The Hong Kong Polytechnic University

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Customer Satisfaction and Bid-Ask Spreads in Stock Markets

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CERTIFICATE OF ORIGINALITY

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Abstract

Does customer satisfaction level affect bid-ask spread? It is an important question to investors, market makers, researchers and other constituents of stock markets. But there is a void in the extant literature about it. This study therefore aims to shed light on the question.

In this study, the hypotheses that higher customer satisfaction levels will lead to smaller bid-ask spreads in stock markets are proposed and tested. The hypotheses are based on the argument that a higher level of customer satisfaction would insure a firm against downward shift in future cash flows. This is because satisfied customers will return and may even purchase more. As a result of steadier cash flows, the information asymmetry of these firms will become lower, which in turn implies a narrower bid-ask spread of their stocks.

With a sample of 2,144 firm-year observations in the period from 1994 to 2008, the testing of the hypotheses is based on quoted spread and effective spread, since both measures are commonly employed in the literature. A log-linear pooled regression model is specified with a number of control variables. The control variables include share price, volatility of share returns, trading volume, firm size, dummy variable for inclusion in S&P 500 index, institutional ownership, number of analysts following, firm age, market to book, profitability, leverage, dummy variables for industry and dummy variables for year. The regression results confirm the hypotheses.

To check the validity of the above results, a series of robustness tests are carried out. These tests include: (1) tests for omission of correlated variables (2) tests for alternative regression models and (3) out-of-sample test. These robustness tests confirm the validity of the hypotheses. The internal validity of the theoretical model employed is also validated by further tests.

Keywords: Customer satisfaction, bid-ask spreads, information asymmetry

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CHAPTER 1

INTRODUCTION

1.1 OBJECTIVE AND MOTIVATION

This study aims to investigate the relationship between customer satisfaction as measured by the American Customer Satisfaction Index (ACSI) and bid-ask spreads in U.S. stock markets.

There are three observations that motivate this study. The initial motivation is the observation of a growing body of academic journal articles in marketing and general management reporting the interaction between marketing metrics and financial performance. In particular, customer satisfaction is found to have an impact on operating margin (Bolton 1998), return on investment (Anderson et al. 1997) and accounting returns (Gruca and Rego 2005). Researchers also investigate the significance of customer satisfaction on shareholder value. For example, Anderson et al. (2004) report that customer satisfaction is positive associated with Tobin's q which is regarded as a measure of shareholder value. Fornell et al. (2006) report that portfolios formed by trading rules based on

ACSI outperform major stock market indexes. The cumulative effect of these research evidences seem to suggest that customer satisfaction does in fact have a real impact on financial performance.

The second motivation is the discovery that the customer satisfaction score, ACSI, employed by these studies is a quantitative measure developed by rigorous statistical methods (Fornell et al. 1996). Furthermore, this score is constructed based on an extensive on-going customer survey with a sizeable sample of respondents. The ACSI score, therefore, should be a reliable measure of customer satisfaction in the U.S. for academic research purposes.

Lastly, it is observed that customer satisfaction level is inversely related to information asymmetry about the variability of operating cash flows of a firm (for reasons to be stated in Chapter 3). On the other hand, bid-ask spreads in stock markets are known to respond to information asymmetry. Specifically, more asymmetric information would widen the spread (Copeland and Galai 1983; Glosten and Milgrom 1985). Then, does customer satisfaction level affect bid-ask spread through the reduction of information asymmetry? It is an important question to investors, market makers, researchers and other

constituents of stock markets. But there is a void in the extant literature about it. This study therefore aims to shed light on the question.

1.2 MAJOR FINDINGS

With a sample of 2,144 firm-year observations in the period from 1994 to 2008 customer satisfaction level, as measured by ACSI, is found to have a significantly negative association with quoted spread and effective spread of NYSE/AMEX firms. The association is found to be robust to tests on omission of correlated variables, the use of alternative regression models, and the Hausman test. The result also holds when NASDAQ firms are employed as an out-of-sample test.

1.3 CONTRIBUTION

This study contributes to a growing body of literature on the financial implications of marketing metrics. In particular, the negative relationship between customer satisfaction levels and bid-ask spreads in stock markets is a new finding that has not be reported by prior research work.

1.4 OUTLINE OF THE THESIS

The reminder of this thesis is structured as follows. Chapter 2 reviews the literature on American customer satisfaction index and bid-ask spreads. The theoretical link between customer satisfaction and bid-ask spreads is developed in Chapter 3, which also discusses the empirical model employed to test the hypotheses. Chapter 4 presents the details of sample selection and description of the data. Empirical results are presented and discussed in Chapter 5. Chapter 6 concludes this study.

CHAPTER 2

LITERATURE REVIEW

To set the stage for current study this Chapter reviews the extant literature on the American customer satisfaction index and bid-ask spread in stock markets. Since the research issue investigated in this thesis has not been previously examined and the literature in both areas to be surveyed is very extensive, the choice of research work reviewed in the ensuing sections is inevitably judgmental. In particular, only those studies on ACSI relating to financial performance and those studies on the information asymmetry dimension of bid-ask spread are included.

2.1 AMERICAN CUSTOMER SATISFACTION INDEX

The American Customer Satisfaction Index (ACSI) is a national measure on overall customer satisfaction of the quality of goods and services purchased in the U.S. It has a scale ranging from 0 to 100 and is currently measured annually for more than 225 firms (and 200 government services) in 45 industries.

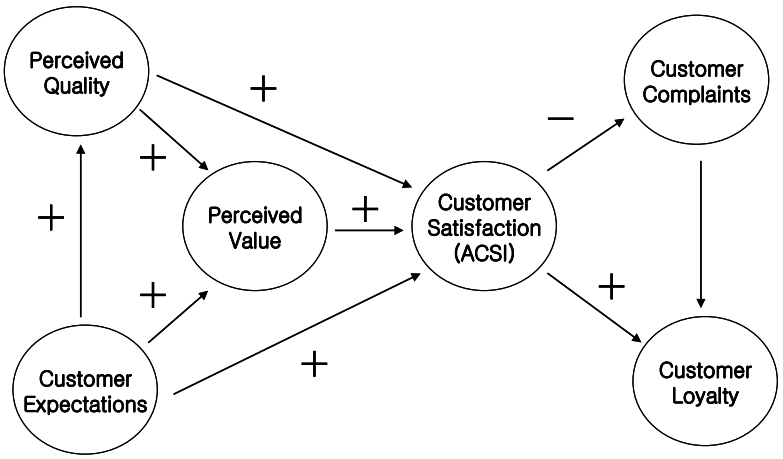
Started in 1994 by the National Quality Research Center of the University of Michigan's Ross School of Business, the ACSI was modeled after the Swedish Customer Satisfaction Barometer which was originally implemented in 1989. In 2009 a private company, ACSI LLC, was set up to handle matters relating to ACSI. At present the ACSI model has been imported by eight countries – Columbia, Dominican Republic, Mexico, Singapore, South Korea, Sweden, and the U.K.

2.1.1 The ACSI Model

The ACSI is designed to be a measure of overall customer satisfaction that possesses the qualitative characteristics of uniformity and comparability. (Fornell et al. 1996). It is recognized by the National Quality Research Centre at the outset that customer satisfaction and other constructs in the model representing customer evaluations cannot be measured directly. So the measurement of ACSI needs to take the form of a latent variable score that is general enough to ensure comparability across firms, industries, sectors and nations. In addition, ACSI is intended not only to reflect past consumption experience, but also to be forward-looking in the sense that it should capture future customer behaviors. With the above considerations, a model of the causal

interaction of customer satisfaction constructs is developed, as depicted in the figure below:

Figure 1 The American Customer Satisfaction Index (ACSI) Model (Fornell et al. 1996)



The arrows in Figure 1 represent impacts between constructs in the model, while the positive (+) signs indicate positive causal effects and negative (-) signs, negative causal effects. Perceived quality, perceived value and customer expectations are antecedents to overall customer satisfaction. They serve to enhance customer satisfaction. The consequences of higher customer satisfaction levels are reduced customer complaints and customers with higher loyalty. A description of the constructs in the model is contained in Appendix 1.

2.1.2 The ACSI Methodology

Since ACSI is designed to represent the national customer satisfaction of the

U.S. as a whole, it therefore includes firms from 45 industries which are selected based on the relative contribution of the industries to the U.S. gross domestic product. Within each selected industry, the largest companies are selected so that the majority of sales in the selected industry are covered. Individual firms may be added to or deleted from the sample to reflect changes in their market position or as a result of mergers and acquisitions. Similarly, new industries may be added when new types of consumer products grow over time. For example, internet retailers or wireless telephone service carriers have been added to the survey.

For each firm selected, the ACSI score is based on the responses from 250 telephone or e-mail interviews on customers who have purchased or used the firm's products or services within specific periods. These periods differ between industries (e.g. three years for a major durable product). The potential respondents are selected without replacement by the "nearest birthday" method (Fornell et al. 1996) and the interview is conducted by professional telephone interviewers of a market research firm contracted by ACSI LLC. The measurement variables and the corresponding latent variables of the interview questionnaire are detailed in Appendix 2.

The collected survey data for each firm are used to estimate the model outlined in Section 2.1.1 using the partial least squares method (Fornell et al. 1996). This method produces estimates of weights for the survey measures to maximize their ability to explain customer loyalty as the ultimate dependent variable in the ACSI model. Then these weight estimates are used to construct the ACSI of the firm concerned.

Industry-level ACSI score is be computed by aggregating the ACSI scores, weighted by firm sales, of all selected firms in an industry. Aggregating the industry ACSI scores in a sector, again weighted by industry sales, gives the sector ACSI score. Finally, the country ACSI score is computed as the average of the sector scores weighted by each sector's contribution to the gross domestic product.

2.1.3 ACSI and Financial Performance

Since the first release of ACSI scores in 1994, there have been numerous studies in marketing employing this measure to investigate various marketing issues. However, as these studies do not bear on the main theme of the thesis, they will not be covered. On the other hand, there is a growing literature that links

marketing metrics with financial performance, which is the subject matter of this subsection.

Andersen et al. (2004) hypothesize a positive relationship between customer satisfaction, as measured by ACSI, and shareholder value, as measured by Tobin's q. Using a sample of 456 firms for the period 2004 to 2007, they regress Tobin's q against the ACSI score and control variables under three different specifications. The regression coefficients for ACSI are significant for all regression models employed. Based on their estimates, a 1% increase in ACSI is associated with a 1.016% change in shareholder value, which translates into an increase of $275m for a Business Week 1000 firm with average assets of $10 billion.

Fornell et al. (2006) investigate the value relevance of ACSI information in three ways. After selecting a sample of 601 firms with ACSI scores for the period 1994 to 2004, they run a log-linear regression of market capitalization against ACSI with book value of assets, book value of liabilities and year dummy variables as controls. A significantly positive regression coefficient is reported for ACSI. They conclude that ACSI is value relevant. Secondly, they

investigate the abnormal returns of firms for which there is an announcement of a change in ACSI score. Using an event window of one day for 161 announcements of 89 firms, they do not document any significant abnormal return, which is consistent with the results of another study using a five-day window (Ittner and Larcker 1998). Lastly, they form portfolios with ASCI firms under different trading rules and find that the returns of these portfolios outperform index-based portfolios (DJIA, NASDAQ and S&P 500).

There is, however, contrary evidence for the value relevance of ACSI in the literature. Jacobson and Mizik (2009) investigate the abnormal returns of portfolios based on 104 ACSI firms for the period starting from the last quarter of 1996 to the first quarter of 2006. They adopt the 4-facor risk model (Carhart 1997) to estimate the expected returns of each of the ACSI portfolios. They report positive significant abnormal returns only for a small group of ACSI leaders in the computer and internet sector.

Ngobo et al. (2011) investigate the use of ACSI by financial analysts. In particular, they examine the association between the forecast errors on quarterly earnings of 111 companies with the level and changes in ACSI scores from

1995 to 2004. They report that customer satisfaction reduces forecast errors. However, analysts respond to the changes rather than to the levels of ACSI scores, and do so in an asymmetric fashion. Analysts seem to be more willing to response to good news (increase in ACSI) than to bad news (decrease in ACSI). To interpret this finding, Ngobo et al. (2011) mention that "analysts know that that decrease in customer satisfaction does not last for a long time and will rapidly revert to the mean level of satisfaction".

Turning to bond markets, Anderson and Mansi (2009) examine a sample of 164 ACSI firms with bonds outstanding for years 1994 to 2004. After controlling for firm specific accounting variables and debt specific variables, they report significantly positive regression coefficients of ACSI on bond credit rating under different regression specifications. Furthermore, significantly negative coefficients of ACSI on yield spread under different regression specifications are also found. These results suggest that ACSI has financial implications beyond the stock markets.

2.2 BID-ASK SPREADS IN STOCK MARKETS

Demsetz (1968) first postulates that bid-ask spread serves as a compensation to

market makers for maintaining and managing inventories to meet with investors' demand as and when it arises. Essentially, bid-ask spread is regarded by Demsetz (1968) as one component of transaction costs, which represent a friction to the trading process. Since his seminal work, studies on the components and determinants of bid-ask spread and trading mechanism have increased and have now developed into a major branch of enquiry in finance.

2.2.1 Adverse Selection Component of Bid-ask Spreads

Treynor, under the pseudonym of Bagehot, suggests that in the presence of information asymmetry the market maker will lose on trades with the informed trader and, to stay in business, the market maker has to recoup the loss from trades with the uninformed trader through the bid-ask spread (Bagehot 1971). This insight has been formalized in theoretical models (Copeland and Galai 1983; Kyle 1985; Glosten and Milgrom 1985; Easley and O'Hara 1987).

More recent studies in economics and finance have identified at least three components of bid-ask spread: order processing costs, inventory holding costs and adverse selection cost, each serving to compensate the market maker for a different type of cost or risk assumed (Stoll 1989, 2003). The order processing

costs component compensates the market maker for the costs (e.g. labor, equipment, overhead, etc) of executing trader's orders. The inventory holding costs component compensates the market maker for assuming inventory risk by accommodating the trader's demand, while the adverse selection cost component compensates the market maker's loss from trading with the informed trader. Since this study focuses on the issue of customer satisfaction and information asymmetry, the remainder of this subsection will only survey the literature as it relates to the adverse selection component of bid-ask spread.

Empirical studies attempt to estimate the components of bid-ask spread. Stoll (1989) estimate all three cost components of the spread explicitly and finds that the adverse selection cost component represents 43% of the spread for NASDAQ firms. However, Stoll's (1989) approach has been criticized because that it ignores the positive autocorrelation in returns, leading to a downward bias in the estimates of realized spread (George et al. 1991). When such bias is avoided using a different estimation approach, George et al. (1991) find that the adverse selection cost component represents only 8 - 13% of the spread for NYSE/AMEX and NASDAQ firms. However, other U.S. studies using different models and sample periods arrive at estimates of the adverse selection cost

component ranging from 35% to 50% (Lin et al. (1995) 39.2%, Madhavan et al. (1997) 35% - 51%, Kim and Ogden (1996) 50%). In the absence of a consensus estimation method, it is not possible to identify precisely the exact weighting of the adverse selection component in bid-ask spread. Nevertheless, based on the estimates of these studies, this component is likely to be important and, thus, warrants further investigation.

2.2.2 Bid-ask Spread as a Proxy Variable for Information Asymmetry

From the discussion immediately above, it is clear that the adverse selection component accounts for a large portion of the bid-ask spread in stock markets. Researchers often avail themselves of this observation and employ the bid-ask spread as a proxy variable for testing their hypotheses involving different levels of information asymmetry. Typically researchers do not attempt to isolate the adverse selection component of the spread. This is due in part to the lack of a consensus estimation model. The results reported by Neal and Wheatley (1998) cast doubts on the estimates of two commonly employed models for estimating the adverse selection cost component. Rather, the analysis depends on a comparison of observed bid-ask spreads before and after a particular event, or across firms with different level of a particular firm characteristic under

investigation. This subsection reviews the literature on this area along six research topics: earnings announcements, earnings surprises, earnings predictability, disclosure level, competing sets of accounting standards, and restatement announcements

2.2.2.1 Earnings announcements

The theoretical models developed by Copeland and Galai (1983) and Glosten and Milgrom (1985) predict that if a corporate event increases (decreases) information asymmetry, the bid-ask spread will increase (decrease) after the event. Similar theoretical results are obtained by other researchers (Diamond and Verrecchia 1991; Kim and Verrecchia 1994). This theoretical prediction has been subject to a number of empirical tests (Venkatesh and Chiang 1986; Lee et al. 1993; Krinsky and Lee 1996; Kanagaretnam et al. 2007).

Venkatesh and Chiang (1986) expect that the market maker will widen the bid-ask spread to defend against possible loss to informed traders who may possess private information prior to earnings or dividend announcements. They compare the average closing effective spread over a five-day period before each earnings and dividend announcement with the average closing effective spread

over the sample period (251 trading days). No widening of effective spread is found for joint announcements of earnings and dividends, or when the time gap between earnings and dividend announcements is within ten days. They find a significant increase in the spread when the earnings and dividend announcements are more than ten days apart, suggesting an increase in information asymmetry during the intervening period.

Lee et al. (1993) investigate the impact of earnings announcements on bid-ask spreads using thirty-minute intra-day transaction data instead of closing prices and quotes. This is because the reaction of bid-ask spreads to earnings announcements should take place very close to the announcements. So it is not surprising that the effect on the spread cannot be captured by closing prices and quotes in Venkatesh and Chiang (1986). In addition, Lee et al. (1993) employ effective spread and quote depth as testing variables while controlling for trade volume, which facilitates the interpretation of post-announcement liquidity. They find that spreads widen during the 30-minute period containing earnings announcement and remain wider than non-announcement period for up to one day. Furthermore, they are able to observe the widening of bid-ask spreads one trading day before earnings announcement.

Besides annual earnings announcements, the impact of quarterly earnings announcements on bid-ask spreads has been studied. Morse and Ushman (1983) examine 378 quarterly announcements of a sample of 25 over-the-counter firms in the period of 1973 to 1976. The mean daily quoted spreads of the sampled firms in a window starting 10-day before and ending 10-day after quarterly earnings announcements are constructed. Contrary to expectation, Morse and Ushman (1983) do not observe any significant changes in the quoted spreads during the event window.

Maddala and Nimalendran (1995) attirbute the lack of significance in the findings of Morse and Ushman (1983) and others to errors in variable bias in estimating earnings surprises. Using a sample of 330 NASDAQ firms with 5,875 quarterly earnings announcements in the period 1984 to 1990, Maddala and Nimalendran (1995) estimate a system of equations containing earnings surprises (treated as an unobserved variable), changes in spreads, changes in trading volume, price changes and analyst forecast errors. In the system, price changes and analyst forecast errors as instrumental variables for earnings surprises. Significant effects of earnings surprises on bid-ask spreads are found.

Lee et al.'s (1993) research design discussed earlier is further refined by Krinsky and Lee (1996) who estimate the three components of bid-ask spread, i.e. inventory holding costs, order processing costs and adverse selection costs, using the approach developed by Stoll (1989) and extended by Affleck-Graves et al. (1994). By employing quarterly earnings announcements of NYSE/AMEX firms in the period January 1989 to 31 December 1990 and using thirty-minute interval transaction data, they document a significant increase in the adverse selection component surrounding earnings release, which is consistent with the findings in other studies. In addition, they observe evidence of decrease in inventory holding costs and order processing costs during the pre-disclosure and event period. They conclude that the relative magnitudes of changes in the three components of bid-ask spread need to be considered together in studies on the impact of earnings announcements on bid-ask spread.

Kanagaretnam et al. (2007) examine the impact of corporate governance mechanisms on the relationship between earnings release and bid-ask spread. By factor analysis, they identify four factors to capture the level of corporate governance of their sample firms: directors' and officers' percentage stock holdings, board independence, board structure, and board activity. They find

that the change in quoted spread during quarterly earnings announcements is negatively related to the four corporate governance variables. They conclude that firms with better governance have lower information asymmetry and thus smaller change in bid-ask spread.

2.2.2.2 Earnings surprises

Brown et al. (2009) study the effect of earnings surprises of quarterly earnings announcements on information asymmetry. Earnings surprises are classified into three categories: Beat, Meet and Miss. Beat, Meet and Miss occur when a firm's actual earnings per share (EPS) is, respectively, greater than, equal to and smaller than the latest concensus forecast prior to the earnings release.

It is argued that earnings surprises will capture the attention of investors and media. Positive surprise (Beat) firms will be regarded by some newly aware investors as attractive buying opprotunities, whereas negative surprise (Miss) firms, signals to sell or even short sell. Earnings surprises affect information asymmetry through their effect on the incentives to search for private information. Beat (Miss) firms tend to increase (decrease) their disclosure activities relative to Meet firms (Miller 2002). Given more (less) public

information for beat (miss) firms, the incentive to search for private information will decrease (increase). So Brown et al. (2009) hypothesize that "the level of information asymmetry decreases (increases) for firms with positive (negative) earnings surprises relative to firms that just meet the consensus analyst earnings forecast".

With a sample of 65,619 quarterly announcements of NYSE, AMEX and NASDAQ firms in the periond starting from the first quarter of 1995 to the second quarter of 2004, Brown et al. (2009) regress the change in average opening quoted spread of the next quarter against two test variables and two control variables of current quarter. The test variables are a dummy variable for Beat and a dummy variable for Miss, wheres the control variables are: (1) quarterly changes in the number of analyst following and (2) quarterly change in market value of equity. The regression produces significantly negative coefficient for Beat and significantly negative coeffiecient for Miss, confirming the foregoing hypothesis.

2.2.2.3 Earnings predictability

Earnings surprises refer to the unexpected earnings components that become

public information on earnings announcement dates. As such, they pertain only to each earnings announcement. Earnings predictability, however, refers to a longer term, say several years, property of the earnings number of a particular firm. Other things being equal, the more predictable is a firm's earnings, the less will be the information asymmetry about the value of the firm's shares, the narrower will be the bid-ask spread.

Affleck-Graves et al. (2002) investigate the impact of quarterly earnings announcements on the abnormal adverse selection cost of the bid-ask spread from the perspective of earnings predictability. A sample of 247 NASDAQ firms with 2,941 quarterly earnings announcements in the period 1985 to 1990 is studied. To measure earnings predictability, Affleck-Graves et al. (2002) use both analysts' forecast errors and dispersion of forecasts. For each year in the period 1984 to 1989, the average analysts' forecast errors and average dispersion of forecasts of each firm are determined, based on four to six annual earnings announcements (depending on data availability). Firms are classified as high (low) predictability when both of these measures are smaller (larger) than the medians of the corresponding measures of all NASDAQ firms in the same period. Other firms are classified as medium predictability.

The abnormal adverse selection cost of the bid-ask spread is measured as the difference between the actual percentage spread and the expected spread in the absence of informed trading. Because of the simultaneity of spread and trade volume, the expected spread for each firm is estimated by a system of two structural equations over the estimation period (day 146 to day 11 prior to quarterly earnings announcements). In an event window of 7 days (day -3 to day +3) on quarterly earnings announcements, the abnormal adverse selection cost of high predictability firms is found to be insignificant, but that of low predictability firm is significantly positive on day -1 and day 0, suggesting that the information asymmetry level of firms with less predictable earnings is higher.

From a different perspective, Jayaraman (2008) examine the implications of the difference between earnings volatility and cash flow volatility, which is labeled as the accrual component of earnings volatility (ACEV), on information asymmetry level. When ACEV is negative (labeled as SMOOTH), earnings are smoother than cash flows. When ACEV is positive (labeled as VOLATILE), earnings are more volatile than cash flows. Both instances could occur as the outcomes of the application of accounting rules. For example, the matching rule

in accounting smooths out fluctuations in cash flows and present a smooth stream of accounting earnings. But the conservatism convention, e.g. to recognize all expected losses earlier rather than later, can result in more volatile earnings. On the other hand, smoother or more volatile income could also be the results of managers' discretionary accounting choices. For example, income smoothing practices dampen the fluctuations of earnings over time, whereas big baths make earnings more volatile.

Using a sample of 69,218 firm year observations for the period 1998 – 2005, Jayaraman (2008) documents a U-shape relationship between quoted spreads and ACEV. That is, quoted spreads have a minimum at the point where ACEV is close to zero and the quoted spreads increase as ACEV becomes more positive or more negative. Jayaraman (2008) regresses the next year's average quoted spreads on ACEV and control variables for the SMOOTH firms (n = 37,249) and VOLATILE firms (n = 30,676) separately. For SMOOTH firms (i.e. ACEV < 0), significant negative regression coefficient of ACEV is reported, suggesting a significantly high level of information asymmetry. For VOLATILE firms (i.e. ACEV > 0), significant positive regression coefficient of ACEV is observed, also suggesting a significantly high level of information

asymmetry. Considered together, these results indicate that accruals, in either direction and irrespective of the causes (accounting rules or managers' discretion), increase informed trading.

To disentangle the respective effects of accounting rules and managerial discretions on informed trading, Jarayaman (2008) adds further control variables to the regression mentioned above. In addition to control variables for operating environment, like age, market to book ratio, cash flow volatility (CFO_VOL), an interaction variable between ACEV and CFO_VOL is added to control for the portion of ACEV due to operations, i.e. resulting from accounting rules. Under this specification, the stand-alone coefficient of ACEV reflects managerial discretion. In this extended regression model, the regression coefficient of ACEV is significantly negative for SMOOTH firms, and positive for VOLATILE firms. These results provide empirical evidence that managerial discretions in financial reporting contribute to informed trading.

As a further refinement of the tests, Jayaraman (2008) decomposes the ACEV into nondiscretionary accrual and discretionary accrual components. Regression results suggest that the discretionary accrual component of earnings volatility

garbles rather informs the market as it is associated with higher quoted spreads for both SMOOTH and VOLATILE firms.

2.2.2.4 Disclosure level

The disclosure level of a firm directly affects the information available to market participants. To the extent that the information is value relevant, the size of the firm's bid-ask spread is expected to be affected by the disclosure. Studies have been conducted on the disclosure of items of information such as oil and gas reserve (Raman and Tripathy 1993), operating segments (Greenstein and Sami 1994), management forecasts (Coller and Yohn 1997) and . These studies are reviewed below.

Raman and Tripathy (1993) investigate the impact of supplementary disclosure of the present-value based oil reserve estimates of oil and gas firms on the change in quoted spread. They use a 20-day window ending 5 days before the filing of Form 10K, and a 20-day window after the filing. The 5-day gap between the windows is designed to prevent information leakage from confounding the analysis. Significant negative regression coefficients for the disclosed reserve estimates are reported in regressions on the change in the

quoted spread. The findings suggest that the disclosure of such information reduces information asymmetry for oil and gas firms.

Greenstein and Sami (1994) study the impact of the SEC's segment disclosure requirements, which was implemented from 1970 onward, on the quoted spread of firms with segments to report. They examine the time-series of the quoted spreads of a random sample of 222 NYSE firms over 127 weeks with the date of filing of Form 10K for the fiscal year 1970 roughly in the middle of the period. By considering the new segment disclosure as an intervention in the time-series of quoted spread of each sample firm, they report significant downward shifts in the mean quoted spread of all the sample firms. Compared to studies on earnings announcements that document transitory changes in bid-ask spread, Greenstein and Sami's work show a permanent shift resulting from new regulation.

Coller and Yohn (1997) examine the effects of voluntary management forecasts on the quoted spread for a sample of 278 firms releasing quarterly earnings forecasts in the period 1988 to 1992. A control sample of 179 non-forecasting firms is identified by matching on industry, fiscal year-end, exchange listing

and market value of equity. The daily average bid-ask spread is obtained for each forecasting and non-forecasting firm twelve months before and nine days after the management forecasts. Cross-sectional regressions are estimated for 179 forecasting firms and their matching non-forecasting firms using average bid-ask spread as dependent variable and a dummy variable for forecasting firms together with control variables as independent variables. They find the dummy variable to be significant 12 months before and nine day before the forecast. However, it is not significant 9 days after the forecast. Such results are interpreted as indicating that forecasting firms have a higher level of information asymmetry which prompts their management to announce forecasts. After the forecast, the information asymmetry is significantly reduced.

2.2.2.5 Competing sets of accounting standards

There are currently two major financial reporting regimes in the world - U.S. Generally Accepted Accounting Principles (U.S. GAAP) and the International Accounting Standards (IAS). While the latter have been adopted by more than 100 countries, U.S. listed firms still have to file their annual financial information prepared under U.S. GAAP to the SEC (foreign firms listed in the U.S. have been allowed to adopt IAS since 2007). At present, the SEC is

deliberating on the possibility of allowing U.S. listed firms to adopt IAS and will make a decision in 2011 (SEC 2008).

The issue is concerned with the quality of financial information produced under the two regimes. To provide empirical evidence on this issue, Leuz (2003) investigates the differential impact on the information asymmetry of financial statements prepared under IAS and U.S. GAAP. As part of the research design, firms listed on the New Market in Germany, which was set up in March 1997 for small and medium-size firms in innovative and fast growing industries, are employed for the study. Because of the inherent uncertainty in the business prospects and management expertise, New Market firms are subject to stricter listing and disclosure requirements. In particular, their financial statements have to comply with either IAS or U.S. GAAP. However, these financial statements are not used as the basis of taxation or dividend restrictions in company law. Their sole function is to provide financial information to the participants of capital market. In this unique setting, the quality of financial statements under different sets of accounting standards will not be affected by institutional factors like capital market structure, listing requirements, and enforcement of accounting standards.

A sample of 69 firms (out of a total of 85 firms) for 1999 and another sample of 195 firms (out of a total of 246 firms) for 2000 are chosen for study. For the 1999 sample 40 firms adopt IAS and 29 firms adopt U.S. GAAP, while for the 2000 sample 102 firms adopt IAS and 93 firms adopt U.S. GAAP. The quoted spreads of the sample firms are employed as a measure of information asymmetry and a dummy variable represents the adoption of U.S. GAAP. To test for the quality of U.S. GAAP against IAS in terms of their impact on information asymmetry, the quoted spreads of sample firms are regressed on the U.S. GAAP dummy variable and controls for each of 1999 and 2000. The regression coefficients for the U.S. GAAP dummy variable are negative but insignificant for both years. Leuz (2003) concludes that "the choice between IAS and U.S. GAAP appears to be of little consequence for information asymmetry".

2.2.2.6 Re-statement announcements

After the filing of Form 10-K with the SEC within 90 days of their fiscal year end, some firms may, at a later date, need to revise the report because of accounting errors. These firms must announce the need for re-statement and then file Form 10-KA (form 10-K amended) to the SEC. The announcement

of a restatement is an unambiguous admission of errors in financial statements, leading to low credibility for the prior financial statements (Anderson and Yohn 2002). Furthermore, the asymmetric information risk of the firm will increase as there is uncertainty on the effect of the restatement on current financial statements as well as on the reliability of the firm's future financial statements (Anderson and Yohn 2002). Anderson and Yohn (2002) investigate the change in bid-ask spreads of a sample of 161 firms announcing restatements in 1997 to 1999. They fail to find any significant change for a period 7 days around the announcement of restatement. However, for another window 3 days before the announcement of the accounting problem through 3 days after restatement filing, they document an increase in bid-ask spread for restatements of revenue but not for other restatements. This result is interpreted by the researchers as indicating that revenue recognition has a greater impact on investors' perception than other restatements.

In summary, the studies on the ACSI score and financial performance reviewed in this Chapter suggest that the ACSI score is positively associated with shareholder value, negatively associated with credit rating and yield spread, and affects analysts' forecast errors. In other words, the ACSI score is found to have

financial implications. On the other hand, the studies on bid-ask spreads reviewed in this Chapter indicate that the bid-ask spread of a firm's share is positively related to the level of information asymmetry about the value of the share. The theoretical link between customer satisfaction levels and the bid-ask spread is developed in the next Chapter.

CHAPTER 3

HYPOTHESES AND EMPIRICAL MODEL

This Chapter formulates the main hypotheses to be investigated in the thesis by providing a theoretical link between customer satisfaction levels and bid-ask spreads. Then, the empirical model to be employed to verify the hypotheses is laid out with justification from the literature.

3.1 HYPOTHESES DEVELOPMENT

The literature review in the previous Chapter highlights the relevance of customer satisfaction levels to participants in stock and bond markets, despite some mixed findings. Customer satisfaction levels are found to be positively associated with the Tobin's q of listed firms, and negatively associated with credit ratings and yield spread. Higher level of customer satisfaction reduces analyst forecast errors and earns abnormal portfolio returns (in at least a small industrial sector). But what, if any, is the implication of customer satisfaction levels on bid-ask spreads? This question has not been explored in extant literature.

The benefits of customer satisfaction have been well documented in marketing literature. In fact, two of these benefits, reduction of customer complaints and strengthening of customer loyalty, have been explicitly identified in the ACSI model reviewed in Chapter 2. Other benefits include increase in usage level, positive word of mouth, greater cross-buying and higher price tolerance.

The link between satisfied customer behaviors and bid-ask spreads lies in the amount, timing and, particularly, stability of cash flows to the firms concerned. It should be observed that for any firm customers are the main source of all future cash inflows, and customer satisfaction level indicates the strength of the firm's customer relationships (Anderson et al. 2004).

Customer satisfaction is found to have a positive effect on customer retention (Anderson and Sullivan 1993; Bolton 1998; Mittal and Kamakura 2001). By increasing retention, customer satisfaction will lead to increase in revenues (Farnell 1992; Rust and Zahorik 1993) as well as reduction in the costs associated with transactions with customers, e.g. communications, sales, and services (Srivastava, Shervani, and Fahey 1998). As a result, net operating cash flows should increase with customer satisfaction. Moreover, greater

customer retention brings a more stable customer base, providing a relatively more dependable source of future revenue (Narayandas 1998).

In addition to customer retention, customer satisfaction has also been found to be associated with an increase in usage level (Bolton 1998) and cross-buy (Reichheld and Sasser 1996), which, when translated into common parlance, means a satisfied customer will buy more as well as buy other products or services from the firm. Cross-buy not only enhances net cash flows, but also accelerates the timing of cash flows of new products or services.

Positive word of mouth by satisfied customers will increase the revenue and lower the costs of getting new customers, resulting in greater net cash flows (Fornell 1992). Positive word of mouth should also contribute to the penetration of new and existing markets, which in turn should lead to accelerated cash flows.

Higher price tolerance of satisfied customers enables the firm to raise prices or at least to better resist downward pressure on prices (Narayandas 1998). It would make the firm less vulnerable to competition and environmental shocks

(Anderson and Sullivan 1993). By shielding the firm to some extent from adverse market forces, satisfied customers provide a less volatile stream of cash flows.

It is proposed here that the likelihood of these purported satisfied customer behaviors increases with the level of satisfaction experienced by customers. Other things being equal, the more satisfied a customer with the products or services of a firm, the higher will be the chance of repeat consumption and increase in usage level. It will also be more likely that the customer will try other products or services offered by the firm.

All these satisfied customer behaviors will either raise the level, or at least increase the stability of the firm's cash flows. Consequently, for a firm with a high level of customer satisfaction the likelihood of a downward shift in future cash inflows will be reduced. The expectation that the firm's future cash flows will probably be maintained at least at the current level will reduce the uncertainty in the intrinsic value of its shares. As the level of information asymmetry decreases, the bid-ask spread will narrow down accordingly.

Based on this reasoning, the main hypothesis of this study is stated as follows:

H: There is a negative association between customer satisfaction level and bid-ask spread.

In the empirical literature, both quoted spread and effective spread are constructed and studied. So, for the purpose of empirical tests, the hypotheses are:

H_1: There is a negative association between customer satisfaction level and quoted spread, and

H_2: There is a negative association between customer satisfaction level and effective spread.

3.2 EMPIRICAL MODEL

Consistent with the empirical literature on bid-ask spreads, a log-linear pooled regression model is employed for testing the hypotheses in this study. The regression equation is as follows:

$$
\begin{aligned}
log(spread) \quad = \quad & \beta_0 + \beta_1 log(ACSI) + \beta_2 log(PRICE) + \beta_3 log(VOLAT) \\
& + \beta_4 log(TRADVOL) + \beta_5 log(MKT\ CAP) + \beta_6 S\&P500 \\
& + \beta_7 log(IO) + \beta_8 log(ANALYST) + \beta_9 log(AGE) + \beta_{10} MTB \\
& + \beta_{11} ROA + \beta_{12} LEV + \sum_{i=1}^{7} \beta_{12+i}\, Industry\ dummy_i \\
& + \sum_{j=1}^{14} \beta_{19+j}\, Year\ dummy_j + error,
\end{aligned}
$$

where spread is either quoted spread or effective spread.

Table 1 shows the definition of all variables employed for testing the hypotheses. The definition and measurement of these variables are consistent with the literature.

<insert table 1 here>

The justification for individual control variables is detailed below.

3.2.1 Share Price

Share price serves as a proxy variable for the inventory-holding and the order processing cost component of the bid-ask spread (Stoll 1978). In addition, prior to 2000, the minimum allowable spread of $1/8 will cause low priced stocks to have artificially high spreads (Stoll 1978).

3.2.2 Volatility

The standard deviation of daily stock returns is also regarded as a proxy variable for the inventory-holding and the order processing cost component of the bid-ask spread (Stoll 1978).

3.2.3 Trading Volume

When trading volume is high, the market maker can easily balance its inventory to a desired level. When the trading volume is low, it will be difficult for the market maker to do so (Tinic 1972). As such, trading volume is a proxy for variable for both inventory-holding and order processing cost component of the bid-ask spread (Stoll 1978).

3.2.4 Firm Size

On average larger firms tend to release more information than smaller firms. Larger firms are also closely followed by analysts and watched by the investment community (Freeman 1987). As such, the extent of information asymmetry is likely to be lower than smaller firms.

3.2.5 Index Inclusion

The effect of inclusion in S&P 500 index is similar to that of firm size. An S&P 500 firm will be more closely scrutinized by the investment community, analysts and other interested parties, than a non-S&P 500 firm. Prior literature has reported significantly positive regression coefficient of index inclusion and bid-ask spreads (Brockman et al. 2009).

3.2.6 Institutional Ownership

While institutional ownership has been posited to represent informed trading and therefore should increase bid-ask spreads (Tinic 1972), empirical studies, tend to report significant negative coefficient for this variable (Fehle 2004; Brockman et al. 2009). Rubin (2007) concludes that the level of institutional ownership is a proxy variable for trading activities, which is inversely related to bid-ask spreads.

3.2.7 Analyst Following

The number of analysts covering a firm is a proxy variable for the number of people producing information about the value of the firm. This variable has been found to inversely related to the adverse selection cost component of

bid-ask spreads (Brennan and Subrahmanyam 1995).

3.2.8 Age

Firm age has been used as a proxy variable to capture the uncertainty of operating environment (Jayaraman 2008), and the amount of information available about the firm (Ecker et al. 2006).

3.2.9 Market to Book

Market to book ratio controls for the growth option or investment opportunity set facing each firm. Alternatively, firms with high market to book have been shown to be more risky (Fama and French 1993). Inclusion of this ratio will therefore control for variations in growth / riskiness of sample firms.

3.2.10 Profitability

Profitability can be viewed as a proxy for disclosure level as profitable firms may be more forthcoming with information (Miller 2002). Disclosure level is inversely related to information asymmetry and, hence, bid-ask spreads.

3.2.11 Leverage

Leverage is included in the model to control for the variation in bankruptcy risk of sample firms (Hilary 2006).

3.2.12 Industry Dummy Variables

Industry dummy variables are included in the regression model to control for possible industry – specific effects the may affect bid-ask spreads of firms in a particular industry systematically.

3.2.13 Year Dummy Variables

Year dummy variables are added to the regression model to control for economic cycles and other yearly fixed effects.

CHAPTER 4

SAMPLE SELECTION AND DESCRIPTION

To test the hypotheses in this study, data on customer satisfaction, share trading activities, institutional ownership, financial performance, assets, liabilities and equity of listed firms are required. This Chapter describes the data sources, final sample and its descriptive statistics.

4.1 DATA SOURCES AND SAMPLE PERIOD

The data on customer satisfaction, the main variable of interest in this study, is obtained from the ACSI project of the University of Michigan's Stephen M. Ross School of Business. The ACSI project started reporting national customer satisfaction measurements in 1994 covering more than 200 corporate and governmental organizations in the U.S. As such, the sample period adopted also starts from 1994 and ends at 2008, the last year when all the data sources were available at the commencement of this study.

Data on trading activities and liquidity are obtained from the Center for

Research in Security Prices (CRSP) database. In particular, daily closing bid and ask quotations, closing share prices, daily stock returns, daily trading volume and number of shares outstanding are extracted from the CRSP database. Firms with missing prices and quotations are excluded. In addition, the main analysis includes only firms that are traded in NYSE or AMEX. In view of market microstructure differences (Bessembinder 1999), NASDAQ firms are excluded from the main analysis, although these firms are used as an out-of-sample robustness test of the hypothesis. Yearly averages of quoted spreads, effective spreads, trading volume market capitalization, as well as yearly volatility of returns, for each firm with ACSI measurements are then constructed for the sample period from the daily price, quotation and return information obtained. Firm age is also computed on a yearly basis for each sample firm counting from the first year of inclusion of the firm in the CRSP database.

The alternative Trade and Quote (TAQ) database, which contains more detailed information on trading activities, is not employed for this study on the grounds that follow. Firstly, the bid-ask spreads constructed from the CRSP database serving as proxy variables for information asymmetry have also been

commonly employed in the literature (Bushee and Leuz 2005; Jayaraman 2008; Laksmana 2008; Khan and Watts 2009). Secondly, while the high frequency fluctuations in prices and quotations of individual stock as captured by the TAQ database result from the interaction of all information and shocks impinging on the stock markets on a continuous basis, customer satisfaction levels, on the other hand, are much more stable and do not change much over days, months and even years. More importantly, Goyenko et al. (2009) conclude that "The evidence is overwhelming that both monthly and annual low-frequency measures capture high-frequency measures of transaction costs. Indeed, in many applications the correlations are high and the mean squared error low enough that the effort of using high-frequency measures is simply not worth the cost." Consequently, to investigate the association between customer satisfaction levels and bid-ask spreads, which is the main theme of this study, it is considered that a systematic sample of the prices and quotations on a daily basis would suffice.

Annual financial and other required information of firms with ACSI scores in the sample period are extracted from the COMPSTAT database. To be specific, income before extraordinary items (item 18), total assets (item 6), long-term

liabilities (item 9), common equities (item 11) and inclusion in S&P 500 index (CPSPIN) are obtained on a yearly basis. From such information, the profitability, leverage and market to book (using the average market capitalization from CRSP) of each sample firm are constructed.

Institutional ownership data are extracted from the Thomson-Reuters Institutional Holdings (13F) Database, while the number of analysts following each sample firm is obtained from the I/B/E/S database.

Merging these five databases and applying the exclusion requirements yields a final data set covering 163 firms for the period 1994 to 2008 and 1,244 usable firm-year observations. The number of usable observations has been greatly restricted by the additions and deletions of ACSI firms. Less than half of the 163 firms have ACSI scores in each of the 15 years covered by this study. On average, there are ACSI scores for around 7 years for each firm in the final data set.

4.2 DESCRIPTIVE STATISTICS

Table 2 reports descriptive statistics for the final sample (Panel A) and distribution of the firm-year observations by industry (Panel B).

<insert table 2 here>

The means, medians, standard deviations, and 25^{th} percentile and 75^{th} percentile values of the variables used in the analyses are displayed in Panel A. The firms in the final sample have a mean and median ACSI score of 76 and minimum and maximum values of 49 and 91 respectively. The quoted spread and effective spread in the sample have a mean of 56 and 27 basis points, a median of 37 and 21 basis points and a standard deviation of 59 and 30 basis points respectively. As expected, the statistics of quoted spreads are uniformly larger than their effective spread counterparts. Though employing samples obtained by different criteria over different periods, the quoted spreads and effective spreads reported in this study have the same order of magnitude as those constructed from the TAQ database (Grullon et al. 2004; Brockman et al. 2009).

Since the majority of firms in the sample are included in *Fortune 500*, they tend to be long established and large in size. An average firm in the sample is listed

for 43 years and has a market capitalization of U.S. $29 billion. It has a profitability ratio of 4.8%, leverage ratio of 26.1%, market to book ratio of 170.2%, share price of $41.8 and annual volatility of 19.1%, while institutional shareholding amounts to 54.4% and it attracts a following of 19 analysts.

Panel B of Table 2 shows the distribution of firm-year observations based on Standard Industrial Classification single-digit codes. Most of the sample firms are in manufacturing (34%), transportation (32%) and wholesale trade (19%). The fewest observations are in mining (< 1%). Though this sample distribution may not be in proportion to the population distribution, the results of analysis in this study will not be biased as industry specific effects are controlled by dummy variables in the main regression models. Anderson (2009) reports a similar distribution.

Table 3 displays the Pearson and Spearman correlation coefficients among the variables – ACSI, quoted spread, effective spread and control variables.

<insert table 3 here>

Consistent with the hypotheses, the correlation coefficients between ACSI and both quoted spread and effective spread are significantly negative. ACSI is also

negatively correlated with volatility, trading volume and number of analysts, but positively correlated with age, market to book, profitability and leverage.

As expected, quoted spread and effective spread have a significant positive correlation coefficient. They are also positively correlated with volatility, but negatively correlated with market capitalization, institutional ownership, age, market to book and profitability. While quoted spread is negatively correlated with trading volume, effective spread is positively correlated. This disparity between the two bid-ask spread measures disappears in ensuing multivariate regression analyses.

CHAPTER 5

EMPIRICAL RESULTS AND DISCUSSION

This Chapter reports the empirical results of regression models between customer satisfaction levels and bid-ask spreads developed in Chapter 3. It also contains the results of a series of checks employed to corroborate the robustness and internal validity of those results. A summary discussion of all the empirical tests concludes the Chapter.

5.1 EMPIRICAL RESULTS

In this section the impact of customer satisfaction, as measured by ACSI, on quoted spreads and effective spreads are examined in a multivariate setting, holding constant the following variables: share price, volatility, trading volume, firm size, S&P 500 index inclusion, institutional ownership, analyst following, age, market to book, profitability, leverage, industry and year.

In order to establish the incremental impact of customer satisfaction on bid-ask

spreads, a research design similar in spirit to forward step-wise regression is adopted. Specifically, three regressions are fitted for each bid-ask spread measure. Firstly, a bid-ask spread measure is regressed against the control variables for trading activities (share price, return volatility and trading volume) and firm size and year *(Model 1)*. The results of this regression serve as the baseline for the other two regressions. Secondly, the customer satisfaction measure ACSI is added as a regressor to evaluate its impact on the spread measure before controlling for all other variables *(Model 2)*. Lastly, the full regression model developed in Chapter 3 is estimated to investigate the significance of customer satisfaction on the spread measure *(Model 3)*.

5.1.1 ACSI and Quoted Spreads

Table 4 reports the results of regressions between quoted spread and the customer satisfaction score.

<insert table 4 here>

The results of *Model 1* indicate that the three trading activity control variables, i.e. price, volatility and trading volume, and market capitalization are highly significant in explaining the variation of quoted spread. With the exception of volatility, they all have significantly negative slopes. Both the sign and order of

magnitude of these regression coefficients match with those in published studies (Brockman et al. 2009; Heflin and Shaw 2000).

From the results of *Model 2*, it can be seen that the ACSI coefficient, -0.721, is both negative and statistically significant. Such results lend support to hypothesis 1, but the conclusion in this study does not solely rely on them because not all control variables have been taken into account in this model. Furthermore, it is worth noting that the sign, size and statistical significance of the four control variables remain very stable.

After including all control variables, the results of *Model 3* show that the negative effect of ACSI on quoted spread, -0.412, attenuates but is still highly significant (at less than 1% level). The four control variables used in *Model 1* and *Model 2* are also very stable in terms of sign, size and statistical significance. Among the additional control variables, S&P 500, market to book and profitability are significantly negative, while leverage is significantly positive. The variance inflation factors of all regressors are well behaved. Multicollinearity among ACSI and the control variables should not be an issue.

It should also be noted that all the three models have adjusted R-squared exceeding 90% and, further, it increases over the three models, suggesting that the regression models capture most of the variations in quoted spreads. In brief, the regression results of the three models provide confirmatory evidence to hypothesis 1.

5.1.2 ACSI and Effective Spreads

Table 5 reports the results of regressions between quoted spread and the customer satisfaction score.

<insert table 5 here>

As expected, the results of *Model 1* here are similar to those of *Model 1* in Table 4. All the four explanatory variables, which are to be used as control variables in *Model 3*, are highly significant with expected signs and sizes, although the adjusted R-squared is lower than that of *Model 1*.[1]

When ACSI is added to the explanatory variables in *Model 2*, the estimates of price, volatility, trading volume, and market capitalization do not exhibit much fluctuation, but the adjusted R-squared increases slightly from 71% to 72%. The

[1] Similar drop in R-squared for regression on effective spread relative to regression on quoted spread is reported in published work, see, for example, Table 4 in Brockman (2009).

regression coefficient of ACSI, -0.793, is significant at less than 1% level.

Though the corresponding coefficient of ACSI attenuates slightly to -0.682 in *Model 3*, it remains to be significant at less than 1% level. As before, the estimates of price, volatility, trading volume, and market capitalization are stable and highly significant. Among the additional control variables, only institutional ownership and profitability, with negative regression coefficients, are statistically significant, while the adjusted R-squared increase to 75%.

Considered as a whole, the results of the three regression models for effective spread and ACSI confirm hypothesis 2 that customer satisfaction is inversely related to effective spread.

5.2 ROBUSTNESS CHECKS

While the results of regression analyses reported in the previous section confirm the two hypotheses proposed in this study, a series of additional analyses have also been carried out to validate the robustness of these results.

Broadly speaking, the robustness checks undertaken can be classified into three categories. The first category relates to potentially important omitted relevant explanatory variables. Economic theory and prior research may suggest other variables would also affect bid-ask spreads, but these variables are omitted from the regression models in the previous section. Specifically, three such variables are examined in the ensuing subsections: research and development expense, advertising expense and corporate governance.

The second category of robustness checks are concerned with the statistical validity of the specification of the regression models employed. Since the regression models reported in Tables 4 and 5 are applied to a panel dataset, the serial correlation of the variables of individual sample firms over time may confound the results. To address this potential issue, two alternative specifications are employed: cross-sectional regressions by year and firm fixed-effects regression. In addition, the Hausman test (Wu 1973; Hausman 1978) is carried out to test for the presence of endogeneity and other specification issues.

The last category of robustness check tests the hypotheses with firms listed in

NASDAQ. As such, it serves as an out-of-sample test of the hypotheses and corroborates the results obtained with NYSE / AMEX firms.

5.2.1 Research and Development and Bid-ask Spreads

The information asymmetry as reflected in the adverse selection component of bid-ask spread is reported to be higher for R&D-intensive firms compared to non-R&D-intensive firms (Boone and Raman 2001). Following Lev and Sougiannis (1996), Boone and Raman (2001) obtain their results by using a dummy variable to represent R&D-intensive firms, which are defined as those belonging to two-digit SIC code 28, and 35 – 38. To the extent that information asymmetry effect is industry specific, it has been controlled for in the main regressions reported in Tables 4 and 5 by using industry dummy variables. However, owing to the limited number of observations available, the industry dummy variables employed in this study are based on 1-digit SIC code, which is coarser than the classification used by Boone and Raman (2001). To ensure that the results of Tables 4 and 5 are not confounded by R&D effects, *Model 3* in both Tables is re-estimated with the inclusion of an interaction variable, R&D dummy x log(ACSI). The R&D dummy takes the value of 1 when R&D expense is reported in COMPUSTAT, and 0 otherwise. Table 6 reports the

results of the re-estimation.

<insert table 6 here>

The interaction variable is negative for both bid-ask spread measures. It is only significant for effective spread. These results suggest that the customer satisfaction helps to lower the information asymmetry level of firms with R&D activities. The coefficients of ACSI are not only negative and significant for both spreads, their magnitudes match well with the corresponding estimates in Tables 4 and 5. Similar remarks apply to all the control variables. In sum, there is no evidence that R&D activities confound the results obtained in Tables 4 and 5.

5.2.2 Advertising and Bid-ask Spreads

Grullon et al. (2004) suggest that firms spending a higher amount on advertising can achieve higher visibility with investors. They argue that as investors have a home bias and prefer the familiar, firms with higher visibility enjoy lower required return and better liquidity, that is, smaller quoted spread and effective spreads.

The empirical findings of Grullon et al. (2004) suggest that advertising expense

could be an omitted correlated variable affecting bid-ask spread measures. To address this issue, *Model 3* in Tables 4 and 5 is re-estimated after including the ratio of advertising expense to sales.

<insert table 7 here>

From Table 7, it can be seen that the inclusion of the advertising variable does not take away the significance of customer satisfaction on bid-ask spreads. In fact, the regression coefficients of ACSI are very stable and match closely with the corresponding estimates in Tables 4 and 5.

As an alternative check, the advertising to sales variable is replaced by natural logarithm of advertising expenses in the regression models of Table 7. Such replacement cuts the usable observations almost by half as firms with no advertising expenses will be discarded. The results of these alternative models are qualitatively the same as those reported in Table 7.

In conclusion, there is no evidence that advertising expense would confound the regression models employed in Tables 4 and 5 to establish the significance of customer satisfaction to bid-ask spreads.

5.2.3 Corporate Governance and Bid-ask Spreads

Firms with good corporate governance have been found to have better liquidity and, in particular, narrower bid-ask spreads (Chung et al. 2010) as the level of information asymmetry will be lower. As such, corporate governance competes directly with customer satisfaction as an explanatory variable for the information asymmetry component of bid-ask spreads. In other words, the main regression model (*Model 3*) may have an omitted correlated variable bias.

To investigate this issue, a measure of corporate governance needs to be constructed. However, there is no consensus measure of corporate governance in extant literature. Different researchers employ different self-constructed indexes (Chung et al. 2010; Kanagaretnam et al. 2007). In this study, the Gompers index (Gompers and Metrick 2001) is used instead of a self-constructed one to provide objectivity to the results. A higher Gompers index score indicates better corporate governance. But the Gompers index is available only for years from 1995 to 2006 and, hence, this robustness check is restricted to the same period.

<insert table 8 here>

Table 8 shows that the regression coefficient of Gompers index is not significant

for quoted spread. But the counterpart is significantly negative for effective spread which is consistent with Chung et al. (2010). After controlling for corporate governance, the regression coefficients of ACSI remain negatively significant and their values are comparable to those of *Model 3* in Tables 4 and 5. To conclude, corporate governance does not confound the results of regression analyses in this study.

5.2.4 Cross-sectional Regressions by Year

To ensure that the conclusions of this study do not depend on the particular regression model selected to test the hypotheses, alternative regression models are adopted in this and the next subsection.

In this subsection, *Model 3* of Tables 4 and 5 is estimated on an annual basis to get parameter estimates free from serial correlation in observations of each firm that is present in the pooled regressions reported earlier. This will lead to 15 separate cross-sectional regressions and 15 sets of regression coefficients. Simple t-tests are applied to test the statistical significance of the means of each coefficient.

<insert table 9 here>

Compared to the corresponding pooled regressions in Tables 4 and 5, the level of significance becomes weaker for all variables. The regression coefficients of ACSI, -0.233 and -0.227, remain significant at 10% and 5% level for quoted spread and effective spread respectively. Fewer regression coefficients of control variables are significant, and notably those for trading volume and firm size become insignificant for effective spread. Despite weaker results, the hypotheses are confirmed by cross-sectional regressions.

5.2.5 Fixed-effects Regressions

From Panel A of Table 2, one can determine that the coefficient of variations for ACSI in the sample is 7.9%. The corresponding figures for quoted spread and effective spread are 105.3% and 111.1% respectively. The variation in customer satisfaction measure may seem to be low in comparison with that of the two bid-ask spread variables. To further examine the impact of potentially correlated omitted variables, a firm fixed-effects regression model is estimated. This model controls for firm-specific features that are not captured in the regression model.

If unobserved firm characteristics are driving the earlier results, then the

regression coefficient for ACSI will be insignificant under this specification.

<insert table 10 here>

The regression coefficient of ACSI for quoted spread is -0.287. Though having the expected sign, it is not significant at the conventional level. However, the counterpart for effective spread is -0.248, which is significant at 5% level. Most control variables are significant and have the expected signs. Though the results obtained under fixed effects regression are less than perfect, they still provide clear support to the hypotheses in this study.

5.2.6 Hausman Specification Test

The Hausman (1978) specification test can be used as a test for endogeneity of the explanatory variable or for violation of the basic assumptions of least squares regression. In the present study, endogeneity should not be a concern because there does not seem to be a sound reason to suspect that firms with lower bid-ask spreads would be given a higher customer satisfaction score. So the Hausman (1978) specification test is applied here to check for any violation of the least squares assumptions.

The lag of logarithm of the customer satisfaction score, denoted by $\log(ACSI_{t-1})$, is chosen as an instrumental variable for the variable itself. One year's observations will be lost as a result. In the first stage of the test, the logarithm of ACSI is regressed against the instrumental variable and other control variables in the study. The residual of this regression is computed and used for the second stage. In the second stage, *Model 3* of Tables 4 and 5 are re-run with the residual of the first stage added as a regressor. If the regression coefficient of the residual is insignificant, then there is no violation of the assumptions of least squares regression; otherwise, the assumptions are violated.

<insert table 11 here>

The first stage regression fits the data quite well as it has an R-squared of 81%. In the second stage regressions, the regression coefficients of the residual are insignificant for both quoted spread and effective spread. It can be concluded that *Model 3*, the main regression model employed in this study, is well specified from a statistical perspective.

5.2.7 ACSI and Bid-ask Spreads of NASDAQ Firms

All regression analyses employed in this study up to this point to test the

hypotheses proposed and to check the robustness of the results obtained, make use of data of NYSE/AMEX firms. NASDAQ firms are excluded because Bessembinder (1999) finds that the transaction cost differences between NYSE/AMEX firms and NASDAQ firms cannot be fully attributable to differences in firm characteristics.

If the hypotheses proposed in this study are correct, they should also be verifiable with data of NASDAQ firms despite the above mentioned issue. As such, NASDAQ firms provide an opportunity to perform out-of-sample tests for checking the robustness of the main findings. In order to address the concern of potential confounding effects of unobserved firm-specific features, a firm fixed-effects regression model, identical to the one in Subsection 5.2.5, is employed for the testing.

<insert table 12 here>

The regression coefficients of ACSI are -1.13 and -0.708 with significant levels of 5% and 10% for quoted spread and effective spread respectively. The sign and significance of control variables compare well with those in Table 10 for NYSE/AMEX firms.

To conclude, the hypotheses of this study are corroborated by independent out-of-sample tests, reinforcing the validity of the main results obtained in Subsections 5.1.1 and 5.1.2.

5.3 INTERNAL VALIDITY CHECKS

While the empirical results in Section 5.1 and Section 5.2 support the hypotheses, it is observed that in the hypotheses development (Section 3.1), the theoretical link between customer satisfaction and bid-ask spreads is not direct. There is a construct, cash variability, mediating between them. Specifically, (1) customer satisfaction reduces future cash variability and (2) cash variability, by bringing uncertainty to the intrinsic value of share, varies positively with bid-ask spreads. This section attempts to investigate the two stages individually to strengthen the internal validity of the present study. For the purposes of this section, cash variability is measured as the coefficient of variation of operating cash flows over a certain period of time (to be detailed below).

5.3.1 ACSI and Future Cash Variability

According to earlier discussion, customer satisfaction is expected to be inversely related to future cash variability. To investigate this inverse

relationship, the coefficient of variation of operating cash flow is computed over three time periods, namely, one-year ahead (CV *t to t+1*), two-year ahead (CV *t to t+2*) and three-year ahead (CV *t to t+3*). To remove extreme values, these future cash variability measures are trimmed at top and bottom 1% for each time period. Then the observations are then sorted by ACSI into quintiles.

<insert table 13 here>

As shown in Panel A of Table 13, there is an inverse monotonic relationship between mean ACSI and mean cash variability across quintiles for all three time periods. It can also be observed that for each quintile the cash variability increases over time.

In addition, a test of difference in mean cash variability between the first and the fifth quintile is carried out. The t-statistics for the difference are significant at 1% level for all time periods.

Both Pearson correlation coefficients and Spearman correlation coefficients for ACSI and future cash variability measures are negatively and significant at 1% level.

In combination, the above tests show unequivocal evidence that ACSI is negatively associated with future cash variability.

5.3.2 Past Cash Variability and Bid-ask Spreads

The positive relationship between past cash variability and bid-ask spreads, among others, is found by Jayaraman (2008) who employs a more extensive sample than the current study. However, to investigate whether the relationship also holds for the sample firms under study, the coefficient of variation of operating cash flows from *t-5* to *t-1* (CV *t-5 to t-1*) is constructed with trimming at top and bottom 1%. The empirical model developed in Chapter 3 is employed for estimation and testing.

<insert table 14 here>

As expected, the regression coefficients for past cash variability are positive and significant for both quoted spread and effective spread. The size and significance of control variables are comparable to the results of other regressions in this study.

5.3.3 Customer Satisfaction, Past Cash Variability and Bid-ask Spreads

Since the ACSI score has a low variability over time, and it is actually

negatively correlated with the past cash variability measure, CV *t-5 to t-1*, (see Table 3), the regressions in the previous subsection may potentially have an omitted correlated variable bias. To address this concern, the customer satisfaction variable is added to the relevant regressions.

<insert table 15 here>

The regression coefficients of both ACSI and past cash variability measure have the expected signs and are statistically significant. Those for control variables are comparable to the results of other regressions in this study.

5.4 DISCUSSION

The empirical tests reported in Section 5.1 provide confirmatory evidence for the hypotheses that customer satisfaction level is negatively related to quoted spread and effective spread. The various robustness checks reported in Section 5.2 reinforce the validity of the conclusion from different perspectives. Section 5.3 validates the theoretical model employed in this study. Taken as a whole, the body of evidence provides strong and unambiguous support to the hypotheses advanced in this study.

Turning to the economic significance of the findings, one can consider the magnitude of regression coefficients of ACSI. As observed earlier, the regression coefficients of ACSI are very stable across tests. For pooled regression models covering the whole sample period as contained in Table 4 to Table 7, the minimum absolute value of regression coefficients for quoted spread and effective spread are 0.412 and 0.668 respectively. When alternative regression models, i.e. yearly cross-sectional regression and fixed effects regression, are adopted, the magnitude of corresponding estimates becomes much smaller. For these alternative specifications (Tables 9 and 10), the minimum absolute value of regression coefficients for quoted spread and effective spread are 0.233 and 0.227 respectively.

Under log-linear regression models, the regression coefficient estimates the elasticity of the dependent variable to the explanatory variable. For an average firm in the sample, the above regression coefficients can be interpreted as follows. When the ACSI score of the average firm increases by 1, the quoted spread will decrease by at least 0.17 basis points (i.e. from a mean of 0.56% down to 0.5583%), and the effective spread will decrease by at least 0.08 basis points (i.e. from a mean of 0.27% down to 0.2692%). Such reductions in

bid-ask spread may seem immaterial in absolute term, but the annual dollar effect is quite substantial. To illustrate, the smallest reduction, i.e. 0.08 basis points in effective spread, is translated into a reduction of U.S. $12.85 million in effective spread per year, which is not an insignificant amount.

CHAPTER 6

CONCLUSION

This Chapter concludes the study by providing a summary of the investigation carried out and findings, which is followed by a discussion on the limitations encountered. Opportunities for future research are also outlined.

6.1 SUMMARY

In this study, the hypotheses that higher customer satisfaction levels will lead to smaller bid-ask spreads in stock markets are proposed and tested. The hypotheses are based on the argument that a higher level of customer satisfaction would insure a firm against downward shift in future cash flows. This is because satisfied customers will return and may even purchase more. As a result, the information asymmetry of these firms will become lower and they enjoy a narrower bid-ask spread.

With a sample of 2,144 firm-year observations in the period from 1994 to 2008, the testing of the hypotheses is based on quoted spread and effective spread,

since both measures are commonly employed in the literature. A log-linear pooled regression model is specified with a number of control variables. The control variables include share price, volatility of share, trading volume, firm size, dummy variable for inclusion in S&P 500 index, institutional ownership, number of analysts following, firm age, market to book, profitability, leverage, dummy variables for industry and dummy variables for year. The regression results confirm the hypotheses.

To check the validity of the above results, a series of robustness tests are carried out. These tests include: (1) tests for omission of control variables (2) tests for alternative regression models and (3) out-of-sample test. These robustness tests confirm the validity of the hypotheses. The internal validity of the theoretical model employed is also validated by further tests.

6.2 LIMITATIONS

There are three major limitations in this study. The first two limitations in the final analysis are reduced to limitation of data sources. Firstly, as noted by Lee et al. (1993): "…the spread is only one dimension of market liquidity. On the New York Stock Exchange (NYSE), a complete quote includes the best price

available for both purchases (the ask) and sales (the bid), as well as the number of shares available at each price (the depth). If the specialist believes the probability that some traders possess superior information has increased, he may respond by increasing the bid-ask spread. Alternatively, the specialist could protect himself by quoting less depth (offering to trade less at each quoted price).” In fact, they document a reverse relationship between bid-ask spread and quote depth during earning announcements, i.e. as bid-ask spread widens, quote depth narrows. A full investigation of the impact of customer satisfaction on market liquidity should therefore examine both bid-ask spread and quote depth together. To do so, however, requires using the TAQ database over the 15-year sample period (in order to get enough observations to increase the power of statistical tests), which is costly both in terms of economic and computational resources.

Secondly, no time-series regressions for individual firms have been conducted a robustness check. The reason is that there are in total 12 explanatory and control variables in the full regression model. Only a few firms in the sample have observations in excess of 12 years. Even for firms with observations in the whole sample period, it is not sensible to run time-series regression because the

resulting estimates will have a very large standard errors and therefore are not reliable.

Thirdly, by design the ACSI score is based on the largest companies in each U.S. industrial sector. As such, only the largest U.S. companies are included in this study. Therefore there may be a selection bias that could affect the external validity of the results obtained.

6.3 FUTURE RESEARCH

This study lends itself to extension in several directions. Firstly, strong evidence is discovered and reported in this study for the hypothesis that higher customer satisfaction reduces information asymmetry and accordingly bid-ask spreads. The next logical step to take to further research would be to examine the relationship between customer satisfaction and the three components of bid-ask spread, particularly the adverse selection component. Various models to estimate this component have been developed in finance literature (Glosten and Harris 1988; Huang and Stoll 1997; Lin et al. 1995). It is conjectured these adverse selection estimates would have a negative relationship with the customer satisfaction measure.

Secondly, to get a fuller knowledge of the impact of customer satisfaction on market liquidity, its relation with quote depth could be examined. Based on the discussion in the previous section, customer satisfaction is conjectured to be negatively related to quote depth.

Thirdly, the relationship between customer satisfaction and other stock trading measures, such as trading volume and variability of returns, could be explored. However, these variables may be influenced by other factors not controlled for in the thesis. Therefore, no directional prediction for their association with customer satisfaction is provided here.

Finally, the implications of reduction in information asymmetry resulting from higher customer satisfaction could be explored in settings other than share trading, e.g. analysts' forecasts. Though Ngobo et al. (2011) investigate the impact of customer satisfaction and analysts' forecast errors, they view ACSI as just one piece of relevant information that analysts should avail themselves of. They do not seem to appreciate the information asymmetry aspect advanced by this study. In particular, they do not investigate the association of forecast dispersions or revisions with customer satisfaction. In conclusion, the

interaction of customer satisfaction and financial measures is a relatively new line of enquiry along which explorations have just begun.

Appendix 1 Description of Constructs in the ACSI Model

Customer Expectations

Customer expectations is a measure of the customer's anticipation of the quality of a firm's products or services. Expectations represent both prior consumption experience, which includes some nonexperiential information like advertising and word-of-mouth, and a forecast of the firm's ability to deliver quality in the future.

Perceived Quality

Perceived quality is a measure of the customer's evaluation via recent consumption experience of the quality of a firm's products or services. Quality is measured in terms of both customization, which is the degree to which a product or service meets the customer's individual needs, and reliability, which is the frequency with which things go wrong with the product or service.

Perceived Value

Perceived value is a measure of quality relative to price paid. Although price (value for money) is often very important to the customer's first purchase, it usually has a somewhat smaller impact on satisfaction for repeat purchases.

Customer Complaints

Customer complaints are measured as a percentage of respondents who indicate they have complained to a firm directly about a product or service within a specified time frame. Satisfaction has a negative relationship with customer complaints, as the more satisfied the customers, the less likely they are to complain.

Customer Loyalty

Customer loyalty is a combination of the customer's professed likelihood to repurchase from the same supplier in the future, and the likelihood to purchase a firm's products or services at various price points (price tolerance). Customer loyalty is the critical component of the model as it stands as a proxy for profitability.

Source: The ACSI website (retrieved on January 28, 2011)

http://www.theacsi.org/index.php?option=com_content&task=view&id=48&Itemid=41

Appendix 2 Measurement Variables Used in the ACSI Model

	Measurement Variable	Latent Variable
1.	Overall expectation of quality (prepurchase)	Customer expectations
2.	Expectation regarding customization, or how well the product fits the customer's personal requirements (prepurchase)	Customer expectations
3.	Expectation regarding reliability, or how often things would go wrong (prepurchase)	Customer expectations
4.	Overall evaluation of quality experience (postpurchase)	Perceived quality
5.	Evaluation of customization experience, or how well the product fit the customer's personal requirements (postpurchase)	Perceived quality
6.	Evaluation of reliability experience, or how often things have gone wrong (postpurchase)	Perceived quality
7.	Rating of quality given price	Perceived value
8.	Rating of price given quality	Perceived value
9.	Overall satisfaction	ACSI
10.	Expectancy disconfirmation (performance that falls short of or exceeds expectations)	ACSI
11.	Performance versus the customer's ideal product or service in the category	ACSI
12.	Has the customer complained either formally or informally about the product or service?	Customer complaints

13.	Repurchase likelihood rating	Customer loyalty
14.	Price tolerance (increase) given repurchase	Customer loyalty
15.	Price tolerance (decrease) to induce repurchase	Customer loyalty

Source: Fornell et al. (1996)

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Table 1 Definition of Variable Measures

Variable	*Symbol*	*Definition / Measured*
ACSI	ACSI	A measure of customer satisfaction provided by University of Michigan's Ross School of Business.
Quoted spread	Q-SPREAD	Yearly average of the difference between daily closing ask price and closing bid price, scaled by their midpoint.
Effective spread	E-SPREAD	Yearly average of two times the difference between daily closing transaction price and the quoted midpoint, scaled by the quoted midpoint.
Share price	PRICE	Yearly average of daily closing share price
Volatility	VOLAT	Standard deviation of daily return in a calendar year.
Trading volume	TRADVOL	Yearly average of daily number of shares traded divided by total number of outstanding shares.
Firm size	MKT CAP	Yearly average of daily closing price times the total number of shares outstanding.
Index inclusion	S&P 500	Value = 1 if the sample firm is included in S&P 500 index; 0 otherwise.
Institutional ownership	IO	Fraction of total shares outstanding held by 13F institutions, lagged by one year.

Analyst following	ANALYST	Number of analysts following a sample firm in a year.
Age	AGE	Number of years since the sample firm's inclusion in CSRP database.
Market to book	MTB	The difference between the book value of total assets and the book value of equity plus market capitalization (MKT CAP), divided by the book value of total assets.
Profitability	ROA	Ratio of income before extraordinary items to total assets.
Leverage	LEV	Ratio of long-term debts to total assets.
Cash variability	$CV_{t-5 \text{ to } t-1}$	The coefficient of variation of operating cash flows from year *t-5* to year *t-1*

Table 2 Summary Statistics

Panel A Descriptive Statistics (number of firm-years = 1,244, but 1164 for Cash Variability)

Variables	*Mean*	*Standard Deviation*	*Median*	*25th Percentile*	*75th Percentile*
ACSI	76.12	6.05	76.00	72.00	81.00
Quoted spread (%)	0.56	0.59	0.37	0.09	0.86
Effective spread (%)	0.27	0.30	0.21	0.14	0.32
Share price ($)	41.77	19.83	39.26	26.90	53.16
Volatility (%)	19.13	0.10	16.48	12.33	22.57
Trading volume (%)	562.1	502.2	425.5	288.0	658.7
Market capitalization ($b)	29.19	51.35	11.63	4.90	27.28
Institutional ownership (%)	54.38	22.09	56.54	40.98	69.84
Analysts following	19.26	8.43	19.00	13.00	24.00
Age (year)	41.42	23.61	39.00	23.00	60.00
Market to book (%)	170.2	94.76	138.5	112.0	193.7
Profitability (%)	4.76	6.75	4.17	2.38	8.06
Leverage (%)	26.10	20.18	26.49	14.98	34.60
Cash variability (%)	32.42	28.54	23.94	14.78	38.65

Panel B Industry Segmentation Data

Standard Industrial Classification	*Number of Firm-years*	*Percentage*
Mining and construction	10	0.81
Manufacturing (food – petroleum)	327	26.29
Manufacturing (plastics – electronics)	99	7.96
Transportation and communication	404	32.47
Wholesale trade and retail trade	231	18.57
Retail trade	115	9.24
Services (hotels – recreation)	36	2.89
Public administration	22	1.77
	1,244	100.00

Table 3 Pearson and Spearman Correlation Coefficients for Variables Used in the Analysis

	ACSI	Q-SPREAD	E-SPREAD	PRICE	VOLAT	TRAD-VOL	MKT CAP	IO	ANALYST	AGE	MTB	ROA	LEV	CV *t-5 to t-1*
ACSI		**-0.14**	**-0.07**	**0.20**	**-0.10**	**-0.10**	**-0.07**	-0.02	**-0.12**	**0.12**	**0.29**	**0.34**	-0.03	**-0.20**
Q-SPREAD	**-0.09**		**0.77**	**-0.25**	**0.40**	**-0.37**	**-0.35**	**-0.25**	**0.10**	**-0.08**	**-0.06**	**-0.08**	**0.12**	-0.01
E-SPREAD	**-0.10**	**0.51**		**-0.44**	**0.54**	**-0.12**	**-0.34**	**-0.20**	0.05	**-0.14**	**-0.16**	**-0.20**	**0.13**	**0.11**
PRICE	0.04	-0.04	0.00		**-0.26**	**-0.18**	**0.51**	-0.05	**0.26**	**0.10**	**0.38**	**0.42**	**-0.33**	**-0.17**
VOLAT	**-0.16**	**0.23**	**0.38**	-0.04		**0.43**	**-0.15**	**0.06**	0.05	**-0.18**	0.02	**-0.14**	-0.02	**0.21**
TRADVOL	**-0.09**	**-0.23**	**0.07**	**-0.07**	**0.60**		**-0.24**	**0.39**	**-0.24**	**-0.11**	**-0.11**	**-0.14**	0.01	**0.23**
MKT CAP	-.0.01	**-0.17**	**-0.09**	**0.12**	**-0.06**	**-0.16**		**-0.10**	**0.57**	**0.12**	**0.32**	**0.21**	**-0.31**	**-0.14**
IO	-0.04	**-0.23**	**-0.16**	**-0.10**	**0.08**	**0.30**	**-0.14**		**-0.08**	0.04	**0.07**	-0.01	0.03	**0.16**
ANALYST	**-0.16**	0.04	-0.03	**-0.13**	0.01	**-0.14**	**0.28**	-0.02		**-0.08**	**0.29**	**0.14**	**-0.28**	**-0.06**
AGE	**0.12**	**-0.09**	**-0.14**	-0.03	**-0.18**	**-0.11**	**0.14**	0.04	**-0.06**		0.02	-0.03	**0.22**	**-0.18**
MTB	**0.28**	**-0.05**	**-0.11**	-0.04	-0.04	**-0.11**	**0.21**	0.01	**0.18**	**0.09**		**0.75**	-0.04	**-0.16**
ROA	**0.26**	**-0.09**	**-0.24**	-0.01	**-0.44**	**-0.36**	**0.09**	**-0.07**	**0.06**	0.05	**0.49**		**-0.14**	**-0.21**
LEV	-0.03	0.04	0.03	**-0.06**	0.06	0.03	**-0.17**	**0.08**	**-0.22**	**0.07**	**0.15**	**-0.04**		**-0.16**
CV *t-5 to t-1*	**-0.20**	0.00	**0.08**	0.02	**0.21**	**0.21**	**-0.08**	**0.13**	-0.04	**-0.18**	**-0.18**	**-0.17**	**-0.14**	

Notes: Below the diagonal are the Pearson correlations and above the diagonal are the Spearman correlations. Correlations that are statistically significant at a minimum of 5% level (two tailed) are presented in bold type.

The variables are defined below:

ACSI	=	A measure of customer satisfaction provided by University of Michigan's Ross School of Business.
Q-SPREAD	=	Yearly average of the difference between daily closing ask price and closing bid price, scaled by their midpoint.
E-SPREAD	=	Yearly average of two times the daily closing transaction price and the quoted midpoint, scaled by the quoted midpoint.
PRICE	=	Yearly average of daily closing share price
VOLAT	=	Standard deviation of daily return in a calendar year.
TRADVOL	=	Yearly average of daily number of shares traded divided by total number of outstanding shares.
MKT CAP	=	Yearly average of daily closing price times the total number of shares outstanding.
IO	=	Fraction of total shares outstanding held by 13F institutions, lagged by one year.

ANALYST	=	Number of analysts following a sample firm in a year.
AGE	=	Number of years since the sample firm's inclusion in CSRP database.
MTB	=	The difference between the book value of total assets and the book value of equity plus market capitalization (MKT CAP), divided by the book value of total assets.
ROA	=	Ratio of income before extraordinary items to total assets.
LEV	=	Ratio of long-term debts to total assets.
$CV_{t-5 \text{ to } t-1}$	=	The coefficient of variation of operating cash flows from year *t-5* to year *t-1*

Table 4 ACSI and Quoted Spreads

	Dependent Variable – Quoted Spread			
	Model 1	*Model 2*	*Model 3*	*VIF*
Intercept	-0.352*	2.615***	0.985*	*0.00*
	(-1.93)	*(5.09)*	*(1.67)*	
log(ACSI)		-0.721***	-0.412***	*1.79*
		(-6.38)	*(-3.14)*	
log(PRICE)	-0.12***	-0.105**	-0.108***	*1.84*
	(-3.14)	*(-2.82)*	*(-3.48)*	
log(VOLAT)	0.727***	0.695***	0.610***	*4.70*
	(14.02)	*(14.02)*	*(14.38)*	
log(TRADVOL)	-0.476***	-0.473***	-0.457***	*4.33*
	(-12.24)	*(-12.63)*	*(-13.28)*	
log(MKT CAP)	-0.217***	-0.225***	-0.206***	*4.16*
	(-16.52)	*(-17.42)*	*(-13.43)*	
S&P 500			-0.078***	*1.33*
			(-3.26)	
log(IO)			0.001	*1.43*
			(0.07)	
log(ANALYST)			-0.009	*2.69*
			(-0.35)	
log(AGE)			-0.012	*1.35*
			(-1.13)	
MTB			-0.208***	*2.14*
			(-2.85)	
ROA			-0.724***	*1.74*
			(-3.75)	
LEV			0.173**	*1.44*
			(1.98)	
Year dummies	Yes	Yes	Yes	
Industry dummies	No	No	Yes	
Adj. R^2	0.938	0.940	0.943	
Number of firm-years	1,244	1,244	1,244	

*p < 0.1, **p<0.05, ***p<0.01; t-statistics reported in brackets are based on White-corrected standard errors.

Table 5 ACSI and Effective Spreads

	Dependent Variable – Effective Spread			
	Model 1	*Model 2*	*Model 3*	*VIF*
Intercept	-0.921***	2.342***	1.627**	*0.00*
	(-4.52)	*(3.99)*	*(1.98)*	
log(ACSI)		-0.793***	-0.682***	*1.79*
		(-6.04)	*(-3.68)*	
log(PRICE)	-0.154***	-0.137***	-0.161***	*1.84*
	(-3.88)	*(-3.57)*	*(-5.51)*	
log(VOLAT)	0.848***	0.812***	0.706***	*4.70*
	(15.14)	*(15.05)*	*(14.15)*	
log(TRADVOL)	-0.345***	-0.341***	-0.270***	*4.33*
	(-14.02)	*(-8.70)*	*(-7.89)*	
log(MKT CAP)	-0.103***	-0.112***	-0.094***	*4.16*
	(-6.59)	*(-7.09)*	*(-5.27)*	
S&P 500			-0.030	*1.33*
			(-1.17)	
log(IO)			-0.065***	*1.43*
			(-5.32)	
log(ANALYST)			-0.023	*2.69*
			(-0.88)	
log(AGE)			-0.011	*1.35*
			(-1.08)	
MTB			0.003	*2.14*
			(0.23)	
ROA			-0.622***	*1.74*
			(-2.58)	
LEV			-0.047	*1.44*
			(-0.97)	
Year dummies	Yes	Yes	Yes	
Industry dummies	No	No	Yes	
Adj. R^2	0.711	0.721	0.751	
Number of firm-years	1,244	1,244	1,244	

*p < 0.1, **p<0.05, ***p<0.01; t-statistics reported in brackets are based on White-corrected standard errors.

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Table 6 Research and Development and Bid-ask Spreads

	Dependent Variables		
	Q-Spread	*E-Spread*	*VIF*
Intercept	0.744	1.740**	*0.00*
	(1.01)	*(2.03)*	
R&D dummy x log(ACSI)	-0.019	-0.028***	*1.81*
	(-1.60)	*(-2.73)*	
log(ACSI)	-0.485**	-0.673***	*1.79*
	(-2.93)	*(-3.55)*	
log(PRICE)	-0.100***	-0.155***	*1.83*
	(-4.58)	*(-6.27)*	
log(VOLAT)	0.629***	0.768***	*3.32*
	(14.63)	*(18.09)*	
log(TRADVOL)	-0.855***	-0.398***	*2.80*
	(-27.55)	*(-15.69)*	
log(MKT CAP)	-0.373***	-0.148***	*3.15*
	(-22.87)	*(-8.93)*	
S&P 500	-0.067**	-0.033	*1.34*
	(-2.22)	*(-1.25)*	
log(IO)	-0.033**	-0.078***	*1.41*
	(-2.54)	*(-6.09)*	
log(ANALYST)	0.288***	0.069***	*2.19*
	(7.70)	*(2.71)*	
log(AGE)	0.012	0.002	*1.31*
	(0.91)	*(0.22)*	
MTB	-0.032**	-0.002	*2.12*
	(-2.13)	*(-0.12)*	
ROA	-0.300	-0.495**	*1.72*
	(-1.51)	*(-2.17)*	
LEV	-0.113*	-0.063	*1.44*
	(-1.78)	*(-1.25)*	
Year dummies	Yes	Yes	
Industry dummies	Yes	Yes	
Adj. R^2	0.908	0.738	
Number of firm-years	1,244	1,244	

*p < 0.1, **p<0.05, ***p<0.01; t-statistics reported in brackets are based on White-corrected standard errors.

Table 7 Advertising and Bid-ask Spreads

	Dependent Variables		
	Q-Spread	*E-Spread*	*VIF*
Intercept	1.285**	1.55*	*0.00*
	(2.15)	*(1.90)*	
Advertising to sales	0.576**	-0.495*	*1.55*
	(2.11)	*(-1.65)*	
log(ACSI)	-0.483***	-0.668***	*1.80*
	(-3.67)	*(-3.63)*	
log(PRICE)	-0.106***	-0.161***	*1.85*
	(-3.36)	*(-5.48)*	
log(VOLAT)	0.622***	0.708***	*4.70*
	(14.21)	*(14.17)*	
log(TRADVOL)	-0.469***	-0.268***	*4.34*
	(-13.49)	*(-7.79)*	
log(MKT CAP)	-0.203***	-0.095***	*4.17*
	(-13.05)	*(-5.31)*	
S&P 500	-0.067***	-0.031	*1.33*
	(-2.83)	*(-1.20)*	
log(IO)	0.005	-0.065***	*1.43*
	(0.48)	*(-5.34)*	
log(ANALYST)	-0.003	-0.020	*2.70*
	(-0.11)	*(-0.77)*	
log(AGE)	-0.017	-0.010	*1.36*
	(-1.61)	*(-0.98)*	
MTB	-0.032***	0.008	*2.26*
	(-2.61)	*(0.56)*	
ROA	-0.562***	-0.606**	*1.75*
	(-3.01)	*(-2.51)*	
LEV	0.009	-0.050	*1.44*
	(0.16)	*(-1.01)*	
Year dummies	Yes	Yes	
Industry dummies	Yes	Yes	
Adj. R^2	0.943	0.751	
Number of firm-years	1,244	1,244	

*p < 0.1, **p<0.05, ***p<0.01; t-statistics reported in brackets are based on White-corrected standard errors.

Table 8 Corporate Governance and Bid-ask Spreads

Period	*1995 – 2006*		
	Dependent Variables		
	Q-Spread	*E-Spread*	*VIF*
Intercept	1.50**	1.36**	*0.00*
	(2.08)	*(2.04)*	
Gompers index	0.000	-0.014***	*1.26*
	(0.11)	*(-3.68)*	
log(ACSI)	-0.560***	-0.611***	*1.85*
	(-3.53)	*(-4.24)*	
log(PRICE)	-0.137***	-0.199***	*1.87*
	(-3.08)	*(-5.01)*	
log(VOLAT)	0.577***	0.665***	*4.02*
	(10.85)	*(12.49)*	
log(TRADVOL)	-0.490***	-0.276***	*3.49*
	(-11.45)	*(-6.84)*	
log(MKT CAP)	-0.208***	-0.090***	*4.11*
	(-10.61)	*(-4.87)*	
S&P 500	-0.100***	-0.069**	*1.28*
	(-3.58)	*(-2.40)*	
log(IO)	0.012	-0.059***	*1.44*
	(0.94)	*(-4.88)*	
log(ANALYST)	-0.011	-0.058**	*2.48*
	(-0.36)	*(-2.05)*	
log(AGE)	-0.027	-0.10	*1.34*
	(-2.13)	*(-0.74)*	
MTB	0.004	0.025	*2.40*
	(0.29)	*(1.63)*	
ROA	-0.954***	-0.969***	*2.19*
	(-3.26)	*(-3.15)*	
LEV	0.187**	-0.057	*1.86*
	(2.01)	*(-0.61)*	
Year dummies	Yes	Yes	
Industry dummies	Yes	Yes	
Adj. R^2	0.944	0.776	
Number of firm-years	981	981	

*p < 0.1, **p<0.05, ***p<0.01; t-statistics reported in brackets are based on White-corrected standard errors.

Table 9 Cross-sectional Regressions by Year

	Dependent Variables	
	Q-Spread	*E-Spread*
	Mean coefficients	*Mean coefficients*
Intercept	-0.395	-0.697
	(-0.64)	*(-1.41)*
log(ACSI)	-0.233*	-0.227**
	(-1.67)	*(-2.26)*
log(PRICE)	-0.295***	-0.537***
	(-4.14)	*(-4.98)*
log(VOLAT)	0.488***	0.457***
	(7.29)	*(4.51)*
log(TRADVOL)	-0.379***	-0.101
	(-6.96)	*(-1.44)*
log(MKT CAP)	-0.169***	-0.009
	(-4.33)	*(-0.22)*
S&P 500	-0.094***	-0.067***
	(-2.67)	*(-3.54)*
log(IO)	0.016	-0.056***
	(1.15)	*(-4.43)*
log(ANALYST)	0.031	0.039
	(1.05)	*(1.17)*
log(AGE)	-0.017	-0.008
	(-1.43)	*(-0.69)*
MTB	-0.017	-0.015
	(-1.21)	*(-1.23)*
ROA	-0.725*	-0.159
	(-1.83)	*(-0.61)*
LEV	-0.007	-0.245**
	(-0.10)	*(-2.54)*
Year dummies	No	No
Industry dummies	Yes	Yes
Mean Adj. R^2	0.707	0.717
Number of yearly regressions	15	15

*p < 0.1, **p<0.05, ***p<0.01; t-statistics reported in brackets are derived from t-test on yearly regression coefficients.

Table 10 Fixed-Effects Regressions

	Dependent Variables	
	Q-Spread	*E-Spread*
Intercept	4.103***	0.107
	(4.01)	*(0.18)*
log(ACSI)	-0.287	-0.248**
	(-1.25)	*(-1.82)*
log(PRICE)	0.009	-0.109***
	(0.33)	*(-6.66)*
log(VOLAT)	1.748***	0.904***
	(37.37)	*(32.41)*
log(TRADVOL)	-1.37***	-0.453***
	(-40.23)	*(-22.36)*
log(MKT CAP)	-0.554***	-0.167***
	(-28.17)	*(-14.23)*
S&P 500	-0.032	-0.107***
	(-0.68)	*(-3.85)*
log(IO)	-0.097***	-0.666***
	(-4.81)	*(-5.52)*
log(ANALYST)	0.596***	0.129***
	(14.20)	*(5.14)*
log(AGE)	0.139***	0.023**
	(7.07)	*(1.97)*
MTB	-0.126	-0.264***
	(-1.07)	*(-3.78)*
ROA	0.678**	-0.777***
	(2.38)	*(-3.78)*
LEV	-0.055	0.163**
	(-0.42)	*(2.07)*
Year dummies	Yes	Yes
Adj. R^2	0.759	0.651
Number of firm-years	1,244	1,244

*p < 0.1, **p<0.05, ***p<0.01.

Table 11 Hausman Test

	Dependent Variables		
	Stage 1	*Stage 2*	
	log(ACSI)	*Q-Spread*	*E-Spread*
Intercept	0.731***	2.031**	1.787*
	(6.90)	*(2.49)*	*(1.88)*
Stage 1 residual		0.512	0.083
		(1.61)	*(0.27)*
log(ACSI)		-0.677***	-0.691***
		(-3.71)	*(-3.18)*
$log(ACSI)_{t-1}$	0.823***		
	(38.07)		
log(PRICE)	0.001	-0.096***	-0.154***
	(0.35)	*(-2.86)*	*(-4.96)*
log(VOLAT)	-0.010	0.611***	0.734***
	(-1.04)	*(13.00)*	*(13.85)*
log(TRADVOL)	-0.003	-0.494***	-0.289***
	(-0.87)	*(-12.84)*	*(-4.34)*
log(MKT CAP)	-0.003*	-0.216***	-0.091***
	(-1.92)	*(-12.53)*	*(-4.85)*
S&P 500	0.006*	-0.093***	-0.046
	(1.87)	*(-3.50)*	*(-1.57)*
log(IO)	-0.000	0.009	-0.063***
	(-0.30)	*(0.70)*	*(-4.34)*
log(ANALYST)	0.001	0.028	-0.014
	(0.16)	*(0.64)*	*(-0.49)*
log(AGE)	0.000	-0.015	-0.016
	(0.14)	*(-1.27)*	*(-1.33)*
MTB	0.001	-0.022*	0.001
	(0.48)	*(-1.70)*	*(0.09)*
ROA	0.022	-0.555***	-0.613**
	(0.80)	*(-2.79)*	*(-2.41)*
LEV	-0.001	0.009	-0.013
	(-0.34)	*(0.13)*	*(-0.24)*
Year dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Adj. R^2	0.813	0.944	0.755
Number of firm-years	1,080	1,080	1,080

*p < 0.1, **p<0.05, ***p<0.01; t-statistics reported in brackets are based on White-corrected standard errors.

Table 12 Fixed-effects Regressions on NASDAQ Firms

	Dependent Variables	
	Q-Spread	*E-Spread*
Intercept	4.14**	0.882
	(2.12)	*(0.56)*
log(ACSI)	-1.13**	-0.708*
	(-2.47)	*(-1.93)*
log(PRICE)	0.066	-0.165***
	(0.97)	*(-2.99)*
log(VOLAT)	1.204***	0.718***
	(10.55)	*(7.82)*
log(TRADVOL)	-0.654***	-0.286***
	(-7.97)	*(-4.34)*
log(MKT CAP)	-0.403***	-0.224***
	(-8.69)	*(-6.01)*
S&P 500	0.341**	0.239**
	(2.59)	*(2.25)*
log(IO)	-0.079**	-0.051
	(-1.89)	*(-1.52)*
log(ANALYST)	0.218**	0.118*
	(2.76)	*(1.85)*
log(AGE)	0.078	0.001
	(1.39)	*(0.03)*
MTB	-0.040**	-0.039***
	(-2.34)	*(-2.82)*
ROA	-0.338	-0.265
	(-0.96)	*(-0.93)*
LEV	-0.126	-0.131
	(-0.81)	*(-1.05)*
Year dummies	Yes	Yes
Adj. R^2	0.813	0.796
Number of firm-years	169	169

*p < 0.1, **p<0.05, ***p<0.01.

Table 13 ACSI and Variability of Future Operating Cash Flows

Panel A

		Mean of Coefficient of Variations of Future Operating Cash flows		
Quintile	*Mean of ACSI*	$CV_{t \text{ to } t+1}$	$CV_{t \text{ to } t+2}$	$CV_{t \text{ to } t+3}$
1	67.7	0.290	0.338	0.374
2	73.1	0.280	0.307	0.342
3	75.8	0.224	0.302	0.322
4	79.5	0.216	0.247	0.271
5	84.2	0.181	0.213	0.232
Quintile 1 – Quintile 5		0.109***	0.125***	0.142***
t-statistic		*3.04*	*3.65*	*4.16*

Panel B

	Correlation Coefficients with ACSI		
	$CV_{t \text{ to } t+1}$	$CV_{t \text{ to } t+2}$	$CV_{t \text{ to } t+3}$
Pearson correlation coefficient	-0.117***	-0.129***	-0.141***
Spearman correlation coefficient	-0.101***	-0.121***	-0.147***

*p < 0.1, **p<0.05, ***p<0.01.

Table 14 Variability of Past Operating Cash Flows and Bid-ask Spreads

	Dependent Variables		
	Q-Spread	*E-Spread*	*VIF*
Intercept	-0.953***	1.480***	*0.00*
	(-5.23)	*(-6.88)*	
log(CV*t-5 to t-1*)	0.033**	0.042***	*1.36*
	(2.47)	*(2.93)*	
log(PRICE)	-0.094***	-0.157***	*1.85*
	(-3.12)	*(-5.51)*	
log(VOLAT)	0.603***	0.680***	*4.73*
	(13.81)	*(13.50)*	
log(TRADVOL)	-0.470***	-0.272***	*4.43*
	(-3.29)	*(-7.75)*	
log(MKT CAP)	-0.199***	-0.089***	*4.07*
	(-12.64)	*(-4.98)*	
S&P 500	-0.693***	-0.054*	*1.32*
	(-2.79)	*(-1.93)*	
log(IO)	0.006	-0.068***	*1.41*
	(0.52)	*(-5.19)*	
log(ANALYST)	-0.013	-0.040	*2.76*
	(-0.49)	*(-1.38)*	
log(AGE)	-0.016	-0.004	*1.42*
	(-1.46)	*(-0.39)*	
MTB	-0.027**	-0.001	*2.18*
	(-2.17)	*(-0.04)*	
ROA	-0.690***	-0.727***	*1.77*
	(-3.68)	*(-3.03)*	
LEV	0.014	-0.043	*1.44*
	(0.23)	*(-0.86)*	
Year dummies	Yes	Yes	
Industry dummies	Yes	Yes	
Adj. R^2	0.943	0.741	
Number of firm-years	1,164	1,164	

*p < 0.1, **p<0.05, ***p<0.01; t-statistics reported in brackets are based on White-corrected standard errors.

Table 15

ACSI, Variability of Past Operating Cash Flow and Bid-ask Spreads

	Dependent Variables		
	Q-Spread	*E-Spread*	*VIF*
Intercept	0.848	1.439	*0.00*
	(1.41)	*(1.63)*	
log(CV*t-5 to t-1*)	0.029**	0.035**	*1.37*
	(2.13)	*(2.36)*	
log(ACSI)	-0.417***	-0.675***	*1.76*
	(-3.10)	*(-3.45)*	
log(PRICE)	-0.092***	-0.154***	*1.86*
	(-3.08)	*(-5.48)*	
log(VOLAT)	0.594***	0.665***	*4.75*
	(13.57)	*(13.40)*	
log(TRADVOL)	-0.470***	-0.272***	*4.43*
	(-13.41)	*(-7.85)*	
log(MKT CAP)	-0.203***	-0.096***	*4.11*
	(-12.99)	*(-5.25)*	
S&P 500	-0.065***	-0.048*	*1.32*
	(-2.64)	*(-1.74)*	
log(IO)	0.004	-0.070***	*1.41*
	(0.38)	*(-5.31)*	
log(ANALYST)	-0.014	-0.040	*2.76*
	(-0.50)	*(-1.40)*	
log(AGE)	-0.015	-0.002	*1.43*
	(0.18)	*(-0.20)*	
MTB	-0.024**	0.003	*2.19*
	(-1.97)	*(0.23)*	
ROA	-0.651***	-0.664***	*1.78*
	(-3.38)	*(-2.64)*	
LEV	0.007	-0.055	*1.44*
	(0.11)	*(-1.10)*	
Year dummies	Yes	Yes	
Industry dummies	Yes	Yes	
Adj. R^2	0.944	0.746	
Number of firm-years	1,164	1,164	

*p < 0.1, **p<0.05, ***p<0.01; t-statistics reported in brackets are based on White-corrected standard errors.