

Nasdaq quotes disappear. (Ewing 1999) Just because the quotes aren't showing up doesn't mean that orders aren't being placed and filled.

APPENDIX 2: ISLAND HTML BOOK FOR YAHOO

This appendix contains a printout of the HTML version of the Island book for Yahoo on 11/15/00 at 11:08 am EST. It shows the stock symbol, Last Match information including Price and Time, Today's Activity including Orders and Volume, and the best fifteen prices for buy orders and sell orders. Orders on the book but outside of the best fifteen are recorded but not displayed. At the moment of the printout, Yahoo had 311 more buy orders and 452 more sell orders that were not displayed. Since the total orders for the day were 5,010, that means 4,217 orders had already been placed (which is 5,010 - 311 - 452 - 15 - 15). That number includes pre-opening activity as well as orders placed but cancelled before being matched.

Clicking on an individual order yields additional information including: a unique reference number, entry time of order, specification of buy or sell, number of shares entered, number of shares remaining, stock symbol and price.

refresh | island home | system stats | help

YHOO

GET STOCK

YHOO | go

LAST MATCH		TODAY'S ACTIVITY	
Price	57.6250	Orders	5,010
Time	11:08:21	Volume	371,903

BUY ORDERS		SELL ORDERS	
SHARES	PRICE	SHARES	PRICE
80	57.6250	300	57.7960
100	57.5625	200	57.7960
100	57.5625	200	57.8120
100	57.5100	20	57.8125
200	57.5000	200	58.0000
100	57.5000	100	58.0625
300	57.5000	350	58.1250
200	57.5000	100	58.1250
200	57.5000	200	58.2500
200	57.5000	200	58.2500
20	57.5000	900	58.3125
1,500	57.5000	2,000	58.5000
25	57.4375	40	58.6875
50	57.3750	500	58.8125
200	57.2500	200	58.8750
(311 more)		(452 more)	

As of 11:08:53

APPENDIX 3: LIST OF ECNS

The following table lists all current ECNs. The market maker ID is the four-character identifier used by NASD. The fees are charged by the ECN to the online broker.

Table 8: List of ECNs

NAME	MARKET MAKER ID	FEES	WEB ADDRESS
ARCHIPELAGO	ARCA	0.5 cents/share	www.tradearca.com
ATTAIN	ATTN	0.5 cents/share	www.attain.com
BLOOMBERG	BTRD	0.5 cents/share	www.bloomberg.com
BRASS UTILITY	BRUT	1.5 cents/share	
INSTINET	INCA	1.5 cents/share	www.instinet.com
ISLAND	ISLD	$1/trade	www.island.com
MARKETXT	MKXT		www.marketxt.com
NEXTRADE	NXTD	1.5 cents/share	
REDIBOOK	REDI	No charge	www.redibook.com
STRIKE	STRK	1.5 cents/share	

APPENDIX 4: SEC DOCUMENTS

The following table lists document resources available from the U.S. Securities and Exchange Commission (SEC).

Table 9: Resources from the SEC

WEB ADDRESS	DECRIPTION
www.sec.gov/news/studies/limitorm.htm	5/4/00 "SEC Study Reveals Problems in Display of Limit Order". Limit orders constitute two-thirds of all orders on Nasdaq. The rule they are referring to is that the limit orders get displayed within 30 seconds after receipt. The samples they studied range from 46% to 92% failure rate -- an occasional sample came in the mid 20%'s range.
www.sec.gov/rules/final/17a23.txt	The rule under which ECNs must register.
www.sec.gov/rules/final/34-40760.txt	Lists "Regulations of Exchanges and Alternative Trading Systems". This document does not list the actual rules though. It is 348 pages long with 648 pages of footnotes. It says there are currently 45 Alternative Trading Systems.
www.sec.gov/rules/s73199.htm	Proposal to require companies to give investors equal access to material information.

APPENDIX 5: WEB SITES OF INTEREST

The following pages list financial web site addresses. It lists web sites in alphabetical order within just a few broad categories. The list includes a very brief description of the contents of the site. As with any listing of this nature, the site may change its address or contents without any notice. Some of these sites offer a lot of information at no charge and some have a fee to access some or all of the contents. This list is not intended to promote any site or any advertising on any site. It is possible that some sites are in inappropriate categories. It is also possible that more than one of these links leads to the same site.

Financial Information and Research

NAME	CONTENTS
http://aol.theonlineinvestor.com	Abundance of financial information
http://moneycentral.msn.com	MSN Moneycentral
http://quote.yahoo.com	Quotes, news and market information
www.100hot.com	Ranks financial sites
www.411stocks.com	Plenty of stock information
www.about.com/finance	Articles and education
www.activetrader.net	Day trader commentary
www.activetraders.net	Educational information
www.alert-ipo.com	Info on lockups, IPO's
www.america-invest.com	Articles and general stock information
www.bellsecurities.com.au	Free research, technical analysis
www.bestcalls.com	Internet investor conference call directory
www.bloomberg.com	Bloomberg site
www.bulldogresearch.com	Analysis of the performance of analysts
www.ceoexpress.com	CEO Express: financial portal
www.clearstation.com	Offers features to gage volatility

www.cnbc.com	Reports from CNBC reporters
www.companysleuth.com	Infonautics consumer research company
www.cyberinvest.com	Education and descriptions
www.dailytrader.com	Daily buy/sell recommendations
www.daypicks.com	Anonymous tips (free trial period)
www.daytraders.com	Daily recommendations by e-mail (free trial)
www.daytradersbulletin.com	Info for futures investors (fee)
www.daytradertoad.com	Day trader "Toad" let's you follow along
www.daytradingintl.com	Recommendations by e-mail (free trial)
www.daytradingstocks.com	Research
www.dayinvestor.com	Free real-time news and stock alerts
www.depotdogs.com	Surveys on real time quote accuracy
www.djinteractive.com	Dow Jones Interactive
www.dynamicdaytrader.com	Focus on short term trading
www.equityalert.com	Offers features to gage volatility
www.excite.com	Financial portal
www.financialweb.com	General stock information
www.fool.com	Motley Fool
www.forbes.com	Some market news
www.hoovers.com	Hoovers site
www.iexchenge.com	Marketplace for stock research.
www.informedinvestors.com	News articles
www.insiderscores.com	See when insiders are planning to sell shares
www.insidertrader.com	See when insiders are planning to sell shares
www.intermarket.nasdaqtrader.com	Info on Nasdaq InterMarket
www.internetinvestingnews.com	Research on stocks
www.inv.com/ref2.htm	Eq. explains 95% variation in stock prices
www.investor.nasd.com	Tools to learn about investing in securities
www.investorama.com	Financial portal
www.investor.com	Microsoft's Moneycentral Investor

www.investors.com	Investor's Business Daily's site
www.ipolockup.com	Lock up calendar with names, prices, dates
www.keynote.com/measures/brokers	Weekly survey of broker response times
www.marketaccess.com	Research
www.marketguide.com	Supplies data used by some other sites
www.markethistory.com	Data mining tools for historical data
www.marketreporter.com	News, upgrades/downgrades, etc
www.marketwatch.com	News articles
www.mediametrix.com	Ranks financial sites
www.money.altavista.com	General stock information
www.money.net	Free real time streaming quotes
www.morningstar.com	Lots of free financial information
www.multex.com	Multex: research
www.multexinvestor.com	Research for the serious investor
www.nasdaqtrader.com	Data, news, services
www.neologicfx.com/tradinglinks_frm.htm	Info on trading resources
www.on24.com	News and market information
www.onmoney.com	Personal finance site for market obsessed
www.openfund.com	Lists fund portfolio holdings
www.personalwealth.com	Research and rankings on sectors
www.prsa.org/foundation	Study on annual reports
www.quicken.com	Quicken. Research
www.quote.com	Research tools. Educational info and IPO's
www.riskgrades.com	Helps determine stock/portfolio risks
www.siliconinvestor.com	Financial portal
www.sixer.com	Technical analysis with 'topsix' and 'deepsix'
www.smartmoney.com	Financial portal
www.soapbox.com	Sells stock research. Author keeps 60%.
www.stocks.com	Pages of links to financial sites
www.stockpoint.com	Screening tools for stock & fund picks

www.stockselector.com	Stock selection tools
www.streetevents.com	Calendar of investment events
www.streetfusion.com	Calendar of investment events
www.thomsoninvest.com	Thomson Investors Network
www.thomsoninvest.net	First Call consensus earnings estimates
www.tradingday.com	Links to financial pages, stock information
www.traderbot.com	Real time financial search engine
www.traderslibrary.com	Order books on trading
www.unlockdates.com	Unlock dates for shares locked by IPO, etc.
www.validea.com	Scans publications et al
www.valuestocks.net	Info on how to find 'value' stocks
www.vcall.com	Virtual conferences by companies
www.wall-street-on-line.com	Fund research
www.wallstreetcity.com	Research and rankings on sectors
www.wallstreetview.com	News, tools, research, real time quotes
www.wealthhound.com	Info and analysis
www.worldlyinvestor.com	News and market conditions
www.worldwidetraders.com	Stock, option, currency trading news
www.whispernumber.com	Whisper earnings report numbers
www.wssource.com	Stock information
www.wsrn.com	Wall Street Research Net
www.wsj.com	Wall Street Journal site
www.wwfn.co	Tool to rate current market conditions
www.yahoo.com	Yahoo has a finance site
www.yardeni.com	Dr. Yardeni's economics network.
www.yodlee.com	Financial portal
www.zacks.com	News, market information
www.zdii.com	Recent news on stocks

Exchanges/Legal/Grips/Etc

http://cme.usvirtual.net	Chicago Mercantile Exchange live demo
www.amex.com	American Stock Exchange
www.abanet.org	Help finding lawyers for securities cases.
www.cme.com/e-currency/ecurrency.html	Chicago Mercantile Exchange
www.ecn-access.com/exchange.htm	All world exchanges and contact info.
www.edgar-online.com	EDGAR information
www.freeedgar.com	SEC document filings
www.investorcomplaints.com	Links to authorities and brokerage laws
www.iseoptions.com	International Securities Exchange
www.nasdr.org	NASD Regulatory for filing complaints
www.nasaa.org	North American Securities Administrators Assn's site. Lists state regulators and contact info.
www.martindale-hubbell.com	Help finding lawyers for securities cases.
www.nasdaq.com	Nasdaq Stock Exchange
www.nasdaqnews.com	Nasdaq newsroom
www.nasdaqnews.com/about/about20f.htm	31 page description of Nasdaq 3Q 1999
www.nasdaqnews.com/news/stats2fa.html	Statistical milestones for the Nasdaq
www.nimi.com	Nasdaq International Market Initiatives
www.nyse.com	New York Stock Exchange
www.onlineinvestorshelp.com	Lists of frequent broker mistakes and complaints
www.phlx.com	Philadelphia Stock Exchange
www.sec.gov	SEC site
www.sia.com	Securities Industry Association
www.tenkwizard.com	Lists 10K information
www.tradersaccounting.com	Completes tax forms for day traders

Brokers/Quotes/Charting Services

http://admisi.com	ADM Investor Services International
Limited	
http://daytrading.about.com	Includes day trading links and commentary
http://insti-trade.com	Online broker (from AOL site)
http://jprcapital.com	By and for day traders
http://lombard.com	DiscoverBrokerage
http://opluent-fx.com	Online spot foreign exchange brokers
www.1st-discount.com	Online broker (from AOL site)
www.4discountbrokers.co	Deep discount broker
www.abovetrade.com	Technical analysis system
www.abwatley.com	AB Watley
www.accessbroker.com	Online broker (from AOL site)
www.accutrade.com	Online broker (from AOL site)
www.activetradingnetwork.net	Online broker (from AOL site)
www.aftrader.com	America First Association
www.agedwards.com	Full service
www.albany.net/~fey/soes_day_trading.htm	Day trading
www.allianceinvest.com	Alliance Investment Management
www.americanexpress.com/direct	American Express
www.ameritrade.com	Ameritrade
www.anderson-strudwick.com	Anderson & Strudwick, Inc
www.attain.com	Day trading broker
www.barclay1.com	Discount Brokerage
www.beacontrading.com	Online broker (from AOL site)
www.bidwell.com	Charting
www.blackwoodtrading.com	Online broker (from AOL site)
www.boisetrading.com	Online broker (from AOL site)
www.bolsamundo.com	Level 2, SOES, ECNs, SuperDOT
www.brownco.com	Brown & Company

www.buyandhold.com	Online broker for long term investors
www.buysidedirect.com	ATS for convertible bonds, etc
www.carlingroup.com	Carlin Equities Corp
www.castleonline.com	Discount broker
www.cdstockbrokers.com	Central Discount stockbrokers
www.clearstation.com	Subsidiary of E-Trade
www.cowen.com	Securities & investment banking
www.cranmer-cranmer.com	Specialists on ASE
www.csfin.com	Christopher Street Finance
www.cybercorp.com	CyBerCorp (bought out by Schwab)
www.d-trade.com	DirecTrade
www.dailygraphs.com	Graphs
www.datek.com	Datek
www.daytrades.com	Online broker (from AOL site)
www.daytrading.net	Online broker (from AOL site)
www.daytradetech.com	Day trading Technologies
www.daytradingfirm.com	Click and point execution
www.daytradingfirms.com/level2.htm	Example NASDAQ Level II display
www.directaccesstrader.com/index.asp	Online broker (from AOL site)
www.dljassettmanagement.com	"Value added" financial solutions
www.dljdirect.com	Donaldson, Lufkin & Jenrette
www.ecn-access.com	24 hr global access to ECNs
www.edgetrader.com	Online broker (from AOL site)
www.edreyfus.com	Dreyfus
www.equitytrading.com	ARCA, TNTO, ISLD access
www.esignal.com	Quote and charting software
www.etrade.com	E-Trade
www.exacttrade.com	Rampart Securities, online investing
www.executedirect.com	Online broker (from AOL site)
www.executioner.com	Two second confirmation

www.expertstocktrader.com	North American Institutional Brokers
www.ffec.com	First Financial Equity Corp
www.fidelity.com	Fidelity Investments
www.fireflytrading.com	Online broker (from AOL site)
www.firstpacific.net	Australian markets
www.firstrade.com	Online broker (from AOL site)
www.floorpass.com	Velocity Trade allows futures contracts.
www.foliofn.com	Offers flat annual fee for unlimited trading Only trades at 10:15 am and 2:45 pm.
www.fortunetrader.com	Online stocks and options
www.franklinross.com	Online broker (from AOL site)
www.freedomtrade.com	Offshore investment advisory
www.freemanweland.com	Freeman & Weland discount brokerage
www.freetradez.com	Free stock trades
www.geeksecurities.com	"Global scale" investments
www.globaltrader.com	Online broker (from AOL site)
www.harrisinvestoronline.com	Chicago based online trading
www.iaac.com	International Asset Advisory Corp
www.iexecutedirect.com	Online broker (from AOL site)
www.ifx.co.uk	Foreign exchange (bullion, metal, options)
www.indiabulls.com	Online broker (from AOL site)
www.interactivebrokers.com	Interactive Brokers (direct access)
www.internetdaytrading.com	Andover Brokerage
www.intltrader.com	Domestic and international trading
www.investinsecs.com	InvestIN.com Securities Corp
www.investmentedge.com	Intrepid Trading brokerage
www.investoronline.com	Owned by Bank of Montreal
www.investorscapital.com	securities firm
www.investrade.com	Deep discount broker
www.i-tradedirect.com	Online broker (from AOL site)

www.itradenow.com	Discount brokerage
www.jboxford.com	JB Oxford
www.jhdarbie.com	JH Darbie, Company
www.keytrade.com	US, EASDAQ, Paris, Brussels
www.keytradeonline.com	Online broker (from AOL site)
www.knight-sec.com	Knight Trading Group (Nasdaq: NITE)
www.lowtrades.com	$4 market/limit orders
www.marketwise.com	Online broker (from AOL site)
www.mbtrading.com	Online broker
www.ml.com	Merrill Lynch
www.mldirect.ml.com	Merrill Lynch Direct
www.moosani.com	Member Karachi stock exchange
www.mostactives.com	Online broker (from AOL site)
www.msdw.com	Morgan Stanley Dean Witter
www.msdwonline.com	Morgan Stanley Dean Witter
www.mtrdirect.com	Miller Tabak Roberts Securities, LLC
www.mydiscountbroker.com	Online broker (from AOL site)
www.naib.com	North American Institutional Brokers
www.navyffg.com	Navy Federal Financial Group
www.ndb.com	National Discount Brokers
www.ndxtrading.com	Online broker (from AOL site)
www.net2trade.com	Online broker (from AOL site)
www.nextrend.com/trading	Online broker (from AOL site)
www.niphix.com	Online broker (from AOL site)
www.nobletrading.com	ISLD, INCA, SOES, SelectNet
www.oberweis.net	Online trading
www.obroker.com	Online broker (from AOL site)
www.olde.com	OLDE Discount Corp (part of H&R Block)
www.onlinetradingdemos.com	Compare broker demos
www.onsitetrading.com	On Site Trading Inc for active traders

www.patagon.com	International flavor
www.pcquote.com	Sells quotes. Lists all exchange fees
www.penntrade.com	US, Canadian, OTCBB, pink sheet
www.platinumtraders.com	Online broker (from AOL site)
www.powerstreet.com	Fidelity
www.precisiotradinggroup.com	Online broker (from AOL site)
www.primasia.com	Asian area
www.princetondaytrading.com	Online broker (from AOL site)
www.pristine.com	Swing trading rather than day trading
www.psgllc.com	Performance Specialists Group, LLC
www.quadrans.com	European exchanges
www.quickandreilly.com	Quick & Reilly
www.radianz.com	Reuters & Equant: trade, clear, settle
www.rmltrading.com	Free access to TheStockCam.com
www.rttrading.com	Online broker (from AOL site)
www.rushtrade.com	Online broker (from AOL site)
www.russosecurities.com	Russo Securities, discount online broker
www.scavone.com	Market maker on the NYSE
www.schwab.com	Schwab
www.scottrade.com	Scottrade discount broker
www.sharebuilder.com	Online broker
www.sharepeople.com	Online broker (from AOL site)
www.shareslive.com.au	Online broker
www.shorelinetrading.com	Full service and online
www.siebertnet.com	Muriel Siebert & Company
www.siponline.com	online trading and investment services
www.spcomstock.com	Sells quotes
www.speedtrader.com	Online broker (from AOL site)
www.state-online.com	Woman-owned private discount broker
www.stocktrade.net	Lieber & Weissman LLC offers 10-1 margin

www.stocktrader.com	Discount stock trading and options
www.stocktrading.com	Online broker (from AOL site)
www.stockwalk.com	Online stocks, OTC, options, mutual funds
www.stoxnox.com	No payment for order flow
www.successtrade.com	Sister site for lowtrades.com
www.summittrading.com	Day trading firm
www.sunstateequity.com	Online broker (from AOL site)
www.suretrade.com	Suretrade (browser based)
www.swbach.com	S.W. Bach & Company, full service
www.swifttrade.com	Online trading
www.tdwaterhouse.com	TD Waterhouse
www.thefinancialcafe.com	Free market orders
www.trade.com	Stocks, bonds, funds, options, IPO's, etc
www.tradecast.com	Tradecast (direct access)
www.trademarkgroup.com	Options on CBOE
www.tradepbs.com	Dreyfus Brokerage Services
www.tradeportal.com	Online broker (from AOL site)
www.tradersfirstgroup.com	Online broker (from AOL site)
www.tradescape.com	Tradescape (direct access)
www.tradesharp.com	Direct access to Nasdaq
www.tradexbrokers.com	Online broker
www.tradewinsonline.com	Online broker (from AOL site)
www.trendsoft.com	Charting software
www.trendtrader.com	Trend Trader, LLC
www.umcstock.com	Tools for online trading
www.undergroundtrader.com	Day trading brokerage
www.usrica.com	Deep discount broker
www.vandermoolen.com	Market maker on NYSE
www.vangreene.com	Online broker (from AOL site)
www.visiontrade.com	Online broker (from AOL site)

www.wallstreete.com	Online broker
www.wdsonline.com	White Discount Securities online broker
www.webstreet.com	Web Street
www.wiensecurities.com	Wien Securities Corp
www.wilshirecm.com	Wilshire Capital Management, LLC
www.wingspan.com	Wingspan

APPENDIX 6: GLOSSARY

Block trade: Usually 10,000 shares or more. Sometimes it is a transaction of more than $250,000.

Clearing: After a trade has taken place, the buyer expects money to leave his account and stock ownership to come to it. Likewise the seller expects money to come to his account and stock ownership to leave it.

Crossed Quotations A temporary and unusual condition where the ask price of one market maker is the same or lower than the bid price of another.

Decimalization   Prices for orders can be entered in decimals. That is not the same thing as "pennies." Pennies are decimals but decimals go to three digits (on Island anyway).

ECN   Electronic Communication Network.

GTC   Good Till Cancel. This is an option when someone places a limit order. Typically a GTC order is good for 30-90 days. If it is not filled within the 30 days, it is canceled automatically.

Limit Orders   This is when an investor gives the order a specific price. The order may or may not be filled at the specified price. If the price is out of range, then the order may not get filled at all. If the order does get filled, it is always possible to get "price improvement."

Long Trades   When a buyer purchases stock he is said to be going long. Whether or not he holds it for a long term is inconsequential.

Market Orders   This is when an investor places the order at the prevailing price. The actual price at which a transaction goes through is not known until later.

Price Improvement: On occasion, the prices on two orders will overlap slightly. The order placed first gets filled at the stated price. The order placed second may get filled at a slightly better price.

Short Trades	When an investor borrows stock and sells it he is said to be going short. His profit motive is in hoping the stock price will drop and he can buy the shares back at a lower price. It's still the same 'buy low, sell high' attitude but with the order reversed.
Stop Limit	The 'stop' is a price trigger that initiates the limit order.
Stop Market	The 'stop' is a price trigger that initiates the market order.
SOES	Small Order Execution System. Established 1985 but not fully operational till 1988. All market makers required to participate.

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