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Decimalization and Illiquidity Premiums: An Extended Analysis

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DECIMALIZATION AND ILLIQUIDITY PREMIUMS:

AN EXTENDED ANALYSIS

By

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ABSTRACT

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AN EXTENDED ANALYSIS

by

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Utah State University, 2015

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In this study I compare the illiquidity premium related to the bid–ask spread before and after the 2001 change to decimal pricing for New York Stock Exchange (NYSE) and Nasdaq stock exchanges. Theory predicts a contraction of the bid-ask spread with a move to more precise pricing, and this association is shown. A disparity between the NYSE and Nasdaq exchanges due to decimalization is shown. A portfolio analysis based on the relationship between the bid-ask spread and next month returns is back-tested, revealing a significant and positive risk-adjusted return for holding the portfolio of stocks with the highest bid-ask spreads. In this portfolio analysis the efficient market hypothesis does not hold.

(24 pages)

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I. INTRODUCTION

My analysis attempts to add to the existing body of literature, exploring the long-term effects of decimalization on the markets over a larger time period. The analysis compares the relationship between spreads and returns across the time periods before and after the decimalization of the NYSE and Nasdaq stock exchanges. I use a data set of monthly data extending from 1995 to 2012 to compare the spreads before and after decimalization. I also test whether the illiquidity premium was affected by decimalization via portfolio analysis as well as Fama-MacBeth (1973) regression analysis. My portfolio analysis indicates that stocks with high bid-ask spreads are correlated with positive risk-adjusted returns above that of the market, indicating a relationship between spreads and returns.

On January 29, 2001 the New York Stock Exchange (NYSE) implemented decimal pricing, replacing the fractional pricing system that had been used since inception. Shortly thereafter on April 9, 2001 the Nasdaq Stock Market made the change to decimalization. With this change came the expected reduction in minimum price increments and bid-ask spreads, as well as other effects to be discussed later on.

Harris (1999) predicted the effects of a smaller tick size on market quality and spreads. In his paper, Harris estimates that the smaller tick size would not only allow for a narrower bid-ask spread, but may also deter market makers from providing liquidity. This disincentive to provide liquidity may stem from market makers earning less money on trades due to the narrower spreads. My analysis of the effects of decimalization on the

NYSE may provide some more insight into this prediction. Harris' study indicates that the larger spreads before decimalization should reflect larger returns, or a greater illiquidity premium, whereas post-decimalization spreads should narrow and the illiquidity premium shrink.

A later study by Bessembinder (2003) revealed what Harris expected, a reduction in bid-ask spreads and quotation sizes for the NYSE and Nasdaq markets as a result of the 2001 change to decimal pricing. His study examined trading data for the weeks leading up to decimalization and for five months after the change to decimal pricing. Bessembinder finds that spreads decreased most significantly for heavily traded large capitalization stocks for both Nasdaq and NYSE stocks. Quotation sizes decreased by about 65% for NYSE stocks and 24% for Nasdaq stocks.

My analysis supports what Harris and Bessembinder have predicted and established. The bid-ask spread tightens from the pre-decimalization period to the post decimalization period. A discrepancy of illiquidity premiums between the two markets is discovered in the results. I believe this inconsistency may arise from the differences in how trades are executed between the two exchanges, as well as the types of companies listed on each exchange.

II. DATA

The data set is comprised of monthly values for the NYSE and Nasdaq exchanges from January 1995 through December 2012 obtained from the Center of Research on Security Prices (CRSP). Both exchanges were used in order to illuminate the different effects of decimalization between a dealer and auction market. The data is separated into pre-decimalization and post-decimalization time periods for each exchange. The NYSE changed in January 2001 and the Nasdaq in April of 2001.

Table 1 reports the summary statistics from the sample. Panel A contains figures for the entire time period and both exchanges. The average bid-ask spread (*Spread*) of a stock is $0.0511 and average price (*Price*) is $20.32. The average beta (*Beta*), which is the correlation of a stock's movement with that of the market, is 0.8503, indicating the sample selection of stocks on average earned less return than the market.

From panels B, C, and D, which represent the different minimum price increment time periods, it is clear to see the trend of spreads tightening as minimum price increments, or tick sizes, are decreased. In the $1/8^{th}$ environment, the average spread is $0.0506; whereas in the decimal pricing environment the average spread is $0.0127. These changes in the bid-ask spread confirm the theory that reductions in tick size are related to narrower spreads.

III. EMPIRICAL RESULTS

A. PORTFOLIO ANALYSIS

I implement a portfolio analysis for each exchange separately as well as combined. Each analysis compares results for pre-decimalization, post-decimalization, and the entire time period. The method for analysis separates stocks into five portfolios each month, ranked by the stocks' one month lagged bid-ask spread. These portfolios are updated each month over the entire period, allowing stocks to change portfolios based on changes in the bid-ask spread.

The Fama-French (1993) three-factor and Carhart (1997) four-factor models are used to estimate the relationships between excess returns (*return – value weighted return*) and the market risk factors. The model is applied to each portfolio for every month and the average estimates are reported. Both models are used for purposes of robustness.

The three-factor model:

$$Excess\ Return_{i,t} = \alpha + \beta_1 MRP_t + \beta_2 SMB_t + \beta_3 HML_t + \varepsilon_{i,t}$$

The four-factor model:

$$Excess\ Return_{i,t} = \alpha + \beta_1 MRP_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 UMD_t + \varepsilon_{i,t}$$

A. I. BOTH EXCHANGES

From the portfolio analysis results on Table 2 Panel A, we can see that the difference in abnormal monthly returns between portfolio QV (largest spread) and portfolio QI (smallest spread) is 2.64% with a test statistic of 40.06. This is congruent with the theory that stocks with a larger bid-ask spread should earn a higher return than the stocks with a smaller bid-ask spread, also known as the illiquidity premium. Panel B and C shows that these average monthly returns are larger pre-decimalization at 3.69% and become smaller post-decimalization, 1.89%.

Interestingly, the alphas, or risk-adjusted returns, for every portfolio but QV are typically not economically significant, even when the estimates are statistically significant. Take for example the alphas from the post-decimalization period on Table 2 panel C, with a range of monthly risk-adjusted returns from 0.19% to 0.61%, it is hard to correlate a relationship of spread size with an illiquidity premium. It is in the QV portfolio that this relationship is highlighted. Average risk-adjusted returns for this portfolio are about 2% each month. By holding the QV portfolio one would have earned on average 2% more than the market without taking on more risk.

A. II. NYSE

The results for the NYSE are seen on Table 3, and the results are rather puzzling. In Panel A (pre-decimalization period) the alphas of the three-factor model are increasingly negative as the spread widens. The estimated alphas are statistically significant, but not large enough economically. Surprisingly, the four factor estimates are not significant in either sense, making it difficult to distinguish the estimates as being different from zero.

Within the post-decimalization period estimates are statistically significant, corroborated between the three- and four-factor models. What is interesting is the economic significance of the alpha estimates, which are very small when compared to the results from the Nasdaq exchange as seen on Table 4. Additionally, the mean raw returns become larger post-decimalization, from .93% to 1.92% in portfolio QV, contrary to expectations.

These abnormal results could in part be caused by the structure of the NYSE, being an auction market where buyers enter competitive bids and sellers enter competitive offers.

Because trades are not negotiated, but rather matched by highest bid and lowest offer, buyers were not receiving optimal prices due to the inexact minimum pricing increments before decimalization. When changed to decimal pricing buyers could insert bids closer to the desired price, driving the price of the security closer to its real value. On the other hand it could be as simple as the types of stock listed on the exchange, which are typically larger market cap stocks.

A. III. NASDAQ

The Nasdaq exchange exhibits the changes to returns and risk-adjusted returns that I anticipated for the pre- and post-decimalization periods. The returns shrink from the pre-decimalization period to the post-decimalization period, more evidence for the relationship between bid-ask spreads and illiquidity premiums. For the QV portfolio, mean abnormal returns fell from 5.39% to 3.01%. The results are also much stronger statistically for both Fama-French estimation models across time periods. This information can be found on Table 4.

Curiously, the difference in returns between portfolios QV and QI are larger than those of the NYSE. Compare the difference in four factor alphas post-decimalization, from the NYSE of 0.64% monthly return to that of the Nasdaq, a 2.85% difference in monthly returns. The illiquidity premium for stocks in the QV portfolio of the NYSE is on average 2% less than those in the Nasdaq portfolio.

B. FAMA-MACBETH REGRESSION ANALYSIS

To substantiate the previous results for the relationship between spreads and illiquidity premiums, I employ a regression model to estimate the effects of stated variables on the next month's returns. I use the Fama-MacBeth (1973) regression model to determine the risk premium for each factor in the model. These factors include a beta value derived from the Capital Asset Pricing Model (CAPM), the size effect, a ratio of book value to market value of the stock, the momentum effect, a measure of idiosyncratic volatility, and the bid-ask spread. The factors used in this model have been used in numerous studies and are generally accepted as having an effect on the returns of a stock.

The method created by Fama-MacBeth was not intended for time series data sets. It is important to note that the standard errors are only corrected for cross-sectional correlation, and the model is open to time-series autocorrelation. To control for this autocorrelation the model is applied to each time step and the monthly estimates have been averaged over the respective time periods. Tables 5-7 report regression results using the following equation:

$$Return_{i,t+1} = \beta_0 + \beta_1 Beta_{i,t} + \beta_2 ln(Size)_{i,t} + \beta_3 ln(B/M)_{i,t} + \beta_4 Mom_{i,t} + \beta_5 ln(IdioVolt)_{i,t} + \beta_6 Spread_{i,t} + \varepsilon_{i,t+1}$$

The general results of the model find that most of the factors have an effect on next-month returns; however, the *Beta* and *Ln(IdioVolt)* factors were of no significance across exchanges and time periods. Overwhelmingly the factor having the prevailing impact on next-month returns is the bid-ask spread (*Spread*). When the model is applied to the combined exchange data, the *Spread* estimates appear to have the most significant t-statistics. From Table 5 we can infer that, over the entire time period, a one cent change to the spread is correlated with an additive change in next month's return of 0.516%. This result is larger in the pre-decimalization period, 0.577%, and smaller in the post-decimalization period, 0.481%.

Applying the model to the exchanges separately yields results similar to those of the portfolio analysis. Table 6 shows that the NYSE pre-decimalization estimate for *Spread* is significant but small, a 0.153% change in next-month returns for a one cent change in spread; however, the estimate is not statistically different from zero in the post-decimalization period with a t-statistic of 1.03, making any correlation of *Spread* to returns unclear for this period. Though the impact of *Spread* on next-month returns decreases from the pre-decimalization to the post-decimalization period, the magnitude of the change, 0.153%, is considerably smaller than that of the Nasdaq.

The Nasdaq exchange once again provides the consistent results aligned with what theory predicts. As seen on Table 7, the spread is correlated with a larger impact on next-month returns in the pre-decimalization period, .723%, and this effect lessens in the post-decimalization period to 0.44%. This model reinforces the idea of an illiquidity premium. As the spreads tightened in 2001, the stocks became more liquid and investors required less of a premium for taking on less risk.

IV. CONCLUSIONS

The results to my analysis of the bid-ask spread reinforces what previous studies have proven. The bid-ask spread definitively narrowed in the post-decimalization period. Raw returns and illiquidity premiums associated with the bid-ask spread were also shown to have constricted over this period. By extending the post-decimalization period to 2012, I have shown this relationship has held in the long-run.

To start I execute a portfolio analysis of the data, creating five portfolios where the stocks are sorted by the bid-ask spread. Multifactor regressions are then applied to the portfolios which reveal large illiquidity premiums for the portfolios with the highest bid-ask spread. When this is broken down by exchange, the results for the NYSE and Nasdaq diverge. On the Nasdaq exchange, premiums associated with illiquidity, or the bid-ask spread, decline after decimalization. The NYSE, however, exhibits larger illiquidity premiums in the post-decimalization period.

By applying Fama-MacBeth multifactor regressions, I test for a relationship between bid-ask spreads and next-month returns, further supporting the results of the portfolio analysis. Between the NYSE and Nasdaq exchanges the results are somewhat mixed. The decimalization effects on the Nasdaq exchange are more consistent statistically and economically across the two periods. The relationship between bid-ask spreads and next-month returns is quite evident. NYSE results were less remarkable, but still demonstrate a reduction in the correlation between spreads and next-month returns.

The differences arising between the NYSE and Nasdaq exchanges are interesting, but unknown in origin. The disparity may arise from how the trades are executed, or even the different characteristics of the stocks on each exchange; but it is not the purpose of this paper to discover why these differences exist. The two analyses combined provide observed evidence that the change to decimalization did have an effect on the bid-ask spread, and that the bid ask-spread is linked to next-month returns and illiquidity premiums.

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APPENDIX

Table 1 – Summary Statistics

Table reports statistics that describe the sample. Monthly data from Jan. 1995 – Nov. 2012. 961,496 observations. Panel A reports for the entire period while panels B, C, and D report on the different minimum increment pricing periods. *Spread* values are monthly averages of the Bid price less the Ask price in dollars. *Price* is the midpoint of bid-ask spread of a security on the last trading day of the month in dollars. *Size* is the end of period market capitalization computed as closing price * number of shares outstanding (in $ billions). *Volume* is average monthly traded volume (in $ billions). *IdioVolt* is the idiosyncratic volatility, or firm specific risk, which is the standard deviation of the residuals from CAPM regressions. *Beta* is a measure of the risk arising from general market movements, reflected as a ratio of the firm to the market. *B/M* is the book to market ratio, a ratio of book value to the market value of the stock.

Summary Statistics					
Panel A. Entire Time Period					
	Mean	Median	Std. Deviation	Min	Max
Spread	0.0511	0.0321	0.0624	0.0004	1.5000
Price	20.31	14.00	213.66	0.03	32,100
Size	2.5758	0.2392	13.0090	.000003	602.4329
Volume	0.01411	0.0017	0.0922	0.000	20.1242
IdioVolt	0.0342	0.0268	0.0270	0.000	1.6892
Beta	0.8503	0.8512	0.9010	-56.1872	137.1456
B/M	0.4344	0.0595	13.6507	-1,005.51	2,832.66
Panel B. 1/8th Environment (Jan 1995 – June 1997)					
Spread	0.0506	0.0314	0.0622	-0.0126	1.5000
Panel C. 1/16th Environment (July1997 – Jan 2001)					
Spread	0.0373	0.0244	0.0458	-0.0594	1.4286
Panel D. 0.01 Environment (Feb 2001 – Dec 2011)					
Spread	0.0127	0.0037	0.0260	-0.0729	1.7841

Table 2 - Returns Across Spread Portfolios: Combined Exchanges

The table reports on measures of returns across quintiles sorted by bid-ask spread in month *t-1*. Panel A reports return measures for the entire period (1995-2012). Panel B reports on return measures for the pre-decimalization period (1995-2001). Panel C reports on return measures for the post-decimalization period (2001-20012). *Raw Returns* are taken from CRSP. *Ab Return* is the excess return, the difference between raw returns and value-weighted market returns. The FF3F and FF4F alphas come from variations of the following equation.

$$Excess\ Return_{i,t} = \alpha + \beta_1 MRP_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 UMD_t + \varepsilon_{i,t}$$

The dependent variable is excess return for stock ***i*** in month *t.* The independent variables include the market risk premium (*MRP*), the small-minus-big risk factor (*SMB*), the high-minus-low risk factor (*HML*), and the Carhart (1997) up-minus-down risk factor (*UMD*). The *FF3F alpha* is the alpha estimated from the above equation excluding the last risk factor (UMD). The *FF4F alpha* is the alpha estimated from the entire equation. Column 6 reports difference between the extreme quintiles. T-statistics are reported below corresponding estimates.

Panel A. Entire Time Period						
	Q I (Low)	Q II	Q III	Q IV	Q V (High)	Q V – Q I
	[1]	[2]	[3]	[4]	[5]	[6]
Raw Return	0.0109	0.0116	0.0123	0.0140	0.0374	0.0264
						(38.74)
Ab Return	0.0020	0.0026	0.0034	0.0051	0.0284	0.0264
						(40.06)
FF3F alpha	0.0012	0.00005	-0.0003	0.0013	0.0268	0.0256
	(4.02)	(0.17)	(-0.95)	(3.28)	(44.52)	(38.25)
FF4F alpha	0.0016	0.0013	0.0023	0.0048	0.0303	0.0287
	(5.29)	(4.20)	(6.42)	(11.51)	(49.10)	(41.82)
Panel B. Pre-decimalization						
Raw Return	0.0145	0.0121	0.0108	0.0122	0.0515	0.0369
						(30.93)
Ab Return	-0.0006	-0.0031	-0.0044	-0.0029	0.0363	0.0369
						(31.69)
FF3F alpha	-0.0011	-0.0056	-0.0063	-0.0027	0.0388	0.0399
	(-2.00)	(-9.70)	(-10.21)	(-4.02)	(35.28)	(32.21)
FF4F alpha	0.0007	-0.0008	-0002	0.0040	0.0463	0.0463
	(1.17)	(-1.31)	(-0.34)	(5.37)	(38.74)	(34.28)
Panel C. Post-decimalization						
Raw Return	0.0084	0.0112	0.0135	0.0153	0.0273	0.0189
						(23.69)
Ab Return	0.0037	0.0065	0.0088	0.0106	0.0226	0.0189
						(24.67)
FF3F Alpha	0.0019	0.0028	0.0035	0.0052	0.0193	0.0174
	(6.04)	(7.98)	(8.29)	(10.11)	(27.09)	(22.39)
FF4F Alpha	0.0019	0.0029	0.0041	0.0061	0.0205	0.0186
	(6.30)	(8.33)	(9.63)	(11.83)	(28.85)	(23.93)

Table 3 - Returns Across Spread Portfolios: NYSE

The table reports on measures of returns across quintiles sorted by bid-ask spread in month *t-1*. Panel A reports on return measures for the pre-decimalization period (1995-2001). Panel B reports on return measures for the post-decimalization period (2001-20012). *Raw Returns* are taken from CRSP. *Ab Return* is the excess return, the difference between raw returns and value-weighted market returns. The FF3F and FF4F alphas come from variations of the following equation.

$$Excess\ Return_{i,t} = \alpha + \beta_1 MRP_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 UMD_t + \varepsilon_{i,t}$$

The dependent variable is excess return for stock *i* in month *t.* The independent variables include the market risk premium (*MRP*), the small-minus-big risk factor (*SMB*), the high-minus-low risk factor (*HML*), and the Carhart (1997) up-minus-down risk factor (*UMD*). The *FF3F alpha* is the alpha estimated from the above equation excluding the last risk factor (UMD). The *FF4F alpha* is the alpha estimated from the entire equation. Column 6 reports difference between the extreme quintiles. T-statistics are reported below corresponding estimates.

Table 3						
	Q I (Low)	Q II	Q III	Q IV	Q V (High)	Q V – Q I
	[1]	[2]	[3]	[4]	[5]	[6]
Panel A. Pre-decimalization						
Raw Return	0.0155	0.0142	0.0125	0.0091	0.0093	-0.0062
						(5.11)
Ab Return	-0.0009	-0.0023	-0.0039	-0.0073	-0.0071	-0.0062
						(5.28)
FF3F Alpha	-0.0023	-0.0039	-0.0064	-0.0101	-0.0087	-0.0064
	(-3.80)	(-5.94)	(-8.85)	(-12.59)	(-8.00)	(-5.19)
FF4F Alpha	-0.0007	-0.0002	-0.0011	-0.0033	0.0002	0.000
	(-1.15)	(-0.34)	(-1.39)	(-3.73)	(0.17)	(0.00)
Panel B. Post-decimalization						
Raw Return	0.0089	0.0106	0.0127	0.0141	0.0192	0.0103
						(10.59)
Ab Return	0.0038	0.0055	0.0076	0.0091	0.0141	0.0103
						(11.55)
FF3F Alpha	0.0023	0.0033	0.0040	0.0039	0.0078	0.0055
	(8.03)	(7.84)	(8.19)	(6.70)	(9.70)	(6.20)
FF4F Alpha	0.0027	0.0033	0.0041	0.0045	0.0091	0.0064
	(7.36)	(7.68)	(8.39)	(7.72)	(11.32)	(7.24)

Table 4 - Returns Across Spread Portfolios: Nasdaq

The table reports on measures of returns across quintiles sorted by bid-ask spread in month *t-1*. Panel A reports on return measures for the pre-decimalization period (1995-2001). Panel B reports on return measures for the post-decimalization period (2001-20012). *Raw Returns* are taken from CRSP. *Ab Return* is the excess return, the difference between raw returns and value-weighted market returns. The FF3F and FF4F alphas come from variations of the following equation.

$$Excess\ Return_{i,t} = \alpha + \beta_1 MRP_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 UMD_t + \varepsilon_{i,t}$$

The dependent variable is excess return for stock *i* in month *t.* The independent variables include the market risk premium (*MRP*), the small-minus-big risk factor (*SMB*), the high-minus-low risk factor (*HML*), and the Carhart (1997) up-minus-down risk factor (*UMD*). The *FF3F alpha* is the alpha estimated from the above equation excluding the last risk factor (UMD). The *FF4F alpha* is the alpha estimated from the entire equation. Column 6 reports difference between the extreme quintiles. T-statistics are reported below corresponding estimates.

Table 4						
	Q I (Low)	Q II	Q III	Q IV	Q V (High)	Q V – Q I
	[1]	[2]	[3]	[4]	[5]	[6]
Panel A. Pre-decimalization						
Raw Return	0.0144	0.0112	0.0110	0.0151	0.0685	0.0541
						(33.12)
Ab Return	-0.0002	-0.0034	-0.0036	0.0005	0.0539	0.0541
						(33.97)
FF3F Alpha	-0.0009	-0.0051	-0.0026	0.0029	0.0579	0.0579
	(-1.19)	(-6.17)	(-3.09)	(3.09)	(39.06)	(34.30)
FF4F Alpha	0.0025	-0.0018	0.0021	0.0085	0.0639	0.0614
	(2.91)	(-2.01)	(2.32)	(8.36)	(39.82)	(33.47)
Panel B. Post-decimalization						
Raw Return	0.0074	0.0115	0.0145	0.0146	0.0345	0.0271
						(23.62)
Ab Return	0.0030	0.0071	0.0101	0.0102	0.0301	0.0271
						(24.51)
FF3F Alpha	0.0001	0.0019	0.0049	0.0061	0.0271	0.0271
	(0.29)	(3.35)	(7.56)	(8.08)	(26.94)	(24.12)
FF4F Alpha	0.0004	0.0024	0.0055	0.0070	0.0285	0.0285
	(0.77)	(4.20)	(8.54)	(9.30)	(28.38)	(25.36)

Table 5 - Fama-MacBeth (1973) Regressions: Combined Exchanges

The table reports average estimates from the following equation using monthly observations.

$$Return_{i,t+1} = \beta_0 + \beta_1 Beta_{i,t} + \beta_2 ln(Size)_{i,t} + \beta_3 ln(B/M)_{i,t} + \beta_4 Mom_{i,t} + \beta_5 ln(IdioVolt)_{i,t} + \beta_6 Spread_{i,t} + \varepsilon_{i,t+1}$$

The dependent variable is the abnormal return for stock *i* in month *t+1*. The independent variables are all measured at month *t* for stock *i*. *Beta* is the beta estimate from the Capital Asset Pricing Model. *Ln(Size)* is the natural log of market capitalization on the last trading day of each month (in $ thousands). *Ln(B/M)* is the natural log of the book-to-market ratio. *Mom* is the momentum effect calculated as the cumulative return of a stock for the previous six months. *Ln(IdioVolt)* is the standard deviation of the residuals from CAPM regressions. *Spread* is the monthly average of the Bid price less the Ask price in dollars. The regression is applied to each month of observations and then averaged over the time period. Column [1] reports estimates over the entire period (1995-2012). Column [2] reports estimates from the pre-decimalization period (1995-2001). Column [3] reports estimates from the post-decimalization period (2001-2012). Significance is indicated by t-statistics reported below each estimate.

Table 5 – Combined Exchanges			
	Excess Returns t+1		
	[1] - Entire	[2] – Pre	[3] - Post
Intercept	0.0166	-0.0022	0.0275
	(0.85)	(-0.06)	(1.24)
Beta	0.0015	0.0005	0.0021
	(1.45)	(0.45)	(1.43)
Ln(Size)	0.008	0.0024	-0.0001
	(1.63)	(2.68)	(-0.21)
Ln(B/M)	0.0045	0.0064	0.0035
	(7.18)	(5.47)	(5.12)
Mom	0.0099	0.0228	0.0029
	(2.83)	(3.45)	(0.85)
Ln(IdioVolt)	0.0043	0.0049	0.0041
	(0.95)	(0.56)	(0.80)
Spread	0.5160	0.5770	0.4809
	(11.57)	(10.98)	(7.90)

Table 6 - Fama-MacBeth (1973) Regressions: NYSE

The table reports average estimates from the following equation using monthly observations.

$$Return_{i,t+1} = \beta_0 + \beta_1 Beta_{i,t} + \beta_2 ln(Size)_{i,t} + \beta_3 ln(B/M)_{i,t} + \beta_4 Mom_{i,t} + \beta_5 ln(IdioVolt)_{i,t} + \beta_6 Spread_{i,t} + \varepsilon_{i,t+1}$$

The dependent variable is the abnormal return for stock *i* in month *t+1*. The independent variables are all measured at month *t* for stock *i*. *Beta* is the beta estimate from the Capital Asset Pricing Model. *Ln(Size)* is the natural log of market capitalization on the last trading day of each month (in $ thousands). *Ln(B/M)* is the natural log of the book-to-market ratio. *Mom* is the momentum effect calculated as the cumulative return of a stock for the previous six months. *Ln(IdioVolt)* is the standard deviation of the residuals from CAPM regressions. *Spread* is the monthly average of the Bid price less the Ask price in dollars. The regression is applied to each month of observations and then averaged over the time period. Column [1] reports estimates from the pre-decimalization period (1995-2001). Column [2] reports estimates from the post-decimalization period (2001-2012). Significance is indicated by t-statistics reported below each estimate.

Table 6 – NYSE		
	Excess Returns t+1	
	[1] – Pre	[2] - Post
Intercept	-0.0266	0.0298
	(-0.88)	(1.31)
Beta	0.0000	0.0009
	(0.01)	(0.49)
Ln(Size)	0.0025	-0.0008
	(3.10)	(-1.66)
Ln(B/M)	0.0031	0.0008
	(4.81)	(1.36)
Mom	0.0151	0.0056
	(2.82)	(1.04)
Ln(IdioVolt)	-0.0008	0.0034
	(-0.13)	(0.72)
Spread	0.1530	0.1659
	(4.22)	(1.03)

Table 7 - Fama-MacBeth (1973) Regressions: NASDAQ

The table reports average estimates from the following equation using monthly observations.

$$Return_{i,t+1} = \beta_0 + \beta_1 Beta_{i,t} + \beta_2 ln(Size)_{i,t} + \beta_3 ln(B/M)_{i,t} + \beta_4 Mom_{i,t} + \beta_5 ln(IdioVolt)_{i,t} + \beta_6 Spread_{i,t} + \varepsilon_{i,t+1}$$

The dependent variable is the abnormal return for stock *i* in month *t+1*. The independent variables are all measured at month *t* for stock *i*. *Beta* is the beta estimate from the Capital Asset Pricing Model. *Ln(Size)* is the natural log of market capitalization on the last trading day of each month (in $ thousands). *Ln(B/M)* is the natural log of the book-to-market ratio. *Mom* is the momentum effect calculated as the cumulative return of a stock for the previous six months. *Ln(IdioVolt)* is the standard deviation of the residuals from CAPM regressions. *Spread* is the monthly average of the Bid price less the Ask price in dollars. The regression is applied to each month of observations and then averaged over the time period. Column [1] reports estimates from the pre-decimalization period (1995-2001). Column [2] reports estimates from the post-decimalization period (2001-2012). Significance is indicated by t-statistics reported below each estimate.

Table 7 – NASDAQ		
	Excess Returns t+1	
	[1] – Pre	[2] - Post
Intercept	-0.0226	0.0434
	(-0.59)	(1.81)
Beta	0.0015	0.0025
	(1.29)	(1.70)
Ln(Size)	0.0047	-0.0003
	(3.87)	(-0.40)
Ln(B/M)	0.0096	0.0065
	(6.20)	(6.77)
Mom	0.0212	0.0029
	(3.07)	(0.90)
Ln(IdioVolt)	0.0050	0.0055
	(0.48)	(1.00)
Spread	0.7229	0.4404
	(15.92)	(7.50)