

Bid-Ask Spreads in U.S. Equity Markets

P.C. Kumar
American University

This paper surveys the bid-ask spread for trades in U.S. equity markets. Bid-ask spreads emerge from divergent objectives of the two principal participants in security markets. The buyer's (seller's) goal is to acquire (relinquish) the asset at the lowest (highest) price possible. For the buyer, this goal implies reducing total costs consisting of increasing opportunity costs and declining costs related to the supply of immediacy by the market maker. The market maker seeks to maximize wealth. The paper discusses bid-ask spreads, explores their conceptual foundations, and provides empirical estimates of their magnitudes. It also surveys impacts of corporate announcements on firm bid-ask spreads. U.S. equity markets are organized along the lines of dealer markets and specialist markets. This paper surveys the empirical studies that estimate bid-ask spreads in these different markets. Given the disparate data, assumptions, and methodologies in these studies, the evidence on the superiority of one or the other market structure is ambiguous.

Not only is the imperfections-in-the-capital-market a popular concept, but what is more important it is a terminal concept. Once this phrase has been written or spoken, the economist has finished with that strand of analysis ... This Gabriel-horn phrase has accordingly received only negligible and negligent attention...Our condemnation of the easy use of imperfections in-the-capital-market is a plea for the study of markets, not a claim that capital markets are 'perfect'.

Stigler (1967)

Introduction

The early literature in financial economics regarded transaction costs as bothersome details to be relegated under Stigler's class of "imperfections-in-the-capital-market." This practice has been reversed, however, with the growth in market micro-structure literature. The relative levels of liquidity, volatility, and transaction costs in capital markets have drawn the attention of professionals in both academe and in the

investment community. Furthermore, there has been increasing interest in the functioning of capital markets with financial liberalization policies installed in Eastern European countries and in the developing world. The gradual proliferation of capital markets worldwide has generated interest in their operational characteristics.

Issues addressed in the extant literature may be organized in three groups. First, what is the nature of costs incurred in transacting financial securities? Are there explicit and implicit components in addition to brokerage and commissions costs? Second, what are the underpinnings of transaction costs? Specifically, can the differing motivations of the two parties to a transaction (buyers and sellers) be reconciled within a common framework? Third, what do the empirical studies on transactions costs reveal? Does one type of market system dominate the other (e.g., auction versus dealer markets) with regard to transaction cost efficiencies? This selective survey focuses on the major component of transaction costs, namely, the bid-ask spread. It attempts to synthesize the literature and present a consensus on the answers to these questions.

The Nature of Transactions Costs

The convergence of interests of academicians and investment professionals on security market operations launched a stream of literature under the broad rubric, “market microstructure.” Studies belonging to this genre focused on a number of related topics: differing market structures with divergent trading styles and attributes, measurements of transaction costs in these markets, volatility of their prices, and liquidity of their transactions.¹ In general, transaction costs are incurred in the transfer of property rights. They relate specifically to the cost of providing liquidity. Amihud and Mendelson (1991) identify the expected cost of illiquidity as the difference between the execution price and the expected price that would have prevailed in the absence of the transaction, i.e., the marginal price impact of the transaction.² Particular components of the costs of providing liquidity include the bid-ask spread, market impact costs, delay and search costs, and direct transactions costs.³ The focus of this paper is exclusively on the *bid-ask spread*, because it is the largest observable component of transaction costs. Stoll (1992) points out that the market maker does

¹ In this context, Loeb (1989) identifies two main types of market mechanisms. Auction markets are characterized by one market maker or specialist handling trades in each security. In negotiated markets there is more than one competing market maker for each security.

² The cost of illiquidity is a notional cost and is difficult to estimate in actual practice.

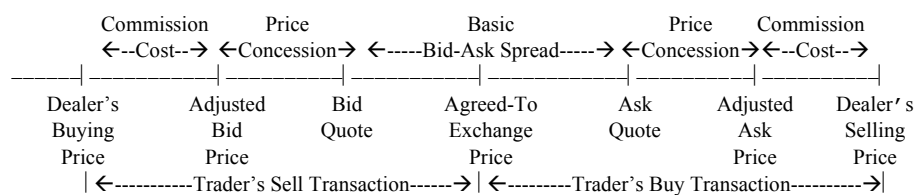
³ *Impact costs* are measured as the change in price between the time an order is presented to a broker and the actual execution price. *Timing costs* are consequences of not executing all parts of an order at the same point in time. These costs are incurred when an institutional order is split into sub-orders that are not executed simultaneously. Finally, *opportunity costs* are the costs of not executing a trade; for example, an order may be cancelled as a result of an adverse price movement (Wagner, 1993; and Wagner and Edwards, 1993).

not set the price of the security being traded. Instead the market maker provides *the service of immediacy*, i.e., the facility by which buyer and sellers can transact without delays. Thus, the economics of market making concerns the provision of this service and its related costs and only indirectly concerns the demand and supply of securities.

Components of the Bid-Ask Spread

Figure 1 delineates the different components of the bid-ask spread as first defined in Bagehot (1971) and identified in Loeb (1989). The basic bid-ask spread is the difference between the ask (dealer's selling/trader's buying) quote and the bid (dealer's buying/trader's selling) quote. The dealer may extract price concession from the trader in one of two forms depending on whether the trader is buying or selling securities, i.e., further reduction in the bid quote when the dealer is required to buy more than the quantity implicit in the bid-ask spread or a further increase in the ask quote when the dealer is required to sell more than the quantity implicit in the bid-ask spread. The commission cost is the brokerage commission charged specifically to the transaction. There are also SEC taxes on sellers of securities and charges to clear transactions (Depository Trust Company).

Figure 1—Components of Transactions Costs



Bagehot (1971) attributes the revenues of the individual dealer (market-maker) to the transactions of three groups of agents. The first group consists of traders possessing special information. The second group includes liquidity-seeking traders who have no special information but merely want to buy, i.e., convert cash into securities, or sell, i.e., convert securities into cash. The third group of traders believes that security prices have not as yet impounded some residual piece of information, but which, in reality, has already been reflected in prices.

The market-maker invariably loses to the first group by setting the bid (ask) quote higher (lower) than the price incorporating the insider's information. A trader with information that the true value of a security is less than the bid price will sell at this price. Thus, the dealer loses (i.e., total costs are greater than the revenues) to the trader with superior information. But the market-maker always gains from transactions with liquidity-motivated traders. The market-maker sets the spread in such a manner that the gains from liquidity traders more than compensate the losses to the

informed traders. The market-maker clearly profits from the third group of traders, which believes that publicly available information has not yet been impounded into security prices. Stoll (1992) identifies the three components of the individual dealer's (market-maker) endogenous *cost of operations*. *Order processing costs* consist of fixed and variable components, such as the cost of space, cost of communications equipment, some labor costs; thus there are economies of scale associated with these costs. *Risk bearing costs* include the cost of carrying inventory.⁴ For example, the dealer with excess (minimal) inventories can lower such risks by reducing (increasing) the bid quote (the trader's selling price) and the ask quote (the trader's buying price). *Adverse information costs* arise from the dealer's disadvantage in dealing with the trader with superior information.⁵

Conceptual Foundations of the Bid and Ask Prices

The theoretical bases for bid and ask prices depend on factors affecting the supply of dealer's services. The dealer is represented as an agent who seeks to minimize the costs of carrying inventories of securities (inventory-theoretic approach). Another stream of the literature focuses on the differential information between informed traders and the dealer (information-theoretic approach). The rest of this section builds these concepts and presents illustrative samples from each subgroup in the literature.

Inventory-Theoretic Approach

The determinants of bid-ask spreads have been analyzed in two separate frameworks. In a single dealer framework the market-maker/dealer has monopoly power on trading activities and consequently sets bid-ask prices (Amihud and Mendelson, 1980; Ho and Stoll, 1981). On the other hand, the individual market-maker/dealer is in a competitive environment in the multi-dealer framework (Ho and Stoll, 1983). In either case, the market-maker/dealer seeks to achieve the optimal inventory level by balancing the inventory carrying costs (excess inventory) against opportunity costs of lost sales (less inventory).

In the monopolist setting, arrivals of buy and sell orders are assumed to follow independent Poisson processes. There are upper bounds on the dealer's inventory holdings due to administrative rules or due to capital requirements (Amihud and Mendelson, 1980). The dealer faces two uncertainties: uncertainty of returns from

⁴ Mann and Seijas (1991) point out that the risk of carrying inventory is more important than the direct cost of carrying inventory.

⁵ The trader, who delays a transaction to obtain better trading terms, incurs delay and search costs. The tradeoff is between transacting immediately, incurring the prevailing bid-ask spread and related market impact costs, against opting for a better price with its implicit search and delay costs. Thus, there is a tradeoff between the benefits of immediacy and the uncertainty of a more advantageous future price.

holding inventories and the uncertainty relating to traders' demand for future trades (Ho and Stoll, 1981).⁶ The dealer maximizes an objective function [average profit per unit time (Amihud and Mendelson, 1980) or expected utility of terminal wealth (Ho and Stoll, 1981)] by adjusting bid and ask quotes in a dynamic programming framework. The quoted bid and ask prices are shown to be dependent on the dealer's stock of inventory; these quotes are monotonic decreasing functions of the inventory on hand. The optimal policy for the dealer suggests a preferred inventory position. Furthermore, this optimal quoting policy is such that it is impossible to profit by speculation, which implies that prices do not deviate substantially from their true values (Amihud and Mendelson, 1980).

The dealer is assumed to form an estimate of the true price (P) of the stock based on the information available. P_b and P_a are the bid and ask quotes respectively. Define $P_b = (P - b)$ and $P_a = (P + a)$. If the goal is to liquidate inventory, the dealer reduces P_a (or reduces a), thereby increasing investor demand, and reduces P_b (or increases b), thereby reducing investor supply of the security. If the goal is to increase the inventory, the dealer increases P_a (or increases a), thereby reducing investor demand, and increases P_b (or reduces b), thereby increasing investor supply of the security. In the multiperiod model, the dealer adjusts components a and b over time in response to inventory changes.⁷

In the Ho and Stoll (1981) analysis the bid-ask spread ($P_a - P_b$) comprises two components. The first component is the risk-neutral spread that maximizes expected profits for the given stochastic demand function. The second component of the bid-ask spread is a risk premium that depends on transaction size, the variance of the stock's return, and the dealer's attitude to risk. The spread is independent of the inventory position, but price adjustment depends on inventories. For example, when inventories increase, the response by the dealer to liquidate inventories is to reduce both ask and bid prices; when inventories decrease, the response by the dealer to build inventories is to increase both the ask and bid prices. Finally, the authors demonstrate that the risk of our dealer is greater than the risk of the dealer facing certain demand because the uncertainty of transaction demand is not eliminated by his or her pricing strategy.

In the multi-dealer framework, the individual dealer recognizes that his or her welfare depends on the actions of other dealers (Ho and Stoll, 1983). It is assumed that dealers face stochastic stock returns and stochastic transactions of fixed size. The bid-ask quotes are shown to depend on the degree to which transactions are cor-

⁶ Dealers sometimes face a sequence of orders of the same kind, i.e., buy or sell. The fact that the dealer faces the uncertainty relating to the identity of the next trader, i.e., whether the trader is a buyer or seller, implies that the dealer may not earn the quoted spread on any given transaction (Mann and Seijas, 1991).

⁷The stochastic demand for the dealer's service is modeled by a Poisson jump process; the stochastic return on the stock and portfolio risk is modeled by a diffusion process.

related across securities at a given point in time and in a given security over several time periods. Furthermore, bid-ask quotes depend on the anticipated actions of other dealers.

Information-Theoretic Approach

Studies in this genre have investigated auction structure (Copeland and Galai, 1983; Glosten and Milgrom, 1985) and sequential trading (Kyle, 1985). Copeland and Galai (1983) analyze the dealer's commitment to transact at the bid and ask price as a combination of put and call options (straddles). The dealer offers the prospective trader two out-of-the money options: a call option to buy at the ask price, $K_A > S_0$ (the current value of the asset) and a put option to sell the security at bid price, $K_B < S_0$. The liquidity trader compensates the loss in exercising the out-of-the-money option with the benefit gained from immediacy. On the other hand, the informed trader transacts for a gain by using the latest information on the value of the security, i.e., he or she trades when $S > K_A$ or when $S < K_B$. Within this framework, the authors show that the bid ask spread is positively related to the price level and the return variance and negatively related to measures of market activity, depth, and continuity. The bid-ask spread is also negatively correlated with the degree of competition among dealers.

Glosten and Milgrom (1985) examine the dynamic properties of bid-ask spreads and transaction prices and the approach that specialists take in processing information. The authors assume that each risk-neutral specialist operates in a competitive environment in which the expected profits from each transaction are zero and there are no other transactions costs (fixed or variable). The authors conclude from their analyses that the bid and ask quotes straddle the price that would prevail if the same information were available to all traders and the specialist. There is a bound on the size of the bid-ask spread arising from adverse selection, however, as a very wide bid-ask spread would drive away liquidity traders.

Furthermore, the value expectations of specialists and the traders tend to converge over time. The spread could widen, i.e., the ask quote increases and the bid quote decreases, if insiders have better information than the liquidity traders, if insiders are numerically greater than liquidity traders, or if the price elasticity of the expected supply and demand of liquidity traders increases. At the limit, if insiders were far more numerous than liquidity traders or if the quality of their information were superior relative to the price elasticity of supply and demand of the liquidity traders, the bid quote would be set so low and ask quote would be set so high that there would be no equilibrium trading price, and the markets would fail. Such a situation would tend to feed on itself. Superior insider information would lead to wider spreads that, in turn, would inhibit trading. Given that insiders' information would be signaled via their trades, the absence of trades would worsen asymmetric information. In these circumstances, if a market closed, it would remain so until the

insiders depart or their information is fully dissipated. There is a welfare loss associated with the absence of a trade because the market is deprived of the benefit of the information implicit in that trade. This conclusion is driven by the requirement in the model that the specialist should break even on every transaction. If this requirement were relaxed to allow the specialist to gain on some transactions and lose on others, closure of the market would not occur. This goal can be accomplished by giving the specialist monopoly power and keeping the bid-ask spread within some feasible range.⁸

In conclusion, the bid-ask spread is the product of levels of differential information among market makers, informed traders, and uninformed traders. Superior insider information would lead to wider spreads; however, there is an upper bound on the spread as an unusually wide spread would drive away liquidity traders. Prices attenuate the private information of the informed trader gradually (Kyle, 1985). Noise traders are essential to the market as they provide the camouflage for the insider's profits. The specialist's monopoly power keeps the market functioning smoothly. The presence of informed traders and noise traders endows the market with depth and resilience.

Empirical Estimates of Bid-Ask Spreads

This section explores the components of bid-ask spreads, inter-market comparisons of bid-ask spreads, and related miscellaneous issues. The following sub-sections summarize the principal conclusions relating to these issues.

Components of Bid-Ask Spreads

Empirical measurements of the components of the bid-ask spread have followed two main approaches.⁹ The first approach, pioneered by Roll (1984), relies on the serial covariance properties of observed transaction prices. This procedure has been followed in Affleck-Graves, Hegde, and Miller (1994), Choi, Salandro and Shastri (1988), George, Kaul, and Nimalendran (1991), and Stoll (1989). The second approach, developed by Glosten and Harris (1988) and known as the trade indicator model, is driven by the direction of trade, i.e., whether incoming orders are

⁸ These conclusions follow from the idiosyncratic specialization of the Glosten and Milgrom (1985) model. Information relating to a security may be released by many sources, of which only one is derived from trades. For example, Brooks, Patel, and Su (2003) report that information is disseminated even during non-trading hours and a market consensus is reached following an unanticipated event.

⁹ For earlier approaches to estimating the determinants of bid-ask spreads, see Benston and Hagerman (1974) and Stoll (1978a & b).

purchases or sales.¹⁰ Madhavan, Richardson, and Roomans (1997) and Huang and Stoll (1997) are examples of this approach.

Empirical attempts to decompose the bid-ask spread into its three components (adverse information, inventory holding, and order processing costs) are impeded by the fact that distinguishing between adverse information and inventory holding costs is difficult because quoted prices tend to react to trades in the same manner. Adjustments to quoted prices for inventory purposes differ from those attributed to adverse information. For example, quoted price adjustments for inventory purposes tend to reverse over time, whereas quoted price adjustments for adverse information do not reverse. On the other hand, the fact that trade prices tend to reverse over time may be used to estimate the order processing component.¹¹ Affleck-Graves, Hegde, and Miller (1994) argue that auction-based trading (specialist market) promotes greater interaction of public orders, thus reducing the order-processing cost component of the quoted bid-ask spread, as compared to a competitive dealer market. On the other hand, the specialist bears a larger component of the cost of absorbing an imbalance in order flow (thus increasing inventory holding costs), whereas multiple dealers can share inventory costs (thus reducing the average inventory holding cost among dealers). The impact of the trading system on adverse selection cost is ambiguous. Adverse selection risk may be reduced by spreading the transaction among a number of dealers; on the other hand, informed traders can conceal their trades more effectively by dealing with a number of dealers.¹²

Table 1 compares the components of bid-ask spreads estimated in Affleck-Graves, Hegde, and Miller (1994), George, Kaul, and Nimalendran (1991), Ho and

¹⁰ Trade indicator approaches have gained currency in the study of microstructure issues. For example, a specific question examined in this framework relates to the time variation of spreads and spread components during the working day. Madhavan, Richardson, and Roomans (1997) examine the impact of trading costs and public information shocks on intraday variations in price volatility. Although they do not separate inventory and order processing components of the spread, they conclude that adverse information costs decline through the day with increases in the other components of the spread. Another issue examined in the framework of trade indicator models is the observed asymmetry in the price effects of block trades. The price behavior of block trades at the bid price are observed to differ from those at the ask price (Holthausen, Leftwich, and Mayers, 1987; Kraus and Stoll, 1972). The covariance approach cannot be used to assess spread components for trades at the bid price as against trades at the ask price.

¹¹ See Huang and Stoll (1997) for this discussion.

¹² Studies have shown that the adverse selection component is related to a number of financial variables. For example, informed traders are assumed to engage in *large trades* (Lin, Sanger, and Booth, 1995); the volume of *insider trading*, an indicator of asymmetric information, results in widening of the bid-ask spread (Chung and Charoenwong, 1998; Kini and Mian, 1995). Analysts following a security reduce the information asymmetry and hence market makers have been observed to reduce bid-ask spreads with increases in the number of analysts following a stock (Chung, McInish, Woods, and Wyhowski, 1995).

Stoll (1997), Wei (1992) and Stoll (1989). It is not clear that specialist-dominated markets have lower order processing cost; whereas, inventory costs are lower in dealer-dominated markets. These results support the observation in Easley et al. (1996) that the risk of information-based trading is lower for actively traded securities (as in the Huang and Stoll 1997 sample) than for infrequently traded securities. This finding implies that the presence of more uninformed traders in an active stock reduces the probability that the market-maker would be trading with an informed trader.

Table 1—Empirical Estimates of the Components of the Bid-Ask Spread

Authors	Percentage of Bid-Ask Spread			Sample
	Order Processing Costs	Information Asymmetry Costs	Inventory Costs	
Stoll (1989)	47%	43%	10%	Nasdaq
George, Kaul, and Nimalendran (1991)	70%	30%	--*	Nasdaq (weekly)
George, Kaul, and Nimalendran (1991)	96%	4%	--*	Nasdaq (daily)
Wei 1 (1992)	18%	82%	--**	NYSE
Wei 2 (1992)	77%	23%	--*	NYSE
Affleck-Graves, Hegde, and Miller 1 (1994)	1%	50%	48%	NYSE/AMEX
Affleck-Graves, Hegde, and Miller 1 (1994)	47%	36%	17%	Nasdaq
Affleck-Graves, Hegde, and Miller 2 (1994)	71%	29%	0%*	NYSE/AMEX
Affleck-Graves, Hegde, and Miller 2 (1994)	90%	10%	0%*	Nasdaq
Huang and Stoll (1997)	68.9%	21.5%	9.6%	NYSE (20 largest stocks)

* Methodology followed by GKN91 combines inventory costs with order processing costs

** Wei (1992) follows Stoll (1989) methodology with combined order processing costs and inventory costs

Wei 1 (1992) and Affleck-Graves, Hegde, and Miller 1 (1994): Results following Stoll (1989) methodology

Wei 2(1992) and Affleck-Graves, Hegde, and Miller 2 (1994): Results following George, Kaul, and Nimalendran (1991) methodology

Sources: Brooks and Masson (1996) and individual studies

Brooks and Masson (1996) note the variability of the components of the bid-ask spread among the studies cited in Table 1. They explore the reliability of Stoll's model through three simulations: a short time-series scenario, a long time-series scenario, and large cross-sectional scenario. They derive the sampling properties of the first-order price change and quote change autocovariances that are the basis for the

spread estimators. Their simulations reveal that Stoll's (1989) estimator (and the George, Kaul, and Nimalendran 1991 estimator) is unreliable in short time-series or small cross-sectional samples because of the high variability of sample autocovariances and the nonlinear nature of the estimator. Hence, the authors conclude that estimations of the components of bid-ask spreads following traditional methods should be interpreted with caution.

Inter-Market Comparisons of Bid-Ask Spreads

Studies comparing bid-ask spreads between the two principal forms of market organization, i.e., dealer markets and specialist markets, have been organized around both general and specific issues. For example, bid-ask spreads in Nasdaq and NYSE markets have been compared for individual investors (Huang and Stoll, 1996; Bessembinder and Kaufman, 1997).¹³ Christie and Huang (1994) compare execution costs in the special case when the stock listing is relocated from a dealer market to a specialist market.

Huang and Stoll (1996) employ matched samples of stocks traded on both Nasdaq and NYSE exchanges. Whereas the Huang and Stoll (1996) sample is drawn from transactions during 1991, Bessembinder and Kaufman (1997) extend the Huang and Stoll (1996) study with transactions completed in 1994. Both studies employ different matching techniques. Huang and Stoll (1996) match the largest Nasdaq firms in their sample with comparable NYSE firms selected by two criteria. The first set includes firms with the same two-digit industry code. The second criterion is based on firm characteristics identified by Fama and French (1992) as being correlated with expected return: share price, market value of equity, ratio of book to market value of equity, and financial leverage.

Bessembinder and Kaufman (1997) select the largest 100 firms listed on the Nasdaq and pair them with 100 NYSE firms that closely match the Nasdaq firms in market capitalization. They then select 100 smallest NYSE-listed firms and pair them with 100 Nasdaq-listed firms that most closely match the NYSE firms in market capitalization. The authors create the third matched pair by randomly selecting 100 Nasdaq-listed firms whose market capitalization is less than the first pair but greater than the second pair. They pair these Nasdaq firms with NYSE firms that most closely match their market capitalization. Thus, Huang and Stoll (1996) focus on the largest stocks listed on both exchanges, whereas Bessembinder and Kaufman (1997) include small and medium capitalization stocks in their sample.

¹³ Chan and Lakonishok (1997) compare round trip execution costs incurred by institutional investors in Nasdaq and NYSE markets. We do not report the results of their study as they do not focus explicitly on bid-ask spreads.

Although Huang and Stoll (1996) use five measures of execution costs, we report only the quoted bid-ask spreads and effective spreads in Table 2.¹⁴ Bessembinder and Kaufman (1997) use three measures of execution costs and the price impact component of the effective spread. We report only their measures of the quoted bid-ask spreads and the effective spreads in Table 3 to contrast the two studies. The quoted spreads reflect publicized quotes, whereas the effective spreads reflect trades at implicit quotes that are not publicized. Obviously, the quoted prices are better measures of order processing costs, inventory costs, and the adverse information costs than are the effective spreads because they are based on prices at which trades actually occur. The measures of quoted half-spreads and effective half-spreads used by Bessembinder and Kaufman (1997) differ from the Huang and Stoll (1996) measures in that they are normalized by the mid-price or average of the bid and ask prices.

Table 2—Bid-Ask Spreads in NYSE and Nasdaq Markets (Huang and Stoll (1996))

Trade Size	# Trades	Quoted Half Spread	Effective Half Spread
NYSE			
Small	935,759	0.129	0.077
Medium	320,593	0.130	0.085
Large	51,861	0.132	0.085
All	1,308,213	0.129	0.079
Nasdaq			
Small	3,018,643	0.247*	0.199*
Medium	915,084	0.240*	0.156*
Large	180,948	0.223*	0.135*
All	4,114,675	0.246*	0.187*

Definition of Trade Size: Small Trade ≤ 1000 shares
 1000 shares < Medium Trade < 10,000 shares
 Large Trade $\geq 10,000$ shares

* Statistically significant at the 5 percent level

Source: Huang and Stoll (1996)

Huang and Stoll (1996) conclude that execution costs in NYSE are lower than the corresponding costs in Nasdaq. Quoted spreads and effective spreads are measured to be twice as large on Nasdaq as compared to NYSE. The authors attribute the higher observed costs to structural developments in the Nasdaq market, namely, internalization, preferencing, and presence of interdealer trading systems. Bessembinder and Kaufman (1997) confirm the findings of Huang and Stoll (1996)

¹⁴ The quoted half-spread is defined as: $s/2 = (a-b)/2$, where s is the quoted bid-ask spread, a is the quoted ask-price and b is the quoted bid price. The effective half-spread is defined as: $z = |p-q|$, where z is the effective half-spread, p is the trade price and $q = (a+b)/2$. The effective spread is smaller than the quoted spread as some trades may be transacted at prices within the quoted bid-ask prices.

that execution costs are, on average, greater for trades in Nasdaq issues as compared to matched NYSE issues. They find that NYSE costs are lower for medium and small capitalization stocks as well. Furthermore, the differentials in spreads are greater for smaller firms.

Table 3—Bid-Ask Spreads in NYSE and Nasdaq Markets (Bessembinder and Kaufman, 1997)

Firm Size	Quoted Half Spread	Effective Half Spread			
		Trade Size			
NYSE		All	Large	Medium	Small
Small	0.019	0.014	0.007	0.010	0.015
Medium	0.008	0.006	0.004	0.005	0.007
Large	0.003	0.002	0.002	0.002	0.003
All	0.006	0.004	0.002	0.003	0.005
Nasdaq					
Small	0.025	0.019	0.018	0.015	0.021
Medium	0.015	0.010	0.006	0.008	0.013
Large	0.004	0.003	0.003	0.003	0.004
All	0.008	0.004	0.003	0.003	0.007

Definition of Trade Size: Small Trade $\leq$ \$10,000
 $\$10,000 <$ Medium Trade $<$ \$199,999
 Large Trade $\geq$ \$200,000

Note: All differences in the measures of spreads for the two markets are statistically significant at the 1% level

Source: Bessembinder and Kaufman (1997)

Related Issues

There are three related issues. First, are the magnitudes of the components of the bid-ask spread different for small and large dealers? Second, do execution costs alter when the listing of securities is relocated from a dealer market to a specialist market? Third, do investors with longer (shorter) investment time horizons hold common stocks with larger (smaller) bid-ask spreads?

In considering the first issue, i.e., whether the magnitudes of the components of the bid-ask spreads are differentiated between small and large dealers, Tripathy and Peterson (1991) observe that there is a variable component in the dealer's order clearing function that is related to the size of the transaction. Further, large transactions impose a cost because they may cause dealers to deviate from preferred portfolio positions. The incremental diversification cost may be a function of the dealer's capitalization. The extent of a dealer's participation may be limited by his or her purchasing capacity. For example, small dealers with insufficient purchasing or borrowing power may attempt to decrease their participation by increasing their bid-ask spreads. For smaller transaction sizes, economies of scale due to fixed overheads suggest a negative relationship between percentage bid-ask spreads and stock prices. For larger transaction sizes, these economies of scale may be offset by the effects of increasing order clearing and diversification costs. This effect is likely to be more

pronounced for securities traded by small dealers than for securities traded by dealers with large capital. The empirical evidence supports the conclusion that small dealers demonstrate greater aversion to processing large transactions.

Do execution costs alter when the listing of securities is relocated from a dealer market to a specialist market? Christie and Huang (1994) examine two such relocations, i.e., when Nasdaq stocks re-list on the ASE and on the NYSE. The authors use posted and realized quotes of the bid-ask spreads and follow the same stock over a narrow window surrounding the listing date. They report that the average execution cost improvement for a Nasdaq-to-NYSE move is 4.7 cents and for a Nasdaq-to-ASE move is 5.2 cents. The authors report that reduction in trading cost is inversely proportional to trading size and directly proportional to spread width. Christie and Huang (1994) conclude that trading costs decline when stock listings are relocated from a dealer market to a specialist market.

Finally, is there a relationship between bid-ask spreads of common stocks and the average length of time that investors hold these stocks? Holding periods of common stocks are found to have positive relationships with bid-ask spreads (Atkins and Dyl, 1997). The bid-ask spread is positively related to turnover.¹⁵ Furthermore, the relationship is stronger in Nasdaq where spreads are typically larger than those in NYSE.

Miscellaneous Issues

We consider five issues in this subsection. How do announcements about corporate decisions and performances (e.g., stock splits, stock repurchases, earnings and dividend levels, market listing and stock delisting, stock distributions, corporate takeovers, seasoned equity issues and initial public offerings) affect bid-ask spreads? How does the behavior of bid-ask spreads vary between the extreme short term (i.e., intraday behavior) and the longer term (i.e., seasonal effects)? What are the different measures of trading costs, and how do they compare? Finally, do trading costs vary with geographical location?

Corporate announcements and bid-ask spreads: Given the well-documented responses of stock returns to corporate announcements, it is not surprising that bid-ask spreads react in a similar manner. The responses of bid-ask spreads may be motivated by a different set of underlying reasons. Table 4 summarizes the findings of various studies on the impacts of corporate announcements on bid-ask spreads.

Reduction in asymmetric information is attributed to the reduction in percentage bid-ask spreads observed after a stock split announcement (Forjan and McCorry, 1995). On the other hand, a study of NYSE data reports that percentage bid-ask spreads tend to increase after a stock split announcement which implies a liquidity cost to investors (Conroy, Harris, and Benet, 1990). Stock price declines are associ-

¹⁵ I thank the referee for making this point.

ated with increased spreads. Variability of returns is explained partly by the increase in bid-ask spreads. The divergence in the findings of the two studies may be due to different empirical approaches. Forjan and McCorry apply event study methodology for several windows around the announcement date. They report that in the -2 day to +2 day window percentage spreads are narrower than normal. They interpret this finding to indicate that dealers need less protection against informed traders after the split announcement because information asymmetry has been reduced with the split.

Table 4—Summary of Bid-Ask Spread Responses to Corporate Announcements

Announcement	Study	Principal Findings
Stock Splits	Forjan and McCorry (1995)	Bid-Ask spreads reduce on announcement
	Conroy, Harris and Benet (1990)	Bid-Ask spreads increase on announcement
Stock Repurchases	Franz, Rao and Tripathy (1995); Wiggins (1994)	Bid-Ask spreads reduce on announcement
	Barclay and Smith (1988)	Bid-Ask spreads increase on announcement
	Miller and McConnell (1995)	No significant impact on bid-ask spreads
	(Tender Offers) Ahn, Cao, and Choe (2001)	Bid-Ask spreads reduce on announcement
Earnings Changes	Brooks (1994)	Bid-ask spreads increase due to increases in adverse selection component
	Krinsky and Lee (1996)	No change in bid-ask spreads-components compensate changes
Dividends	Brooks (1994)	No impact on bid-ask spreads
	Mitra and Rashid (1997)	Bid-ask spread increase on day prior to announcement of dividend initiation
Equity Issues	Tripathy and Rao (1992)	Large issues: Bid-ask spreads reach normal levels before issue disclosure Small issues: Bid-ask spreads reach normal levels on offer date
	Hegde and Miller (1989)	Bid-ask spreads of IPOs are 25 percent smaller than bid-ask spreads of seasoned issues
	Hanley, Kumar, and Seguin (1993)	Bid-ask spread reduces as market price and offer price converge
	Kadlec and McConnell (1994)	Listing reduces bid-ask spread
Takeovers	Jennings (1994)	Bid-ask spreads increase initially but return to normal levels

On the other hand, Conroy, Harris, and Benet compare pre-announcement spreads with post-execution spreads. Stock repurchase announcements signal managers' private information to securities markets. Two conflicting hypotheses explain the impact of share repurchases on bid-ask spreads. The *competing market maker* hypothesis suggests that, in repurchasing its stock, the firm is establishing a lower bound on the bid price that the specialist can specify. This action reduces the bid-ask spread.

The *information asymmetry* hypothesis suggests that managers have incentives to manipulate the firm's repurchases plans to exploit their insider information, e.g., repurchasing shares when they are undervalued. The specialist, who is aware that he or she is dealing with informed traders when managers enter the market, responds by increasing the bid-ask spread. Barclay and Smith (1988), using annual data for NYSE firms for the period 1970-1978, conclude that bid-ask spreads widen when firms engage in share repurchases.

This finding is not supported by Franz et al. (1995), Wiggins (1994), and Miller and McConnell (1995). Franz et al. (1995) conclude from their analysis of 157 announcements of open market repurchases (OMR) by Nasdaq firms in the period 1983-1987 that there is a net decline in percentage bid-ask spreads after adjusting for inventory and order processing costs. Wiggins (1994) finds that there is no evidence of bid-ask spreads increasing from an analysis of 195 OMR announcements in the 1988-1990 period after controlling for price changes and movements in the spreads of a control portfolio. Spreads are observed to decrease slightly. Miller and McConnell (1995) report in their replication of the Barclay and Smith (1988) study that there is no evidence of spreads increasing after controlling for changes in stock price volatility, changes in volume, and changes in stock price levels.

It is clear that the Barclay and Smith (1988) findings are not replicated in the other studies. The reason may be attributed to the fact that these studies use daily data surrounding the announcement whereas Barclay and Smith use annual data. Ahn et al. (2001) examine the impact of share repurchase tender offers and report a temporary reduction in the bid-ask spread during the offer period. The bid-ask spread is observed to be asymmetric during the offer period, i.e., the bid-side spread is smaller than the ask-side spread. The authors interpret this result as being consistent with the competing market maker hypothesis which predicts that intensified competition in market making increases the bid price and narrows the spread asymmetrically during the offer period.

Earnings announcements affect the components of the bid-ask spreads. The adverse selection component increases due to greater information asymmetry around the date of the earnings announcement. Brooks (1994) partitions transactions data from 1988 into three groups based on firm size measured by firm equity value. The author finds that bid-ask spreads are higher on the day prior to earnings announcement for the full sample, small, and medium-sized firms. The bid-ask spread returns

to its non-event level after the announcement. The adverse selection component (including the inventory holding component) is significantly higher than its non-event level on the day before the announcement.

Krinsky and Lee (1996) analyze the effects of earnings announcements on the components of the bid-ask spread in the period 1989-1990. They find that adverse selection costs (as a proportion of the quoted proportional spread) increases during the pre-disclosure period (26 half-hour trading periods from the day prior to the announcement) compared to the benchmark period (26 half-hour trading periods two weeks prior to the announcement day). They report also that the level of the adverse selection costs in the event period (26 half-hour trading periods two weeks subsequent to the announcement day) is greater than the level in the pre-disclosure period. Both the inventory holding component and order processing component decrease as the market-maker's risk of holding excessive inventory decreases with the release of public information due to increased trading activity.¹⁶ The change in the overall bid-ask spread depends on the relative changes of its components. In general these relative changes neutralize each other and the bid-ask spread remains unchanged.

Does the payment of dividends affect bid-ask spreads? Brooks (1994) reports that dividend announcements (unlike earnings announcements) have no impact on bid-ask spreads. Mitra and Rashid (1997) report that the bid-ask spread as a percentage of the mid-price and dollar bid-ask spreads increases significantly on the day prior to the announcement of dividend initiation. These increases reflect the market maker's anticipatory uncertainty. The authors report that the increase in spread declines significantly from the day prior to the day of the announcement of dividend initiation. Furthermore, the average percentage spread remains lower, on average, over the 365-day post-announcement period, than the level on the 90-day pre-announcement period. The implication of these findings is that announcements of dividends by dividend-paying firms do not impact bid-ask spreads, whereas the announcement of dividend initiation by non-dividend paying firms increases the bid-ask spread.

Howe and Lin (1992) find that, on average, firms that do not pay dividends are associated with higher bid-ask spreads. In the case of dividend-paying firms, not only are bid-ask spreads lower, but they are negatively related to dividend yields. This relation holds even after controlling for determinants of bid-ask spreads, i.e., price level, trading volume, return variance, and competition. The empirical evidence supports the hypothesis that dividend payments affect bid-ask spreads.

¹⁶ Earnings announcements may result in higher trading activity (volume) and/or higher price volatility. The benefits of higher volume are economies of scale that reduce inventory holding costs and thus lower bid-ask spreads. Higher price volatility increases the risk of holding inventory and results in higher bid-ask spreads. The volume effect possibly dominates the price volatility effect and thus net bid-ask spreads are reduced.

The decline of bid-ask spreads in the preannouncement period of seasoned equity issues is attributed to the possibility that resolution of information asymmetries begins even before the announcement date. The empirical evidence indicates that bid-ask spreads for larger issues in the OTC market reach normal levels before the first disclosure of the offering, whereas bid-ask spreads for smaller issues reach their normal levels on the offer date (Tripathy and Rao, 1992). The decline of bid-ask spreads at the offer date is attributed to the decline of the adverse selection effect and dealers' liquidity support in the after-market.

In their comparison of initial public offerings (IPOs) and seasoned issues, Hegde and Miller (1989) find that the average percentage bid-ask spreads of IPOs is 75 percent of the average level for seasoned issues. Significant differences in these bid-ask spreads continue until the eighth week. The coefficients of the determinants of IPO bid-ask spreads (price, price volatility, turnover, number of market makers and firm size) are lower than the coefficients of the seasoned issue spreads. Furthermore, the levels of these independent variables are lower in the IPO issues as compared to seasoned issues. The empirical evidence indicates that listing of stocks on exchanges is associated with an improvement in liquidity, i.e., reduction in their bid-ask spreads (Kadlec and McConnell, 1994).¹⁷ Underwriters of IPOs generally provide price stabilization (price support to prevent a decline in the open market price of the security). Hanley, Kumar, and Seguin (1993) report that bid-ask spreads decrease when the market price is close to the offer price and there is a high probability of price stabilization. The authors find significant negative returns related to the likely termination of stabilization activities.

With the number of corporate takeovers increasing substantially in the 1980s and 1990s, Jennings (1994) examines the reactions of bid-ask spreads to takeover announcements. This study reports that even though bid-ask spreads increase at the announcement and continue increasing for a short time, they return to their normal levels subsequently.

Finally, Amihud and Mendelson (1988) note that whereas the liquidity of an asset is measured by the bid-ask spread, asset prices reflect the liquidity characteristics of the assets. Firms have incentives to improve the liquidity of their claims. Liquidity-enhancement is costly; hence, the firm needs to balance the benefits of increased liquidity against the associated costs.

The authors note that corporate financial policies and existing institutional arrangements serve as liquidity-enhancing devices, such as public issues of shares, standardization of claims, limited liability, corporate borrowing, disclosure of insider information, underwriting new public issues, stock denominations at lower prices, and listing on organized exchanges.

¹⁷ The authors report that average listing is associated with a five percent reduction in absolute bid-ask spreads and a seven percent reduction in relative bid-ask spreads.

Seasonal patterns in bid-ask spreads: Do seasonal patterns in bid-ask spreads explain the January effect? Clark, McConnell and Singh (1992) examine NYSE data and report the existence of a seasonal pattern in which both relative and absolute bid-ask spreads decline between end-December and end-January. There is no correlation between changes in bid-ask spreads at the end of the year and January stock returns. The bid-ask spreads of stocks traded on the Nasdaq exchange are reported to be highly negatively correlated with firm size and do not have any seasonal characteristics. Furthermore, the bid-ask spreads are large enough to preclude profitable trading strategies designed on the seasonality of the returns of small firms (Lamoureux and Sanger, 1989). An examination of intraweek pricing effects reports that bid-ask spreads are mostly constant throughout the week, whereas stock returns start the week with negative values and peak on Fridays. The general conclusion is that stock return anomalies are not caused by changes in bid-ask spreads (Fortin, 1990).

Intraday behavior of bid-ask spreads: Does the intraday behavior of bid-ask prices of stocks trading in the NYSE differ from those in the Nasdaq? This difference between the markets may be attributed to their intrinsic organizations. NYSE is structured around the specialist, whereas the Nasdaq market is dealer-oriented. Wider spread at the end of the day in NYSE is indicative of the market power of the specialist. On the other hand, reduction of the bid-ask spread at the end of the day in the Nasdaq may be the result of the efforts of individual dealers to control their inventories. The empirical evidence indicates that, unlike the bid-ask spreads of stocks trading in the NYSE which follow a U-shaped pattern during the day, bid-ask spreads for stocks quoted in the Nasdaq market are relatively stable during the day but narrow significantly toward the end of the day (Chan, Christie, and Schultz, 1995; McInish and Wood, 1992). Jang and Lee (1995), however, report diverging results. They find closing bid-ask spreads of NYSE stocks at the end of the trading day to be smaller than the bid-ask spread at other times of the day. The authors rationalize that because no trading occurs at closing bid-ask spreads, these quotations are only for window dressing, particularly as this contraction is greater for stocks with larger daily average bid-ask spreads.¹⁸

Trading costs and geographical location: Most of the NYSE-listed securities also trade in at least five other regional exchanges and the OTC market. These centers are connected to the Intermarket Trading System (ITS) which disseminates trade details to all locations. Hence one would expect dealers to meet or to beat the ITS quote. Thus, identical market orders have equal opportunities for best price execution, irrespective of the initial routing location. In the absence of this condition, we

¹⁸ McInish and Wood (1992) find that the plot of minute-by-minute bid-ask spreads for various times of the day has a crude J-shaped pattern. For given values of activity, risk, information, and competition measures, bid-ask spreads are higher at the beginning and end of the day relative to the middle of the day.

would have comparable orders being executed at different prices depending on their points of origination and how they are handled at each location.

Lee (1993) investigates whether the location of execution affects the prices of trades in NYSE-listed securities. This issue is important in the context of order flow inducements, whereby dealers pay brokers cash rebates (to the extent of \$0.01 per share) to route customer orders to their market centers. This practice also raises the question of whether the fiduciary responsibilities of the broker to obtain the best execution for the client are jeopardized by such side-arrangements with dealers.

Lee (1993) prescribes three tests to compare price executions across market locations. The first test compares the liquidity premium (defined as the absolute difference between the trade price and the midprice of the bid-ask spread) on off-Board trades with that paid on adjacent NYSE trades. The results indicate that NYSE trades have generally lower liquidity premia; this is noticeable in the 100-400 share trade category.¹⁹

The second test classifies all trades as buys or sells and compares trade prices of off-Board transactions to adjacent NYSE transactions. Best execution implies more than simple execution within the bid-ask spread. There is a tradeoff between trading at the quoted spread and speed of execution. The risk of trading within the spread may be slower speed of execution with consequent price slippage. This tradeoff is not reflected in the liquidity premium test. This alternate test relies on comparing prices of trades on NYSE and prices of trades on the regional exchanges. If the price advantage of faster execution outweighs the price advantage of within-the-spread execution, then Nasdaq performance should be superior. Each trade is classified as buyer or seller-initiated. It is possible to compare the prices of buy (sell) transactions in the regional exchanges to prices of adjacent buy (sell) transactions in NYSE. Better execution is equated to lower average trade prices on buy transactions and higher average trade prices on sell transactions. The results of this test indicate that the price differentials favor NYSE, especially for small transactions.²⁰

The third test examines the relative likelihood of price improvement over the quoted prices by documenting the frequency of inside-the-spread trading across different exchanges. This test is based on percentage of trades inside the best ITS

¹⁹ The Midwest and Pacific exchanges have lower liquidity premia than does the NYSE. The average difference in liquidity premia by trades is 0.69 cents per share in 1988 and 0.98 cents per share in 1989; the average difference by shares is 0.20 cents per share in 1988 and 0.59 cents per share in 1989. In relation to Nasdaq, the average difference by trades is 1.32 cents per share in 1988 and 1.49 cents per share in 1989; by shares the average difference is 1.10 cents per share in 1988 and 1.29 cents per share in 1989.

²⁰ Cincinnati, Midwest, and Pacific exchanges have price differential advantages in mid-sized transactions. Average price differential between regional exchanges and NYSE is 0.43 cents per share in 1988 and 0.70 cents per share in 1989, signifying advantage to trading in the NYSE. The corresponding values for Nasdaq are 1.44 cents per share in 1988 and 1.50 cents per share in 1989.

spread for each exchange. The results indicate that 39 percent in 1988 and 37 percent in 1989 of NYSE trades are executed inside the spread.²¹

Lee's (1993) study has some noteworthy conclusions. First, the intermarket structure for NYSE securities is less integrated than presumed. It is an open question whether full integration is possible, given the current system. Second, the performance gap between NYSE and the regional exchanges is most evident in the small trade category and presumably affects small investors. Third, trading volume does not necessarily flow in the direction of best execution. It is anomalous that even though the Nasdaq market had the least favorable performance as indicated in the three tests, this exchange has the largest increase in volume. Finally, there is the issue of order flow inducements. Investors should note that broker and dealer services are separable. A trader or investor who engages a broker does not commit himself to a particular dealer. Ideally, the investor/trader should seek the broker who charges minimum commission and the dealer who offers optimal execution. Brokers should be held accountable for the execution cost incurred by their clients.

Synthesis of the Empirical Studies

This section integrates the findings in the survey and suggests some directions for further research. This survey reveals some interesting features of bid-ask spreads in U.S. equity markets. First, bid-ask spreads, as a specific measure of transactions costs, display some interesting behavior patterns. They tend to contract in response to corporate decisions that reduce adverse selection effects. They exhibit no seasonal patterns. Bid-ask spreads appear to expand at the beginning and end of the trading day and contract at the middle of the trading day. Second, the inter-market comparisons of transactions costs in the literature are interesting. Inventory holding cost is higher in the exchanges as compared to Nasdaq, whereas order processing cost is lower in the exchanges than in Nasdaq. Adverse selection costs are somewhat ambiguous (Affleck-Graves, Hegde, and Miller, 1994). Third, the empirical evidence reviewed is at best ambiguous on the question of dominance of one or the other market system in terms of lower transactions costs. The data, assumptions, and methodologies are too disparate and diverse to permit a definitive conclusion in this regard.²² For example, in some cases, the data do not distinguish trades initiated on the market maker's account and trades initiated on a client's account.

²¹ Comparable figures for the Cincinnati exchange are 48 and 49 percent, respectively. In the case of the Nasdaq market, the inside-the-spread proportions of trades are 30 percent and 27 percent in 1988 and 1989 respectively.

²² Christie and Schultz (1994a, 1994b) observe that transactions in which the bid and ask prices are specified in odd-eighths are relatively uncommon in the Nasdaq market. Hence the posted spread in the Nasdaq market is higher than in other markets. They conclude that collusion among dealers is the most probable explanation for this finding. This conclusion is extreme in its severity. (See also Eisenbeis, 1995.) It should be noted that the posted bid-ask

Bid-ask spreads as measures of transactions costs have broad implications for liquidity, volatility of prices, and market efficiency. The underlying relationship between liquidity and the firm's cost of capital supports the observed relationship between the liquidity of the firm's securities and its value.²³ Investors require higher rates of return on stocks with larger bid-ask spreads. This requirement provides firms with the incentive to increase the liquidity of their securities and thus reduce their opportunity cost of capital. Given that bid-ask spreads affect the liquidity of securities being traded, firms would benefit by investing in liquidity-enhancing projects. Firms can increase the liquidity of the claims they issue by appropriate strategies. For example, underwriting public offering of shares, disclosure of insider information that mitigates the asymmetric information problem encountered by dealers in transacting with informed investors, and listing on organized exchanges are some useful strategies.²⁴

Bid-ask spreads reflect the variability of the underlying stock's return. A portion of a stock's unsystematic variability may reflect its lack of liquidity. Stocks with lower liquidity are thus expected to exhibit wider price fluctuations with these deviations stemming from greater unsystematic or firm-specific risk.²⁵ Finally, low bid-ask spreads are synonymous with markets with greater liquidity. It does not follow that such markets are informationally efficient. For example, in a market with some informed investors, the presence of uninformed or noise traders contributes to the market's liquidity but not necessarily to its efficiency.²⁶

This survey suggests some areas for additional study. First, it is a well-established belief that the firms listed on the NYSE are different from those on the AMEX or Nasdaq exchanges. Firms from mature industries are listed for trading on the NYSE. The member firms of the Dow Jones Index, often labeled "blue chips" and hence investment grade, are listed on this exchange. On the other hand, firms listed on the Nasdaq are smaller, younger, and their products are more likely to be technology-intensive. Characteristics of these firms may affect the risk-bearing component of transactions costs of trading in their securities. Thus, variances in bid-ask spreads or execution costs among markets may be explained by differences in the characteristics of firms trading in them. The first step toward testing this hypothesis is to investigate whether relevant financial characteristics (measured in terms of financial

prices are essentially suggested prices and not the prices at which transactions will be consummated. The posted spreads are widely known, but actual prices are rarely publicized (or are published with some delay). Higher transactions costs need not be considered synonymous with price gouging or attributed to structural inefficiencies in specific markets.

²³ Amihud and Mendelson (1986) observe that the relationship between liquidity and the firm's cost of capital is "a rational response by investors in an efficient market when faced with trading friction and transactions costs."

²⁴ See Amihud and Mendelson (1988) for this discussion.

²⁵ See Bernstein (1987) for this discussion.

²⁶ For a broad discussion of this topic, see Black (1986) and Bernstein (1987).

ratios) drawn from a sample of firms from each exchange explain the differences in risk bearing costs.

There are some noteworthy studies in the literature that merit replication. This suggestion draws from Hasbrouck's (1993) effort to assess the "quality of a security market." The essence of this study is the specification of transaction prices (a non-stationary time series) as the sum of an efficient price estimate (a random walk component) and a pricing error component (a stationary component). Dispersion of the pricing error is an indicator of how closely transaction prices track the efficient price and is therefore considered a natural measure of market quality. Because there has been no such attempt to measure the quality of international security markets (specially, emerging markets), this effort would meet this deficiency.

Conclusion

This study has presented a detailed survey of bid-ask spreads in U.S. equity markets. We have reviewed the definition of these costs and concluded that they incorporate other elements beyond simple commission costs. Empirical studies of market microstructure have compared some elements of transactions costs among the various markets. Given the disparities in motivations, databases, and methodologies employed in these studies, no definitive conclusions have been reached. We have recommended and identified further studies to fill some of these gaps. This paper is a positive response to Stigler's exhortation for the better study of financial markets.

It is appropriate to end this study by considering two relevant policy issues. First, from a more narrow perspective, the impact of order flow inducements calls for careful scrutiny. Trades may be initiated separately by traders and by as well as by market-makers trading on their own accounts. The relevant issue is whether the broker's fiduciary responsibilities are compromised by trades on their own accounts, with consequent impacts on the quoted price level (and thus the bid-ask spread), generating additional costs to the client. It would be useful to separate the trades according to their originators, i.e., external traders and internal market-makers, and relate their respective execution costs.

Second, from a broader perspective, the principal U.S. equity securities markets, including NYSE, AMEX, Nasdaq and the various regional markets, have been the models for developing nations, in promoting their own securities markets in the 1990s. It is important for policy formulators in these nations to note that regulatory oversight, while essential to ensure proper functioning of markets, should not deter competition. Both auction-based and dealer-based market systems have their unique benefits and costs. Only free competition among the market systems will lead to greater efficiency and provide best execution for investors.

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