THE JOURNAL OF FINANCE • VOL. XLVII, NO. 2 • JUNE 1992

The January Anomaly: Effects of Low Share Price, Transaction Costs, and Bid-Ask Bias

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ABSTRACT

The January effect is primarily a low-share price effect and less so a market value effect. In the recent 1977–1986 period, after-transaction-cost raw and excess January returns are lower on low-price stocks than on high-price stocks. Failure of informed traders to eliminate significantly large before-transaction-cost excess January returns on low-price stocks is potentially explained by higher transaction costs and a bid-ask bias. At the least, the January anomaly found in prior tests is not persistent, and thereby, not likely to be exploitable by typical investors.

NUMEROUS AUTHORS PROVIDE EVIDENCE supporting the view that the January anomaly is a firm size phenomenon. However, indirect evidence also exists that share price may dominate firm size in explaining the January anomaly. For example, Jaffe, Keim, and Westerfield (1989) still find share price significant in explaining abnormal January returns after control for firm size. Kross (1985) concludes that the size effect is primarily a price effect. Transaction costs, degree of neglect, misassessment of risk, and infrequent trading have been shown to partially explain the positive abnormal returns on small firms stocks. These characteristics are equally, if not more, applicable to low-price stocks. The price effect explanation of the January anomaly may be consistent with the tax-loss-selling and the gamesmanship hypotheses. Both hypotheses predict a turn-of-the-year effect resulting in high January returns for depressed stocks, which are potentially dominated by low-price stocks. Furthermore, evidence of a positive turn-of-the-year bid-ask effect in returns of low-price stocks has also been suggested to overestimate the January anomaly. Despite all this suggestive evidence supporting a possible price effect explanation of the January anomaly, no direct evidence is available to answer the empirical question on whether the January anomaly is more dissipated with control for a price effect than control for a firm size effect.

This paper documents that low share price stocks earn abnormal returns in January before transaction costs. This effect appears to be stable over time

*Bhardwaj is from Winthrop College and Brooks is from the University of South Carolina. The authors wish to thank Scott Harrington, Edward Miller, William Moore, Rodney Roenfeldt, Ronald Rogers, René Stulz (editor) and an anonymous reviewer for helpful comments. We are grateful to the College of Business Administration at the University of South Carolina for its financial support.

and to subsume the result that small firm stocks earn abnormal returns in January. Once transaction costs and the bid-ask bias in computed returns are taken into account, however, no positive abnormal returns are found in the recent 1977–1986 period for holding periods up to two years. Profitable exploitation of the January anomaly by investors appears to be limited. Abnormal returns are only possible if investors can accurately predict subperiods associated with excess returns after consideration of both transaction costs and a bid-ask bias. Although the 1967–1976 period appears to have offered excess January returns, evidence that this profit opportunity was predictable has not been forwarded.

This study differs from other related studies in several ways. First, all NYSE and AMEX stocks are grouped into a 5×5 matrix of portfolios based on market value quintiles and pre-specified stock price ranges over the twenty-year period, 1967–1986. In contrast, Jaffe, Keim, and Westerfield (1989) use stock price-based quintiles rather than specific price ranges and use regression-based analysis, where firm size and stock price are highly correlated independent variables.

Second, both estimates of brokerage commissions and bid-ask spreads are derived from actual end-of-the-year transactions for each of the several share-price-based samples. The percentage transaction cost per trade is found to be inversely related to share price. This transaction cost relationship is then used to investigate whether or not typical investors are able to obtain windfall gains from trading in low-price stocks after consideration of transaction costs. The estimates of transaction costs are obtained to duplicate more closely investors' costs than those used in prior studies. After-transaction-cost excess returns estimates may be less subject to misestimation if transaction costs are derived based on share price as opposed to market value. This should hold if share price, rather than firm size, is more related to the dollar value of the trade, stock price volatility and thinness of trading. Inconsistency in results exists between prior studies by Stoll and Whaley (1983) and Schultz (1983). Only Schultz finds statistically significant after-transaction-cost excess returns for small firm stocks. The difference in results could be attributed to underestimation of transaction costs. The average share price of the smallest decile of NYSE and AMEX stocks in the Schultz sample is considerably lower compared to the average share price of the smallest decile of NYSE stocks examined by Stoll and Whaley (1983). The estimates of transaction costs in these studies are derived from firm-size-based bid-ask spreads and minimum commission rates. The minimum commission rates come from the NYSE Commission Schedule for the average dollar transaction in that year for all NYSE stocks during a year. Underestimation of costs is therefore likely because of use of minimum firm size based transaction costs rather than the higher than average costs documented in low-price stock transactions. The impact is more pronounced in Schultz's study where lowest priced AMEX stocks would have higher bid-ask spreads and commission rates.

Third, a buy-and-hold portfolio strategy recommended by Blume and

Stambaugh (1983) and Roll (1983) is used in the current study. Both of these studies demonstrate that frequent portfolio rebalancing implied in many earlier studies materially overstates the computed returns on small stocks due to a bid-ask effect that can be eliminated using a buy-and-hold strategy.[1] Blume and Stambaugh (1983) also find the January size effect with a buy-and-hold strategy to be approximately one-half the level found with a daily rebalancing strategy. The significantly large after-transaction-cost excess returns on small firm stocks reported in the Schultz (1983) study which employs a daily rebalancing procedure are, therefore, overstated. Reinganum (1983b) and Keim (1987) still find positive pre-transaction-costs abnormal returns for small firm stocks even with the recommended buy-and-hold strategy. In the present study, investors are unable to exploit the January anomaly after consideration of transaction costs. Unlike other transaction costs adjusted return studies, the overstatement of excess returns from a turn-of-the-year bid-ask bias is also documented. The bias is large for low-price stocks even with a buy-and-hold portfolio strategy and is found to be a material factor that contributes to the observed January anomaly.

Finally, a more recent time period is examined to see if the prior observed January anomaly is persistent. To be exploitable by investors, an anomaly must persist over time or be predictable. The results over the more recent period confirm that the January anomaly is not found in the 1977–1986 period. This evidence leads to the conclusion that there is no investor-exploitable January anomaly.

The structure of the paper is as follows. Section I demonstrates that the January anomaly is a low-price stock-induced phenomenon and is not as well explained as a small firm phenomenon. In Section II, we show that in a recent period (1982–1986) typical investors were unable to achieve positive after-transaction-cost abnormal returns by investing in low-price stocks over holding periods from one day to two years. Section III provides evidence that observed returns on low-price stocks are overstated due to a turn-of-the-year bid-ask effect. Section IV concludes.

I. The January Price Effect

A. Data and Methodology

Common stock returns and the returns on the equally weighted portfolio of all NYSE and AMEX stocks are obtained from the daily CRSP tapes. Year-end shares outstanding and share price information on NYSE and AMEX stocks are obtained from the Standard & Poor's Compustat annual primary, supplementary, tertiary, and research files. The data on the

[1] Daily rebalancing is employed in numerous earlier studies, including Reinganum (1981a,b, 1982) and Keim (1983). Lakonishok and Smidt (1984) also provide evidence that thinness of trading, a characteristic of small stocks, results in faulty estimation of returns, especially if a daily rebalancing procedure is used.

research file is included to decrease a possible survivorship bias. Tests cover the twenty-year period from January 1, 1967 to December 31, 1986.

Returns on twenty-five portfolios, cross-classified by market value of firm's equity and stock price are obtained each year by the following procedure.

1. Each year all NYSE and AMEX stocks with the previous year's ending price and shares outstanding information available from CRSP are included in the sample.
2. The company's size proxied by equity market value is determined as the share price times the number of shares outstanding. The stocks are ranked in ascending order based on firm-size and then divided equally into five size groups from low to high (S1 to S5). Within each size group, stocks are further divided into five price groups from low to high (P1 to P5), according to the closing price at the end of the prior year. The five price groupings are: less than or equal to \$5, \$5 to \$10, \$10 to \$15, \$15 to \$20, and more than \$20.
3. Returns on stocks within each size-price group are used to obtain a) the average return on the first trading day in January, $RJ1$, b) the average holding period return during the first five trading days in January, $RJ5$, and c) the average holding period return in January, RJ, for the twenty-five possible size-price portfolios.
4. Repeating steps 1 through 3 for each year in the twenty-year period, 1967–1986, yields up to twenty values of the three types of average January returns ($RJ1$, $RJ5$, and RJ) for each of the size-price portfolios. Portfolios with ten or more stocks are used in the tests.[2]

B. Results

Of the 39,556 stocks in the twenty-year sample, 69% are listed on the NYSE while 31% are AMEX stocks.[3] The relative proportion of NYSE listings also is directly related to both size and price rankings.

Table I contains the average holding period portfolio returns over the 1967–1986 period for the first trading day in January ($RJ1$), for the first five trading days in January ($RJ5$), and for the month of January (RJ). The pattern of returns is quite consistent; within each size group, the three January returns ($RJ1$, $RJ5$, and RJ) exhibit an inverse relation with stock price. The F-statistics in Table I in the far-right column consistently reject the null hypothesis that there is no variation in January returns across the five price-based portfolios within a particular size group. But within each price group, returns seem to have little or no relation to firm size; none of the

[2] The number of stocks in each of the size-price portfolios varies, but is not a function of time over the twenty-year period. The portfolio (S5, P1) did not contain at least ten stocks in any year and, therefore, did not enter the portfolio analysis. The returns are obtained by first averaging each year's returns across stocks in each size-price portfolio, and then averaging across the years 1967–1986 when the portfolio contained at least ten stocks.

[3] The proportion of AMEX securities by year remains fairly constant over the twenty-year period in the range of 29 to 34% with no discernible pattern.

Table I

Price Effect Versus Size Effect in January Returns

This table reports average holding period returns for the first day of January (*RJ*1), first five days of January (*RJ*5) and month of January (*RJ*) over the 20-year period, 1967–1986. Returns are on portfolios of NYSE- and AMEX-listed stocks cross-classified by firm size and stock price. The market value of firm's equity is used to proxy the firm size. *F*-statistic tests are for the null hypothesis that there is no variation in returns across the five price groups within a particular size group (last column) and across the five size groups within a particular price group (last three rows). The number of years when at least ten securities enter a size-price cell are provided.

		Price Group					
Size Group		P1 ≤ \$5	\$5 < P2 ≤ \$10	\$10 < P3 ≤ \$15	\$15 < P4 ≤ \$20	\$20 < P5	*F*-statistic[a]
S1	*RJ*1	0.0364	0.0152	0.0075	0.0062	0.0067	12.52†
(Smallest)	*RJ*5	0.1015	0.0511	0.0254	0.0228	0.0125	9.92†
	RJ	0.1856	0.1085	0.0630	0.0542	0.0222	7.23†
	Years	19	20	17	14	7	
S2	*RJ*1	0.0272	0.0182	0.0094	0.0059	0.0023	5.68†
	*RJ*5	0.0791	0.0496	0.0311	0.0254	0.0114	5.43†
	RJ	0.1337	0.1013	0.0651	0.0567	0.0372	3.46*
	Years	18	20	20	19	17	
S3	*RJ*1	0.0323	0.0171	0.0099	0.0050	0.0010	5.91†
	*RJ*5	0.0708	0.0513	0.0336	0.0211	0.0109	3.61†
	RJ	0.1627	0.0931	0.0648	0.0452	0.0327	3.26*
	Years	8	18	19	20	19	
S4	*RJ*1	0.0555	0.0068	0.0086	0.0059	0.0002	3.94†
	*RJ*5	0.1306	0.0456	0.0332	0.0262	0.0082	4.17†
	RJ	0.4290	0.0955	0.0529	0.0498	0.0253	6.69†
	Years	1	12	17	19	20	
S5	*RJ*1	—	0.0620	0.0100	0.0051	−0.0017	7.73†
(Largest)	*RJ*5	—	0.1315	0.0358	0.0191	0.0026	6.34†
	RJ	—	0.3103	0.0669	0.0365	0.0123	5.22†
	Years	0	1	12	17	20	
F-statistic[b]	*RJ*1	0.49	2.14	0.08	0.04	1.30	
	*RJ*5	0.47	0.73	0.17	0.15	0.31	
	RJ	1.38	1.18	0.09	0.22	0.41	

[a] Degrees of freedom range from 4, 89 to 3, 46.
[b] Degrees of freedom range from 3, 42 to 4, 84.
* Significant at the 5% level.
† Significant at the 1% level.

F-statistics in the three bottom rows are significant at a 10% level.[4] Non-January returns (not reported) are not related to either stock price or firm size at conventional significance levels.

The results for individual years (not reported) also suggest a strong relationship between stock price and January returns, while little or no relationship between firm size and January returns is found. Keim (1983) and Brown, Kleidon, and Marsh (1983) find instability and reversals in the firm size anomaly during the years studied. The instability is not found when examining the price effect. In examining the yearly results, we find a continuing, stable, and strong low-price January effect in each of the twenty years, 1967–1986. This evidence of a consistent January price effect across years also supports the contention that the January anomaly is primarily a price effect and not a size effect.

C. Discussion

The results of the tests on price effect versus size effect demonstrate that the January effect is essentially a low-price phenomenon. The price effect explanation of abnormally large January returns is intuitively appealing for several reasons. Both the tax-loss-selling hypothesis (Wachtel, 1942) and the gamesmanship hypothesis (Haugen and Lakonishok, 1987) predict high observed returns on low-price stocks in January if selling pressure on these stocks dissipates and buying pressure increases at the beginning of the year. Rock (1988) models an environment in which a January effect is found when intermediaries build larger inventories of stocks at the close of the year. The apparent underpricing can reach one-half of the sum of both the spread and round-trip commission. This underpricing is consistent with the absence of profit opportunities. Consistent with Rock's position, Ritter (1988) provides evidence of a selling pressure in December and a buying pressure in January on small firm stocks. Considering other characteristics of low-price stocks, e.g., high transaction costs, low liquidity, and large turn-of-the-year bid-ask bias, the observed large positive returns on low-price stocks in January may be illusory even for informed investors.

[4] A supplemental test uses a two-stage residual regression technique similar to the one employed by Chen (1983). In the first-stage regression, each return ($RJ1$, $RJ5$, and RJ) exhibits a statistically insignificant relation to firm size measured by the natural logarithm of firm's equity market value, but a significant negative relation to stock price. In the second-stage regression, the residuals derived from the first-stage regressions of January returns on firm size exhibit a statistically significant negative relation with stock price. This evidence indicates that stock price provides additional information about January returns that is not captured by firm size. Alternatively, residuals derived from the first-stage regression of January returns on stock price do not exhibit any relationship with firm size. Thus, firm size provides no marginal contribution in explaining January returns.

Two additional tests are performed using the "within-groups" method to confirm the initial results. Cook and Rozeff (1984) suggest this procedure over the independent groups ranking procedure we employ in the first test. With this method, all twenty-five portfolios in each year have an almost equal number of stocks. The results from the two within-groups tests continue to support the results of the independent groups ranking used as the primary test. Detailed information on the three supplemental tests is available from the authors upon request.

If the stock price is the fundamental factor underlying the January effect, a strong, spurious relation between January returns and firm size would be observed in a study that does not specifically control for difference in stock prices. Arguments that have been offered in the past to explain the size anomaly (based on transaction costs, degree of neglect, misassessment of risk, and infrequent trading) are probably equally, if not more, applicable to low-price stocks. Replication of earlier studies, using a share price variable, is necessary in order to reaffirm or deny the significance of these characteristics of small stocks. For example, prior findings of a neglected firm effect (see, for example, Barry and Brown (1984)) may merely be reflecting a second proxy for share price that is not adequately reflected when firm size is used as a control variable.

The evidence of large January returns for low-price stocks suggests that the impact of a buy-and-hold strategy and transaction costs on January returns should be examined in a sample of low-price stocks rather than small firm stocks.

II. Transaction Costs

Explicit consideration of transaction costs, including the dealer's bid-ask spread and broker's commissions, is needed to determine if short- or long-term excess returns are obtainable for typical investors.[5] Both before- and after-transaction-cost returns on portfolios of stocks in different price ranges are examined in this section. The five stock price ranges are the same as described earlier in Section I. The transaction cost tests are performed during a five-year period, 1982–1986. The data available to us on bid-ask prices required for the transaction cost tests were restricted to this five-year period. This study is a partial supplement to and expansion of the Stoll and Whaley (1983) and Schultz (1983) studies that examine the after-transaction-cost excess returns on portfolios based solely on firm size.

A. Estimates of Bid-Ask Spreads and Commissions

First, estimates of bid-ask spreads are derived for each of five stock price groups and the market proxy group. The following procedure is used.

1. Five trading days are randomly selected, one from each year of the 1982 through 1986 test period. The days are September 24, 1982, May 17, 1983, March 6, 1984, August 22, 1985, and June 25, 1986.
2. On each of these five days, closing bid and ask prices are obtained from *Francis Emory Fitch Inc.'s Daily Market Publications—Stock Quotations on the New York Stock Exchange* for twenty randomly selected stocks in each of the five price ranges used in the prior test. This yields 100 bid

[5] Floor traders, dealers and specialists may still potentially obtain excess returns while typical investors may not have an ability to capture these gains. However, if the bid and ask spread and brokerage commissions are just sufficient to cover, on average, long-run marginal costs of the dealers and brokers, they may not have any favorable position relative to the typical investor. Rock's (1988) position must also be considered.

and ask prices for each of the five price ranges. For the market proxy group, twenty additional stocks are randomly selected, irrespective of price, on each of the five days.[6]

3. For each stock, the difference between the closing ask and bid prices is divided by the average of the ask and bid prices to determine the stock's percentage spread. The average spread is obtained by an equal weighting of spreads across the 100 stocks within each of the six bid-ask spread estimate stock samples.

Panel A of Table II provides descriptive information on the six bid-ask spread estimate samples. Bid-ask spreads are inversely related to share price when examined across the five stock price ranges. Average estimated spread for the lowest price range sample, containing up to $5 stocks, is 5.953%; the highest price range sample of greater than $20 stocks has an average spread of 0.899%. The corresponding average spread for the market proxy sample is 1.640%.

Next, the estimates of commission rates are derived. The closing price and the volume of the last trade reported in *Francis Emory Fitch Inc.'s Daily Market Publications—Stock Sales—New York Stock Exchange Issues* are collected for a second set of six stock groups, e.g., one for each price range and one for the market proxy. The 100 stocks in each group are obtained by a random selection of 20 stocks from each of the five years, 1982-1986. The closing transaction prices and trading volumes on the trading day prior to the last trading day in December are obtained for each stock. The commission schedule used by a prominent discount broker during the test period is used to determine the two-way commission as a percentage of the transaction value for each of the 100 transactions in each stock group.[7] An equally weighted average of percentage commission rate across the 100 securities is then derived for each of the six commission rate estimate stock samples. The

[6] A spread derived from randomly selected data over the sample period, rather than one at the end of the year, is used to reduce a possible bias if larger spreads are encountered at the turn-of-the-year. However, the consequence of the bias is viewed as minimal since the average turn-of-the-year spread for a sample of 2,100 observations of stock prices up to $5 was 6.090% compared to 5.953% in the randomly selected dates sample.

[7] The commission schedule is subject to a $34.00 overriding minimum, an otherwise minimum charge of $0.08 per share on the first 900 shares plus $0.04 per share thereafter, and maximum of $49.00 on the first 100 shares and $0.45 per share thereafter. Commissions, subject to the above boundary conditions, are then as follows:

Dollar Volume (V)	Commission	
$0-2,500	$ 19	+.016V
2,501-6,000	44	+.006V
6,001-22,000	62	+.003V
22,001-50,000	84	+.002V
50,001-500,000	134	+.001V
500,001+	234	+.008V

Stocks less than $1.00 have commissions of $34.00 + .04V.

trading day prior to the last trading day in December is selected to gather volume and trade sizes to reflect actual trade sizes and commission rates applicable to participants engaged in the end-of-the-year and January transactions. Confirming the need to use end-of-the-year trading volume, Lakonishok and Smidt (1984) find the dollar trading volume of their lowest activity decile of stocks to be about three times larger on the next to the last trading day in December relative to an October through November trading period. Panel B of Table II provides descriptive information on the six commission rate estimate samples. Round-trip commissions are inversely related to share price. Median per-trade volume and both mean and median dollar transaction size are directly related to share price.

B. Estimation of Holding Period Returns

Holding period returns are examined over the five-year period 1982–1986 for a sample of all NYSE and AMEX stocks with daily returns available on the CRSP tape.[8] At the beginning of each year in the 1982–1986 period, selected stocks are divided into five price ranges as specified earlier. Using the buy-and-hold portfolio strategy recommended by Blume and Stambaugh (1983), the before-transaction-cost returns, R_T, for each of the five price range portfolios and total portfolio of all stocks over various holding periods from one day through two years are derived as:

$$R_T = \frac{1}{N} \sum_{i=1}^{N} r_{iT}, \tag{1}$$

where N is the number of stocks in the portfolio and r_{iT}, the T-days holding period return on stock i obtained by compounding daily returns r_{it}, for $t = 1$ to T, as:

$$r_{it} = \left(\prod_{t=1}^{T} [1 + r_{it}] \right) - 1. \tag{2}$$

The after-transaction-cost portfolio returns, R_T^*, for various holding periods are derived from the holding period returns on individual stocks net of transaction costs as:

$$R_T^* = \frac{1}{N} \sum_{i=1}^{N} r_{iT}^*, \tag{3}$$

[8] Fifteen corrections were made to the CRSP returns used in the tests. We examined all returns entering our analysis representing greater than a 100% gain or 50% loss over one trading day. *S&P Daily Stock Price Records* and *S&P Stock Reports* are used to examine for possible errors. Fourteen errors represented overstatements while one understated returns. The average CRSP daily return over the fifteen error observations is 634% while the corrected average return is −1.5%. Most of these errors in CRSP returns are the result of a failure to make appropriate adjustments for reverse stock splits and reorganizations out of bankruptcy where shareholders receive one new share for multiple older shares. Errors ranged from −83.1 to 3858.1% and predominantly occurred in low-price stocks. Corrections were viewed essential in possibly reducing a bias toward faulty overstatement of the low-price effect.

Table II

Characteristics of Stock Samples

Information on the randomly selected stock samples used to estimate bid-ask spreads and commission rates for each of the six price range groups including the market proxy group is provided below in Panels A and B. The bid-ask spread estimate samples comprise 100 randomly selected stocks (20/year, 1982-1986) for each price range group and market proxy group. Bid-ask spread is computed by stock as: $S = (A - B)/(A + B)/2$, where A and B are ask price and bid price, respectively. The commission rate estimate samples are also comprised of 100 randomly selected stock transactions (20/year, 1982-1986) for each price range group, but the last transaction information, closing price and number of shares traded, used to compute commission rate are obtained for the trading day prior to the last trading of the previous year. The commission rates estimates for a round-trip transaction (purchase plus sale) are derived from the commission rate schedule provided by a prominent discount broker. Average trade volume in number of shares and trade sales in dollars per sample transaction by price group is also provided. Panel C provides information on sample size and beta for the holding period return sample by price range group. The OLS beta is computed every year, 1982-1986, for each sample stock from daily returns for one year using an ordinary least squares regression of stock returns against returns on the CRSP equally weighted market portfolio that includes dividends. The estimate of Scholes and Williams (1977) beta is also provided. The reported values of betas are equally weighted averages of individual security betas over the five-year study period, 1982-1986.

Sample		Price Range Group					Market Proxy Group
		$P \leq \$5$	$\$5 < P \leq \$10$	$\$10 < P \leq \$15$	$\$15 < P \leq \$20$	$\$20 < P$	
Panel A. Bid-Ask Spread Estimate Sample							
Sample Size		100	100	100	100	100	100
Price/Share (Bid)	Mean	\$3.230	\$8.037	\$12.903	\$17.727	\$ 43.113	\$25.852
	Median	3.250	8.094	13.000	17.719	35.281	22.938
	SD	1.272	1.296	1.448	1.428	21.966	16.987
	Maximum	5.000	10.000	15.000	20.000	128.875	93.625
	Minimum	0.531	5.188	10.125	15.063	20.250	1.438
Bid-Ask Spreads (%)	Mean	5.953	2.465	1.791	1.400	0.899	1.640
	Median	5.128	2.548	1.827	1.389	0.806	1.198

Table II—*Continued*

Sample		Price Range Group					Market Proxy Group
		$P \leq \$5$	$\$5 < P \leq \$10$	$\$10 < P \leq \$15$	$\$15 < P \leq \$20$	$\$20 < P$	
Panel B. Commission Rate Estimate Sample							
Sample Size		100	100	100	100	100	100
Price/Share (Close)	Mean	\$2.838	\$7.946	\$12.534	\$17.464	\$36.065	\$ 27.455
	Median	3.000	8.000	12.375	17.438	32.375	23.938
	SD	1.465	1.418	1.560	1.425	15.345	31.039
	Maximum	5.000	10.00	15.000	20.000	89.750	116.875
	Minimum	0.281	5.13	10.188	15.125	20.125	0.625
Commission Rate (%)	Mean	14.434	3.498	3.379	2.562	1.435	2.813
	Median	7.407	2.674	2.917	2.027	1.289	1.283
Trade Volume	Mean	1,995	1,679	1,660	3,737	2,874	3,500
	Median	500	750	400	500	500	1,000
Trade Sales	Mean	\$4,500	\$12,923	\$21,521	\$62,616	\$115,566	\$128,200
	Median	1,250	5,938	5,125	8,688	17,988	20,300
Panel C. Holding Period Return Sample							
Total Number of Stocks		990	1,404	1,474	1,411	4,586	9,865
Average Beta							
OLS		0.998	1.038	0.993	0.982	1.046	1.024
Scholes-Williams		1.004	1.030	0.991	0.982	1.043	1.023

SD = standard deviation.

where r^*_{iT} is the T-days holding period return on stock i after netting transaction costs incurred on the acquisition and liquidation dates, and is determined by:

$$r^*_{iT} = (1 + r_{iT}) \frac{(1 - [s_{li} + c_{li}]/2)}{(1 + [s_{ai} + c_{ai}]/2)} - 1. \quad (4)$$

The above adjustment in equation (4) assumes that transaction costs equal to half the sum of both the relative bid-ask spread and round-trip commission are incurred for each buy or sell transaction. The terms s_{ai} and s_{li} represent relative spreads for stock i on acquisition and liquidation days, respectively, based on the price range the stock occupied on these days, and are derived from Panel A of Table II. The terms c_{ai} and c_{li} are the corresponding round-trip commission rates on acquisition and liquidation days similarly derived from Panel B of Table II. Thus, if a stock was acquired at \$9.50, the acquisition day transaction costs for this security would be (2.548% + 2.674%)/2 = 2.611%, where 2.548% and 2.674% are the median estimates of relative spread and round-trip commission rate for stocks in the \$5 to \$10 price range.[9]

The number of stocks in the holding period return sample for each of the five price range portfolios and the total portfolio are given in Panel C of Table II, together with the OLS and Scholes and Williams (1977) betas. Although not shown in Panel C of Table II, stocks in each Panel C price range portfolio are approximately evenly distributed over the years 1982–1986. Thus, the Panel C results on specific portfolios are not dominated by a given year's results. The betas for each price category in Table II are not materially different from one. For this reason, a market adjusted model is used to derive the excess returns. Any bias induced by understating the risk of low-price stocks would be toward overstating excess returns and would induce a bias away from verifying that informed investors are unable to obtain excess returns from low-price stocks after consideration of transaction costs.[10]

C. Holding Period Returns Results

Table III provides holding period returns and excess returns, both before and after transaction costs on the five price range portfolios and the total proxy market portfolio of all stocks in the five price range portfolios. Results are presented over six holding periods from one day through two years.

[9] Median transaction costs are used in preference to mean transaction costs since they are lower and are, thereby, less likely to bias results in favor of finding a transactions cost explanation.

[10] The intervalling effect documents that betas for small firm stocks increase while betas of large firm stocks decrease as the return measurement interval increases. See Cohen, Hawawini, Maier, Schwartz, and Whitcomb (1983) and Handa, Kothari, and Wasley (1989) for more information.

Column 2 of Table III contains the portfolio returns, R_T, computed using equation (1) for the six holding periods from one day to two years for each of the five price range portfolios and the total market portfolio. Before considering transaction costs, lower price stocks appear to outperform higher price stocks only over time horizons of up to and possibly including one year.[11]

The holding period returns net of transaction costs reported in column 3 of Table III are derived using equation (3). Positive returns are not available in any of the five price range portfolios from the first trading day of the year through the month of January for typical investors. The after-transaction-cost holding period returns are negative for all portfolios through January except for the \$5 to \$10 price portfolio, where the positive return of 0.5% is statistically insignificant. For the six-month holding period, no relationship between stock price and after-transaction-cost return is observed. For the holding periods from one year through two years, after-transaction-cost returns are positively related to stock price. Thus, higher price stocks tend to outperform lower price stocks during the two longest holding periods examined.

D. Excess Returns Results

The before-transaction-cost excess returns for different portfolios and holding periods are presented in column 4 of Table III. From one day to one year holding periods, the lower price stocks outperform higher price stocks. When the time horizon reaches two years, the lower price stocks appear to be underperforming the higher price stocks.

The excess returns after transaction costs reported in column 5 consider the differential transaction costs for holding a specific price range portfolio versus holding the total portfolio as a market proxy. The portfolios of lower price stocks in almost all instances underperform the market portfolio over all holding periods after consideration of differential transaction costs.[12] This phenomenon continues to hold when the mean transaction costs from Panel A and B of Table II are used instead of the median transaction costs in equation (4). An exception occurs with the six-month results; however, overperformance by the lowest price group is still not significant at the 5% level.

The excess return on the two lowest price groups is significantly negative for most of the holding periods at the 1 and 5% significance levels, as shown

[11] Results with the daily rebalancing procedure using an arithmetic mean procedure (not reported) are consistent with prior results by Reinganum (1981a), Keim (1983) and several other size-effect studies. Low-price stocks dominate high-price stocks during all holding periods.

[12] Firms that were delisted or where trading had ceased through the year-end were not included in the primary tests. Due to a potential survival bias, tests were rerun with continuous trading only required through the first five days of January. If a firm ceased trading and did not resume before the end of holding period, the available funds were reinvested in the market portfolio with no additional transaction costs considered. Returns are usually within a multiplier of 0.98 to 1.02 of the returns presented in column 2 of Table III and never more variant than a multiplier of from 0.94 to 1.06. Revised results were similar to the primary test results reported in this paper with no differences in conclusions.

Table III

Before- and After-Transaction-Cost Holding Period Returns and Excess Returns for Five Price Range Portfolios and a Proxy Market Portfolio During the 1982–1986 Period for Holding Periods of One Day Through Two Years

Before-transaction-cost holding period return R_T (in column 2), on a portfolio of N stocks is computed as

$$R_T = \frac{1}{N} \sum_{i=1}^{N} r_{iT},$$

where r_{it}, the T-days holding period return on stock i, is obtained by compounding daily returns r_{it}, for $t = 1$ to T. The after-transaction-cost holding period return, R_T^* (in column 3), on portfolio of N stocks is computed as

$$R_T^* = \frac{1}{N} \sum_{i=1}^{N} r_{iT}^*$$

where r_{iT}^*, the T-days holding period return after transaction costs on stock i, is derived as

$$r_{iT}^* = (1 + r_{iT}) \cdot \frac{(1 - [s_{li} + c_{li}]/2)}{(1 + [s_{ai} + c_{ai}]/2)} - 1.$$

The terms s_{ai} and s_{li} represent relative spreads for stock i on acquisition and liquidation days based on the stock price on these days and are derived from Panel A of Table II. The terms c_{ai} and c_{li}, the corresponding round-trip commission rates on acquisition and liquidation days, are obtained from Panel B of Table II. The before-transaction-cost excess returns, ER_T (in column 4) and after-transaction-cost excess return, ER_T^* (in column 5) are obtained by subtracting the holding period return on the total portfolio (market proxy) from the corresponding holding period returns (in columns 2 and 3, respectively) on each of the five price range portfolios.

Holding Period and Portfolio (1)	Returns Before Transaction Costs R_T (2)	Returns After Transaction Costs R_T^* (3)	Excess Returns Before Transaction Costs ER_T (4)	Excess Returns After Transaction Costs ER_T^* (5)
First Day of January				
≤ \$5	2.3[a]	−9.7[a]	2.2[a]	−5.7[a]
\$5 < P ≤ \$10	0.7[a]	−4.5[a]	0.6[a]	−0.5[a]
\$10 < P ≤ \$15	0.3[a]	−4.3[a]	0.2[a]	−0.4[a]
\$15 < P ≤ \$20	−0.1[b]	−3.5[a]	−0.2[a]	0.5[a]
> \$20	−0.5[a]	−2.6[a]	−0.6[a]	1.4[a]
Total Portfolio	0.1[a]	−4.0[a]	0.0	0.0
First 5 Days of January				
≤ \$5	5.9[a]	−6.3[a]	4.2[a]	−3.9[a]
\$5 < P ≤ \$10	3.0[a]	−2.3[a]	1.2[a]	0.0
\$10 < P ≤ \$15	2.1[a]	−2.6[a]	0.3	−0.2
\$15 < P ≤ \$20	1.4[a]	−2.0[a]	−0.4[a]	0.4[b]
> \$20	0.5[a]	−1.6[a]	−1.2[a]	0.8[a]
Total Portfolio	1.8[a]	−2.4[a]	0.0	0.0
Month of January				
≤ \$5	10.6[a]	−1.9[a]	7.0[a]	−1.4[b]
\$5 < P ≤ \$10	6.0[a]	0.5	2.3[a]	1.1[a]
\$10 < P ≤ \$15	3.7[a]	−1.0[a]	0.1	−0.4
\$15 < P ≤ \$20	3.3[a]	−0.1	−0.4	0.4

Table III—*Continued*

Holding Period and Portfolio (1)	Returns Before Transaction Costs R_T (2)	Returns After Transaction Costs R_T^* (3)	Excess Returns Before Transaction Costs ER_T (4)	Excess Returns After Transaction Costs ER_T^* (5)
> \$20	1.6[a]	−0.6[a]	−2.1[a]	−0.0
Total Portfolio	3.7[a]	−0.5[a]	0.0	0.0
First 6 Months of the Year				
≤ \$5	21.9[a]	8.9[a]	9.4[a]	0.9
\$5 < P ≤ \$10	14.6[a]	8.8[a]	2.2[b]	0.8
\$10 < P ≤ \$15	10.2[a]	5.5[a]	−2.3[b]	−2.5[a]
\$15 < P ≤ \$20	12.2[a]	8.8[a]	−0.2	0.8
> \$20	10.5[a]	8.2[a]	−1.9[a]	0.2
Total Portfolio	12.4[a]	8.0[a]	0.0	0.0
One Year				
≤ \$5	23.5[a]	10.7[a]	2.7	−5.5[b]
\$5 < P ≤ \$10	19.3[a]	13.3[a]	−1.4	−2.9[b]
\$10 < P ≤ \$15	20.4[a]	15.4[a]	−0.4	−0.8
\$15 < P ≤ \$20	22.4[a]	18.8[a]	1.7	2.6[b]
> \$20	20.2[a]	17.7[a]	−0.5	1.5[a]
Total Portfolio	20.8[a]	16.2[a]	0.0	0.0
Two Years				
≤ \$5	38.6[a]	25.0[a]	−1.1	−9.6[a]
\$5 < P ≤ \$10	35.6[a]	29.0[a]	−4.1	−5.6[b]
\$10 < P ≤ \$15	39.7[a]	34.3[a]	−0.0	−0.4
\$15 < P ≤ \$20	42.4[a]	38.3[a]	2.7	3.6[b]
> \$20	40.4[a]	37.4[a]	0.7	2.8[a]
Total Portfolio	39.7[a]	34.6[a]	0.0	0.0

[a] Significant at the 1% level.
[b] Significant at the 5% level.

in column 5 of Table III. Also, the two highest price groups significantly outperform the market portfolio at the 1 and 5% levels for both the two shortest and the two longest holding periods. To a lesser extent, the same phenomenon is found when returns on the last trading day of the previous December are also included (not reported). Highest price stocks continue to exhibit positive excess returns during most holding periods.

E. Supplemental Tests

The results in column 5 of Table III indicate that as the holding period is increased, the excess return of low-price stocks become more negative and the excess return of high-price stocks are more positive. These findings are rather peculiar since low-price stocks have to be held for a longer period of time to cover their higher transaction costs. To determine if the above result is specific to the 1982–1986 period examined, the analysis was replicated during two separate ten-year periods, 1967–1976 and 1977–1986, using the transaction cost estimates from Table II for the 1982–1986 period. The

results are qualitatively the same for the most recent ten-year period, 1977–1986. Low-price stocks underperform high-price stocks during almost all holding periods and the excess return of low-price stocks are still more negative for longer holding periods of one and two years. We do find after-transaction-cost excess returns are statistically higher for lower price stocks than higher price stocks in the 1967–1976 period.[13] The more recent results may partially be attributed to investors' increasing interest in small stocks because of their positive abnormal performance in the past as reported in previous research. Alternatively, low-price stocks have higher positive skewness relative to the market that is not incorporated into our derivation of excess returns. This condition provides a biased understatement of excess returns on low-price stocks. The 1982–1986 results, however, are sufficient to question the continued existence of prior findings of a small-firm or low-price effect. An anomaly cannot be profitably exploited (and, one could argue, it does not even exist), if it is both sporadic and unpredictable.

III. The Bid-Ask Bias in Computed Returns

Computed returns on lower price stocks also may be overstated due to a turn-of-the-year bid-ask effect. Due to end-of-the-year portfolio rebalancing (Haugen and Lakonishok, 1987), and potential tax-loss-selling effect (Reinganum 1983a), trades at the turn-of-the-year may not occur randomly at bid and ask prices. For example, excess selling by investors at bid prices at the end of the year and excess buying in early January at ask prices due to the above reasons could lead to a greater incidence of bid transactions at the year-end and greater likelihood of ask transactions at the start of the year. A positive bid-ask bias in turn-of-year returns would be induced.[14] The bias would be manifested in all stocks that exhibit such a switching pattern, but would be largest for lowest price stocks where bid-ask spreads are known to be largest. This would cause the Table III results on low-price stocks to be overstated relative to high-price stocks.

Keim (1989) provides evidence of a higher probability of bid prices in late December and ask prices in early January. Keim examines the turn-of-the-year bid-ask effect by comparing bid-to-bid returns with closing price returns on OTC stocks over the five turn-of-the-years, 1984–1988. He finds that the difference in returns between the lowest and highest price decile of OTC stocks attributable to bid-ask bias is 1.1% to 2.0% on the two trading days surrounding the turn-of-the-year. For the lowest price AMEX and NYSE stock groups, using AMEX price decile cutoffs, Keim reports a bias in the range of 1.5% to 2.0% for 40 NYSE stocks examined over the 1988–1989

[13] The commission rates derived from the recent period of 1982–1986 are used to proxy the possibly higher commission costs of the 1967–1976 period. This potentially biases results toward overperformance by low-price stocks.

[14] Ritter's (1988) evidence on the turn-of-the-year shift from selling to buying by individual investors is consistent with the turn-of-the-year bid-ask effect.

turn-of-the-year. Bhardwaj and Brooks (1989) examine bid-ask bias in returns for a larger sample of 500 lowest price NYSE stocks comprising 100 stocks per year drawn at the beginning of the years 1982–1986. With an average stock price of \$4.48 versus Keim's average share price of \$0.82, the bid-ask bias on the first trading day of January is 0.72% as compared to 1.5–2.5% found for Keim's sample. Bhardwaj and Brooks (1989) provide evidence that the turn-of-the-year bid-ask bias is significant and persistent even beyond the fifth trading day of the year.

Based on the above findings, this section investigates the impact of the turn-of-the-year bid-ask effect in overstating the returns on our lowest price group, P1, containing up to \$5 stocks. This portfolio contains the stocks with the largest bid-ask spreads and is expected to have the largest positive bias in observed returns.

A. Description of Sample

At the beginning of each of the five years, 1982–1986, all NYSE stocks in the lowest price group, P1, are selected based on the following requirements. Both recorded closing prices as well as bid and ask closing prices for the last two trading days of the previous year and first five trading days of the year under consideration are required. The recorded closing prices are obtained from the *Standard and Poor's ISL Handbooks of Daily NYSE Price Quotations*. The bid and ask closing prices are from *Francis Emory Fitch Inc.'s Daily Market Publications—Stock Quotations on the New York Stock Exchange*. Only NYSE stocks are included in the sample since the *Emory Fitch* data only covers this market.

A total of 300 NYSE stocks comprise the final sample over the 1982–1986 period, distributed with 64, 47, 37, 80, and 72 stocks in the respective years.[15] The average stock price for the sample is \$3.19 and the relative spread is 6.09%.[16] To the extent that the AMEX stocks excluded from our sample have a lower average price and higher average spread than the NYSE stocks, the bid-ask bias in returns based on only the NYSE sample will underestimate the true bias in returns for the lowest price portfolio P1 of Section II.

B. Distribution of Bid, Ask, and Mixed Transactions

Table IV provides the distribution of bid, ask, and mixed[17] transactions around the turn-of-the-years, 1982–1986, for the sample. A systematic switch

[15] The lowest price group, P1, contained 990 stocks (Panel C, Table II). All of the 688 AMEX-listed stocks and two NYSE-listed stocks were excluded due to nonavailability of bid and ask prices.

[16] Relative spread is estimated as the difference between ask price and bid price divided by the average of ask and bid prices.

[17] A transaction is considered a bid transaction if the recorded closing price on a day is less than or equal to that day's closing bid price. If the recorded closing price exceeds or equals the closing ask price, the transaction is classified as an ask transaction. Remaining transactions are classified as mixed (bid or ask) transactions.

Table IV

Bid-Ask Effect: Distribution of Bid, Ask, and Mixed Transactions Around the Turn of Years, 1982-1986, for a Sample of All NYSE Listed Stocks Priced at $5 and Less

A transaction is considered a bid transaction if the recorded closing price on a day is less than or equal to that day's closing bid price. If the recorded closing price exceeds or equals the closing ask price, that transaction is classified as an ask transaction. Remaining transactions are classified as mixed (bid or ask) transactions. The excess probability of bids is defined as the probability of bid transactions minus the probability of ask transactions. Days −1 and 0 represent the last two trading days of the previous year. Days 1 to 5 are the first five trading days of the year.

Type of Transaction	Trading Day Relative to End of Year						
	−1	0	1	2	3	4	5
Bid	163	161	108	93	93	102	126
Ask	88	80	116	118	141	131	113
Mixed	49	59	76	89	66	67	61
Bid (%)	54.3	53.7	36.0	31.0	31.0	34.0	42.0
Ask (%)	29.3	26.3	38.7	39.3	47.0	43.7	37.7
Mixed (%)	16.4	19.6	25.3	29.7	22.0	22.3	20.3
Probability of Bids Minus Asks (%)	25.0	27.0	−2.7	−8.3	−16.0	−9.7	4.3

	Days −1 and 0	Days 1 to 5
Bid	324 (54.0%)	522 (34.8%)
Ask	168 (28.0%)	619 (41.3%)
Mixed	108 (18.0%)	359 (23.9%)
Mean Excess Probability of Bids	25.8%	−7.2%
t-statistic for H_0: Mean Excess Probability of Bids = 0	9.06[a]	−2.15[b]
Degrees of Freedom	9	24

[a] Significant at the 1% level.
[b] Significant at the 5% level.

from bids on the last two trading days in December to asks on the first few trading days in January is observed. On the last two trading days in December (Days −1 and 0), bids exceed asks by a margin of 324 to 168. In early January (Days 1 to 5), asks exceed bids by a margin of 619 to 522. A total of 600 transactions (300 stocks × 2 days) were available for the year-end comparison, while a total of 1,500 transactions (300 × 5 days) formed the sample for the beginning-of-the-year comparison. The probability of bids exceeds the probability of asks for Days −1 and 0 by 25.8% (t-value 9.06). The phenomenon reverses during Days 1 to 5 where asks exceed bids with a probability of 7.2% (t-value 2.15). This evidence of the likelihood of bids exceeding the likelihood of asks at year-end and the greater probability of asks in early January is consistent with the findings of Keim (1989).

C. Estimates of Bid-Ask Bias

The bid-ask bias in computed returns is estimated by employing a general bid-ask effect model. This model allows transactions to occur at bid or ask prices with different probabilities. The model is an extension of the Blume and Stambaugh (1983) model. The following assumptions are adopted for model derivation.

1. All stock market transactions pass through market makers, e.g., dealers and specialists. Thus, all stock trades occur either at dealers' ask or bid prices.[18]
2. Market makers unanimously agree on the quoted ask and bid price of each stock.
3. The unobserved true price of a stock is the average of the ask and bid prices, i.e., the true price $P = [A + B]/2$, where A and B are closing ask and bid prices at the close of period t. This assumption is consistent with Blume and Stambaugh (1983, p. 390).
4. The dealer's relative spread, $s = [A - B]/([A + B]/2)$, remains constant from period $t - 1$ to period t.
5. Only price changes are used to proxy for both true and computed returns in the bid-ask bias model.[19]

Under these assumptions, different possible outcomes of observed probabilities of the different transaction prices at the close of periods $t - 1$ and t for a stock that trades at both periods $t - 1$ and t are shown in Table V. In the table, the variables p and q are equal to the probabilities of bid transactions minus the probability of ask transactions at $t - 1$ and t, respectively. Both p and q are bounded $[-1, 1]$. For example, $p = 0$ for a stock indicates equal likelihood of bid and ask transactions at $t - 1$ and $p = 1$ indicates the

Table V

Transaction Price Outcomes and Probabilities for Ask (A) and Bid (B) for Transactions That Trade at Both t and $t - 1$

The variables p and q in the probability expressions represent excess probabilities of bid transactions at $t - 1$ and t, respectively. Excess probability of bids is defined as the probability of bid transactions minus the probability of ask transactions.

Period $t - 1$		Period t	
Transaction Price	Probability	Transaction Price	Probability
A_{t-1}	$0.5 - p/2$	A_t	$0.5 - q/2$
B_{t-1}	$0.5 + p/2$	B_t	$0.5 + q/2$

[18] Stoll and Whaley (1983) and Schultz (1983) adopt this assumption in calculating transaction costs when examining the small firm effect.

[19] The implied assumption of no dividends during the return estimation period simplifies the notation in the derivation of bid-ask bias. This assumption is not essential for the analysis (see Blume and Stambaugh 1983, p. 392).

occurrence of only bid transactions. The expected value of the computed return, $E(R_t)$, is therefore given by:

$$\begin{aligned} E(R_t) = {} & (.5 - p/2)(.5 - q/2)([A_t/A_{t-1}] - 1) \\ & + (.5 - p/2)(.5 + q/2)([B_t/A_{t-1}] - 1) \\ & + (.5 + p/2)(.5 - q/2)([A_t/B_{t-1}] - 1) \\ & + (.5 + p/2)(.5 + q/2)([B_t/B_{t-1}] - 1), \end{aligned} \tag{5}$$

and the true return, R_t, computed from the averages of ask-and-bid prices at the close of $t - 1$ and t is:

$$R_t = ([A_t + B_t]/2)/([A_{t-1} + B_{t-1}]/2) - 1. \tag{6}$$

With the constant spread assumption 4, the difference $E(R_t) - R_t$ obtained by subtracting equation (6) from (5), on simplification yields the following bid-ask effect model.[20]

$$\text{Bid-ask bias} = \frac{s^2(1 - pq)}{4 - s^2} + \frac{2s(p - q)}{4 - s^2}. \tag{7}$$

The bid-ask effect model described by equation (7) essentially collapses to the Blume and Stambaugh (1983) model with $p = q = 0$, under their assumption of random occurrence of bid and ask transactions. The expression of bid-ask bias using the Blume and Stambaugh model, therefore, becomes $s^2/(4 - s^2)$. The second term in equation (7), $2s(p - q)/(4 - s^2)$, accounts for additional bid-ask bias at the turn-of-the-year due to differential probability of bid and ask transactions. The estimates of bid-ask bias at the turn-of-the-year using our model may still be understated since the model assumes the true price is the midpoint between the bid and the ask prices. In a scenario described in Rock (1988), both the bid and ask prices at the end of December may be driven down to an extreme point where the ask price is equal to the true price.

From the distribution of bid, ask and mixed transactions for the sample of 300 NYSE stocks in Table IV, the excess probability of bids on day 0 is 27.4% ($p = 53.7\% - 26.3\%$) while the excess probability of bids on day 1 is -2.7% ($q = 36.0\% - 38.7\%$). The computed average spread for the sample stocks is 6.09%. With $p = 0.274$, $q = -0.027$ and $s = 0.0609$, the estimated bid-ask bias of returns on the first trading day of January is 1.01%. The corresponding estimates for bid-ask bias of returns on the sample of low-price NYSE stocks over the first two, three, four, and five trading days in January are 1.18, 1.42, 1.23, and 0.80%, respectively. For holding periods longer than five trading days with acquisition on Day 0 and liquidation on other than year ends, we can assume liquidation to occur randomly at bid or ask prices. With $p = 0.274$ and $q = 0$, i.e., bids exceeding asks on Day 0 by 27.4% and equal probability of bids and asks on the liquidation day, a bias of about 0.98% will

[20] The details of this derivation are available from the authors.

be induced in computed returns. For holding periods of exactly one and two years, the induced bias equals 0.09% in equation (7). Both acquisition and liquidation occur at the year-end and even though $p \neq 0$ and $q \neq 0$, the Blume and Stambaugh model provides an unbiased result since, in this case, $p = q$.

These results indicate that the computed returns on the low-price NYSE stocks are typically overstated by about 0.8 to 1.0% for holding periods less than one year due to the turn-of-the-year bid-ask effect. The actual bias for the combined sample of NYSE and AMEX stocks in the lowest price group in columns 2 and 3 of Table III could be more than 1.0% for holding periods less than one year. This is due to the exclusion of a large number of AMEX stocks from the bid-ask bias estimate sample. The AMEX stocks have much lower prices than NYSE stocks and are, thereby, likely to have higher percentage spreads and bid-ask biases.

Adopting a conservative estimate of 1.0% for the turn-of-the-year bid-ask bias in computed returns on lowest price stocks, the conclusions derived from after-transaction-cost returns and excess returns of Section II.C, D, and E remain unchanged. Lowest price stocks further underperform higher price stocks in the 1982–1986 and 1977–1986 periods. Alternatively, lowest price stocks sufficiently outperformed higher price stocks in the ten-year period 1967–1976 to more than cover the negative adjustment for the turn-of-the-year bid-ask bias.

IV. Conclusions

Findings in prior studies of significant positive abnormal returns for small firm stocks are potentially affected by incomplete consideration of the combination of price effect, transaction costs, portfolio strategy, and the turn-of-the-year bid-ask effect. By examining portfolios of NYSE and AMEX stocks cross-classified by firm size and stock price over the 1967–1988 period, the January anomaly is found to be a low-price phenomenon rather than a small firm effect. We argue that the stock price is the fundamental factor underlying the January effect. The conclusions of previous studies relating the January anomaly to a small firm effect may have resulted from inadequate control for differences in stock prices.

After consideration of differential transaction costs of low and high-price stocks during the 1982–1986 period, the low-price stocks appear to be dominated by high-price stocks over almost all holding periods of one day to two years. In fact, the low-price stocks are generally found to be associated with significant negative excess returns while the high-price stocks had significant positive excess returns. These results are dependent on the time period examined. Using our 1982–1986 estimates of transaction costs, we find that the low-price stocks outperformed the high-price stocks after consideration of transaction costs in the ten-year period, 1967–1976. Over the next ten-year period, 1977–1986, a reversal of this phenomenon occurs with high-price stocks dominating the low-price stocks. The readers are, therefore, cautioned

that these results of superior performance of high-price stocks in the recent period may not be transferable to other time periods and should not be used as a predictor of future performance of stocks. The same cautions are also raised against accepting conclusions of earlier studies where the small firm stocks appear to have been associated with large abnormal returns.

Finally, we demonstrate that a turn-of-the-year switch from excess probability of bids in late December to excess probability of asks in early January also induces a positive bid-ask bias in computed returns conservatively estimated at about 1%. The bias is materially large and statistically significant for low-price stocks. The bias persists for holding periods less than one year.

Our results are consistent with the assertion that for typical investors, the January anomaly of low-price stocks outperforming high-price stocks cannot be used to earn abnormal returns.

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