

# Stock Market Liquidity and the Cost of Issuing Equity <sup>\*</sup>

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# Stock Market Liquidity and the Cost of Issuing Equity

## Abstract

We show that stock market liquidity is an important determinant of the cost of raising external capital. Using a large sample of seasoned equity offerings, we find that, *ceteris paribus*, investment banks' fees are significantly lower for firms with more liquid stock. We estimate that the difference in the investment banking fee for firms in the most liquid quintile versus the least liquid quintile is about 101 basis points, or 21 percent of the average investment banking fee in our sample. Our findings suggest that firms can reduce their cost of raising capital by improving the market liquidity of their stock.

## I. Introduction

Should a firm have any interest in the market liquidity of its securities? Previous studies have tried to answer this question by relating liquidity to the firm's cost of capital. However, the empirical evidence to date on this issue is somewhat mixed.<sup>1</sup> This paper takes a different approach to test whether liquidity matters to the firm by examining an event that links liquidity to the direct cost of raising external capital. We hypothesize that when firms access the external equity capital markets the liquidity of their stock affects the transaction costs—specifically, the investment banking fees—associated with floating new equity. Using a sample of 2,387 seasoned equity offerings (SEOs) during 1993-2000, we test this hypothesis and find that, *ceteris paribus*, investment banks' fees are substantially lower for firms with more liquid stock.

The rationale for why liquidity might affect the flotation costs associated with a seasoned equity offering is that the costs faced by the investment banking group are similar in spirit to those of other market makers such as dealers, specialists, or block traders who line up buyers and sellers to facilitate the intermediation process. For example, the underwriting syndicate may face inventory risk from receiving the shares as well as adverse selection risk if they maintain a net position in the stock. Further, the investment banking group may also incur sunk costs in

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<sup>1</sup> In the case of stocks, Amihud and Mendelson (1986, 1989), Amihud, Mendelson, and Lauterbach (1997), Eleswarapu (1997), Brennan and Subrahmanyam (1996), Brennan, Chordia, and Subrahmanyam (1998), and Easley, Hvidkjaer, and O'Hara (2002) provide evidence that liquidity is priced in the cross section of stock returns, while Reinganum (1990), Eleswarapu and Reinganum (1993), and Chen and Kan (1996) find no supporting evidence. In the case of bonds, Amihud and Mendelson (1991), Warga (1992), and Kamara (1994) find that bond yields are negatively correlated with liquidity, while Elton and Green (1998) find that the liquidity effect found in previous studies is not economically significant after correcting for data problems.

seeking out investors and processing the transactions. As a result, the more liquid the market for the underlying stock, the easier it is for the investment bank to place the new issue and reduce these intermediation costs.<sup>2</sup> Since it should be easier to place an equity issue in a liquid market than to place it in an illiquid market, the stock market liquidity of the issuing firm should be an important determinant of the investment banking fees.

To test this hypothesis, we examine a sample of seasoned equity offerings (SEOs). We use this corporate transaction because it is intuitively appealing along many dimensions. First, the costs of raising external capital are large, and investment banking fees often represent the lion's share of the total flotation costs of a new issue. For example, Lee, Lochhead, Ritter, and Zhao (1996) find that the average firm pays around seven percent of the total proceeds to raise capital through a seasoned equity offering (SEO). Investment banking fees are by far the largest portion of the flotation costs, representing over 76 percent of the total costs of raising external capital for SEOs. These fees also vary considerably—from less than one percent for some issues to up to 10 percent for others. Second, this transaction is pragmatic from a researcher's perspective because an active secondary market for the underlying securities already exists for the SEO shares. Thus, we are also able to measure the liquidity of the underlying shares. Unlike initial public offerings, in which investment banking fees tend to cluster and there is no pre-issue liquidity, SEOs have easily observable pre-issue liquidity, economically large fees, and considerable variation in both fees and liquidity.<sup>3</sup>

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<sup>2</sup> There is a vast literature, starting with Demsetz (1968), which shows intermediation costs decline with liquidity. For example, LaPlante and Muscarella (1997) find that block trades have a lower price impact (one measure of how costly a trade is) when markets are more liquid. See O'Hara (1995) for an excellent survey.

<sup>3</sup> See Chen and Ritter (2000) for a discussion of clustering in IPO fees and (lack of clustering in) SEO fees.

Our results indicate that stock market liquidity is a major determinant of total investment banking fees (i.e., the gross spread or gross fees) in SEOs. We show that there is a surprisingly large and robust inverse relationship between the total fees paid to investment banks and the stock market liquidity of the issuing firm. Our finding is robust to each of the seven measures of liquidity we use in our analysis. Further, we show that these results are not only statistically significant, but are also economically meaningful. For instance, the average SEO fees for firms with high liquidity are more than 100 basis points lower than for those with low liquidity, *ceteris paribus*. These results are important because they highlight the economic significance of the effect of stock market liquidity on the cost of raising capital.

Moreover, we find that the effect of market liquidity on investment banking fees is stronger for large equity issues than for small issues. For large (top issue size quintile of our sample) equity issues, the average difference in gross fees for liquid versus illiquid stocks, controlling for other factors, is 164 basis points per share issued. This difference represents 34 percent of the average gross fee for all the SEOs in our sample and 43.6 percent of the average gross fee for large SEOs. For small equity issues, the average difference in gross fees for liquid versus illiquid stocks, controlling for other factors, is 86 basis points. As a large issue is more difficult to place in an illiquid market than a small issue, this result suggests that the effects of liquidity on investment banking fees are stronger in those situations in which liquidity should matter the most. This can be interpreted as evidence that the marginal cost of illiquidity is higher for large issues.

These results complement Corwin (2003) who finds that liquidity may also reduce the magnitude of underpricing in seasoned equity offerings. Corwin shows that underpricing in seasoned equity offerings is, on average, 2 percent of the issue size and that a portion of this

underpricing is negatively related to some measures of market liquidity. In our sample, the investment banking fees are on average 4.8 percent of the issue size and we also document that the effect of liquidity on these fees can be substantial. This underscores the importance of market liquidity on the total cost of raising capital beyond that found by Corwin (2003).

Our findings also complement previous studies that examine the link between liquidity and firms' cost of equity. Our paper establishes a link between stock market liquidity and the cost of raising capital; this link is significant because we document that liquidity matters to the firm without relying upon any equilibrium asset pricing model. This is important because any test that attempts to demonstrate empirically an effect that liquidity may have on required returns is, of course, a *joint* test that liquidity is priced *and* that the asset pricing model the researcher uses is correct. Further, our results do not rely upon the assumption that expected returns, risk factors, and factor loadings are properly measured.<sup>4</sup>

Overall, our paper shows that liquidity may affect firm value through its effect on the direct costs of raising capital. Rather than demonstrating an association between liquidity and discount rates, we document a connection between market liquidity and the flotation costs of raising external capital. This is an important contribution to the debate on whether a firm has any interest in the market liquidity of its securities because it suggests that the effects of liquidity on the value of the firm go beyond those predicted by existing theoretical models.

The remainder of the paper is structured as follows. In Section II we discuss the potential determinants of investment banking fees. In Section III we discuss our data and sample construction. Section IV presents our empirical findings. Section V provides robustness tests for our results, and Section VI concludes.

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<sup>4</sup> See Brav, Lehavy, and Michaely (2002) for a discussion of the difficulty in estimating expected returns.

## II. The Determinants of Investment Banking Fees

In this section, we discuss the various factors that may explain cross-sectional differences in investment banking fees in SEOs. Most studies examining investment bank fees have centered on initial public offerings (IPOs). For example, several researchers have found that investment banking fees in IPOs have surprisingly little cross-sectional variation, which may be attributed to strategic pricing among investment banking syndicates (Chen and Ritter (2000)) or to efficient contracting mechanisms (Hansen (2001)).<sup>5</sup> In contrast to IPOs, there is substantial cross-sectional variation in SEO gross fees.

Figure 1 presents a scatter plot of the gross fees against the offering size for the full sample of SEOs. While there appears to be modest clustering on round percentages, there is also substantial variation in fees, even conditional on offering size. Surprisingly, despite the large magnitude and variation of investment banking fees in SEOs, there is relatively little empirical research on their determinants. The main purpose of this paper is to shed light on the determinants of investment banking fees in SEOs, and more importantly, to test the hypothesis that stock market liquidity lowers the costs of raising capital.

<Insert Figure 1 about here>

We argue that investment banks should charge lower (higher) fees to firms with more (less) liquid stocks. The rationale for this argument is that it should be easier for investment banks to place a SEO in a liquid market than to place it in an illiquid market. To test this

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<sup>5</sup> Chen and Ritter (2000) and Hansen (2001) find that IPO gross fees cluster at 7.00%, especially for medium-sized (\$20mm – 80mm offer size) IPOs. Torstila (2003) documents clustering of IPO gross fees at various levels in several different countries.

hypothesis, we construct a variety of liquidity variables. While there is no unanimously accepted measure of market liquidity, frequently used proxies tend to be measures that gauge the transaction costs and ease of executing orders. In this paper, we use the following measures: (1) quoted spreads, (2) effective spreads, (3) relative effective spreads, (4) quoted depth, (5) average trade size, (6) volume, (7) turnover, and (8) an aggregate liquidity index (described in detail below).

Economies of scale with respect to issue size have been well-documented in SEOs.<sup>6</sup> Thus, we expect the cost of issuing equity to decline with the size of the offering, and so we control for issue size in all our tests. Further, we expect fees to increase with the opaqueness of the firm's assets. That is, it may be harder for investment banks to place shares that are fundamentally more difficult to value. In this study, we use the size of the firm as a proxy for the level of opacity or transparency. Further, since there is evidence that investment banks charge higher fees to riskier firms, we also control for the volatility of stock returns.

Another important factor that may affect the investment bank fees in SEOs is the reputation of the lead underwriter. Investment banks with better reputation may work harder during an SEO to ensure that the issue is successful. Thus, we expect gross fees to be positively related to the reputation of the underwriter. Following Megginson and Weiss (1991), we use the annual market share of the lead manager as a proxy for reputation. It is assumed that book-runners with better reputation tend to have a larger market share.

We also expect the gross fee to decline with the level of coordination during an SEO. That is, after controlling for other factors, we expect gross fees to be smaller in SEOs in which multiple book-runners are participating. The intuition is that multiple book-runners may be able

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<sup>6</sup> See Lee, et al. (1996).

to find investment banks for the selling and underwriting syndicates more efficiently than a single book-runner. We use a dummy variable that is equal to one if there are multiple book-runners, and zero otherwise, to measure the level of coordination.

Finally, the level of the stock's price may be a factor as well. Institutional investors, who may be important investors in an SEO, tend to shun low-priced stocks. As a result, investment banks may have a more difficult time placing low-priced issues. Similarly, exchange listing may also have some effect on the ability to place an issue. Shares listed on the NYSE tend to have a larger shareholder base and subsequently may be easier to place. Consequently, we also include the level of the stock's price and exchange dummy variables as determinants of the investment banking fees. While these variables form our benchmark set of controls, Section V.B explores the sensitivity of our results to a number of other specifications and shows that our results are quite robust.

### **III. Sample Selection, Variable Definitions, and Summary Statistics**

#### **A. Sample Selection**

Our initial sample consists of the universe of 4,357 seasoned equity offerings listed on Securities Data Company's *Global New Issues* database over the period 1993-2000. We start our sample in 1993 because we need data from the NYSE's Trades and Quotes (TAQ) database to calculate the measures of stock market liquidity. To be included in our final sample, each observation must satisfy the following criteria: a) the company is not a financial institution (SIC codes 6000 through 6999); b) the size of the offering is greater than \$20 million;<sup>7</sup> c) the company is present in both the CRSP and TAQ databases; d) the company has at least six months of

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<sup>7</sup> All of our results are qualitatively unchanged if we also include issues smaller than \$20 million.

transaction data prior to the seasoned equity offering; e) the offering is a firm commitment; and f) the offering is not a shelf registration. These selection criteria generate a final sample of 2,387 seasoned equity offerings.<sup>8</sup> This sample includes 1,456 Nasdaq-listed firms, 104 Amex-listed firms, and 827 from the NYSE-listed firms.<sup>9</sup>

## **B. Variable Definitions**

To measure the cost of issuing new equity, we use the dollar gross fee divided by the total proceeds.<sup>10</sup> The dollar gross fee is the difference between the price at which the underwriting syndicate buys shares from the issuing firm and the offer price for the shares. While the gross fee is the total compensation to the investment banking group doing the SEO, it is often comprised of three separate components: management fees, selling concession, and the underwriting fee. However, since in most situations these components are a fixed fraction of the gross fee, we do not examine them separately.<sup>11</sup>

To measure the market liquidity of the stock of the issuing firm, we use the following eight variables:

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<sup>8</sup> Our final sample includes 593 “repeat” issuers—firms that have more than one SEO in our sample period. All our results are robust to the inclusion or exclusion of these observations.

<sup>9</sup> Unlike other studies on SEOs (for example, see Corwin (2003)), we do not exclude utilities. We do this because most utilities were deregulated during our sample period. However, all of our empirical results are qualitatively unchanged if we exclude this type of firm.

<sup>10</sup> This is generally referred to as the “gross spread.” We instead adopt the term “gross fee” to avoid confusion with our bid-ask “spread” measures of liquidity.

<sup>11</sup> In general, the management fee, the selling concession, and the underwriting fee represent 60%, 20%, and 20% of the gross fee, respectively. Not surprisingly, our results continue to hold across each of the components.

1. *Quoted Spread*: We construct this measure for each firm-month as the average difference between bid and ask prices over all quotations from the firm's primary exchange which occur during regular trading hours. We follow Weston (2000) in filtering the TAQ data for errors. Specifically, we filter out quotations for which the ask is smaller than or equal to the bid price (crossed markets) or for which there is non-sequence warning flag on the Trades and Quotes (TAQ) database (stale quotes). Additionally, we remove all spreads greater than \$5.00 and spreads that represent more than 20% of the quote midpoint (outliers). These filters affect less than one percent of the observations in our sample. The pre-offering spread is the time-series average of monthly quoted spreads over the six months prior to the offering date.

2. *Effective spread*: This measure accounts for the fact that trades may be executed inside of the quoted spread and is defined as twice the difference between the transaction price and the midpoint of the quoted spread. We use Roll's (1984) serial covariance measure to compute effective spreads defined as:

$$\text{Effective Spread} = 2 * \sqrt{-\text{cov}(\Delta P_t, \Delta P_{t-1})}$$

where  $\Delta P_t$  is the change in transaction price from  $t-1$  to  $t$ . We use tick data for all transactions in each stock over the sample period to estimate effective spreads. Schultz (2000) demonstrates that this technique yields a reliable metric when applied to intra-day data.<sup>12</sup> We use the same filters as in the quoted spread.

3. *Relative effective spread*: This measure is simply the effective spread scaled by the average transaction price. We use the same filters as in the quoted spread.

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<sup>12</sup> As Schultz (2000) points out, there may be serious errors with matching trades to quotes over the sample period for Nasdaq stocks. Thus, a trade-based measure of the effective spread provides a more consistent and reliable metric to use across exchanges and over time.

4. *Quoted depth*: This measure is the average number of shares offered at the bid and ask prices over all quotations using the same filters as in the quoted spread.<sup>13</sup>

5. *Volume*: This variable is constructed from the CRSP database as the average monthly trading volume for the six months preceding the date of the offering. Since our sample contains NYSE, AMEX, and Nasdaq firms, the construction of trading volume presents some problems. In dealer markets, trades are often immediately turned around by the market maker and thus double counted, making it hard to compare with volume in auction markets. Thus, we follow the common approach of dividing Nasdaq trading volume by two to correct for the double counting.

6. *Turnover*: This measure is defined as the total monthly volume over the six months prior to the offering divided by number of shares outstanding, where Nasdaq volume is appropriately scaled.

7. *Trade size*: This variable is the average number of shares traded over all eligible trades.

8. *Liquidity Index*: The liquidity index ( $L_i$ ) is constructed for each observation  $i = 1, \dots, N$  as:

$$L_i = \frac{1}{N} \frac{1}{K} \sum_{k=1}^K \text{Rank}_k(X_{i,k})$$

where  $X_{i,k}$  is the  $k^{\text{th}}$  measure of liquidity (e.g., trading volume) for firm  $i$  in our sample. The rank function stacks each observation from least liquid to most liquid. For example, the stock with

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<sup>13</sup> It is important to note that the quoted depth on Nasdaq may be less informative than the quoted depth on the NYSE. This is due to the fact that the inside depth for Nasdaq stocks only represents the depth of the inside dealer, and not the aggregate market depth (as in NYSE or AMEX). Further, Nasdaq depth may have less variation due to the common practice of "auto-quoting" a depth of 1,000 shares. While there is no reason to suspect any systematic bias from Nasdaq quoted depths, we replicate our analysis using only data for NYSE and Amex stocks and our results are qualitatively similar.

the highest trading volume gets a rank of  $N$  (most liquid) while the stock with the lowest trading volume has a rank of one (least liquid). By computing the cross-sectional rank of each observation within our sample, we create a uniform index for each liquidity measure,  $k$ . As such, we can then average the ranks of each observation across the  $K$  dimensions of liquidity. We then scale this average by the number of observations,  $N$ , so that our liquidity index varies between zero (least liquid) and one (most liquid). In this study, we use  $K=7$  using all of the liquidity measures listed above. For example, a liquidity index measure of one implies the observation has the highest volume, turnover, trade size, and depth, and lowest quoted and effective spreads. The advantage of this index is that it provides a balance between all of the liquidity measures – penalizing firms that may have high trading volume but also large spreads or that may have small spreads but also low depth, etc., while rewarding firms that have high measures across all dimensions.<sup>14</sup>

To measure the level of firm transparency, we use return volatility and the market value of the issuing firm. The return volatility is measured as the standard deviation of daily returns over the six months prior to the offering date. The market value of the issuing firm is the average closing price times the average number of shares outstanding over the six months prior to the offering date.

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<sup>14</sup> In addition to our liquidity index, we also construct a single liquidity measure based on a principal component factor analysis. That is, we use the eigenvalues of the covariance matrix for the liquidity measures to determine the factor loading on each of the seven variables. Restricting the set of principal factors to one, we then construct a liquidity factor based on these loadings. This measure has a correlation with our liquidity index of 0.91 and all of our results follow through using either measure. Results for the liquidity index are presented for both brevity and simplicity.

As a proxy for the reputation of the lead manager, we use the market share of the lead manager based on the entire SDC seasoned equity offerings database. The market share is constructed for each book-runner as the total principal value issued by each book-runner divided by the total principal amount of issues that year. Issues that have multiple book-runners are allocated  $1/N$  to each book-runner for the construction of market shares. To proxy for the level of coordination in the SEO, we use a dummy variable that is equal to one if there are multiple book-runners and zero otherwise.

### **C. Summary Statistics**

Table 1 reports the summary statistics for our sample firms. The average (median) principal of the SEOs in our sample is equal to \$130 million (\$74 million). This amount represents approximately 11% (21%) of the market value of the average (median) firm in our sample. This indicates that the companies in our sample issue a significant amount of new equity during SEOs. This table also reports that the average (median) gross fee is equal to 4.8% (5%). These gross fees are similar to the ones reported in other studies (see for example, Lee, et al. (1996)). The average (median) management fee, underwriting fee, and selling concession are equal to 0.99% (1%), 1.04% (1.04%), and 2.81% (2.93%), respectively. Notice that the selling concession is the largest component of the gross fee (approximately 60%). This table also highlights significant cross-sectional differences in our measures of liquidity. Finally, it is important to note that many our variables exhibit typical right-skewness (the median is below the mean). As a result, we use log-transformations in our analysis to mitigate any potential impact of outliers.

<Insert Table 1 about here>

## IV. Empirical Results

### A. Univariate Results

Table 2 provides a breakdown of the gross investment banking fee for 25 portfolios of seasoned equity offerings. Each portfolio is formed by first splitting the sample into five groups based on the quintile ranking of the principal amount of the offering.<sup>15</sup> Within each size quintile, we then form five portfolios based on the quintile ranking of the liquidity index. Each portfolio contains 95 or 96 offerings.

The results presented in Table 2 show a negative relationship between liquidity level and investment banking fees. For each size quintile, portfolios in the most liquid quintile have considerably smaller fees than those in the least liquid quintile. In all cases the difference is statistically significant. Further, in all quintiles there is a roughly monotonic relationship between the investment banking fees and our liquidity measures (these results also hold using the various measures of liquidity individually rather than the liquidity index).

<Insert Table 2 about here>

Because liquidity is correlated with size, it is important to mention that this pattern is not simply a result of inter-quintile sorting. Note that for each size quintile, the gross fee for the least liquid quintile is larger than the gross fees paid in the most liquid quintile for the next smallest size quintile. For example, offerings in the most liquid quintile for size quintile four paid an average investment banking fee of 3.91 percent (Table 2, Column 5, Row 4). However, while all offerings in size quintile five (Table 2, Row 5) are strictly larger than those in size

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<sup>15</sup> We replicate this analysis by first splitting the sample into ten groups based either on the issue size, volatility, or the decile ranking of the principal amount of the offering scaled by the pre-issue market value of equity. The results are qualitatively the same.

quintile four, offerings with the least liquidity paid an average of 4.35 percent – a premium of 44 basis points relative to offerings in the most liquid quintile for size quintile four.

Another interesting result that emerges from Table 2 is that the effect of market liquidity on investment banking fees appears stronger for large equity issues than for small issues. This result suggests that the effects of liquidity on investment bank fees are stronger in those situations in which liquidity should matter the most. Our interpretation is that it is relatively harder to place a large issue into an illiquid market than to place a small issue. These results are confirmed in our multivariate analysis, which we discuss in sub-section IV.C.

Finally, there is evidence that riskier firms have higher costs of raising capital (see for example, Altinkilic and Hansen (2000)). Thus, to ensure that the correlation between gross fees and liquidity is not due to differences in riskiness, we form portfolios by first splitting the sample into five groups based on the quintile ranking of the stock return volatility of the issuing firm. Then, within each volatility quintile, we form five portfolios based on the quintile ranking of the liquidity index. The results from this analysis are reported in Table 3. The evidence in this table indicates that even after controlling for the riskiness of the issuing firm, there is a strong negative relationship between liquidity level and investment banking fees. Note that all the differences in gross fees between the most liquid firms and the least liquid firms are significantly different from zero at the one percent level. These results give us confidence that our main findings are not driven by the documented relation between risk and gross fees.

<Insert Table 3 about here>

## **B. Multivariate Results**

While the results presented in the preceding section suggest a relationship between stock market liquidity and the cost of issuing seasoned equity, these results may be misleading if there

are confounding effects between liquidity and gross fees. For example, firms with highly liquid stocks also tend to be large, less risky firms with better access to high quality underwriters. In this section we re-examine the relationship between liquidity and gross fees, while controlling for these potential confounding effects in a multivariate regression framework.

As described in Section II, we factor out confounding effects on fees by controlling for the size of the issue (principal amount), the share price, the level of asymmetric information and the level of firm risk (proxied by return volatility and the market value of the issuer), the reputation of the lead investment bank (proxied by the market share of the lead manager), and the level of coordination in the SEO (proxied by a dummy variable that is equal to one if there are multiple book-runners, zero otherwise). We also include indicator variables for Nasdaq and Amex stocks to control for any market microstructure effects and year dummies to mitigate any time series variation in fees and hot issues markets (see Ritter (1984) and Lowry and Schwert (2002)).

Table 4 present the results from the multivariate regression analysis where we regress the gross investment banking fees on a series of liquidity measures and a vector of control variables. Supporting the results from the univariate analysis, the results indicate that fees are strongly related to our liquidity measures, even after controlling for other factors. As predicted by our hypothesis that the costs of raising capital are lower for more liquid stocks, Table 4 shows that fees are positively related to quoted, effective, and relative effective bid-ask spreads, and negatively related to depth, average trade size, average volume, turnover, and our liquidity index variable.

<Insert Table 4 about here>

The signs, magnitudes, and statistical significance of the coefficients on our control variables are roughly consistent across all the specifications. The regression coefficient on issue size (principal amount) is negative, which supports the idea that there are economies of scale in SEOs. Furthermore, consistent with the idea that fees increase with the opaqueness of the firm's assets, our results indicate that fees decline with firm size and increase with the volatility of stock returns.

We also find that investment banks with higher reputation charge slightly higher fees, though this relation is not statistically significant. This is consistent with the idea that intermediaries are unable to earn substantial rents on their reputation. Finally, we find that fees are slightly lower for issues that have multiple lead managers. This result is consistent with the idea that multiple book-runners are able to place a new issue more efficiently than a single book-runner.

While the regression results in Table 4 point to a statistical relation between liquidity and investment banking fees, they also indicate economic significance. To gauge the economic magnitude of our results, we calculate the effect of a change from the fifth liquidity quintile (most liquid) to the first liquidity quintile (least liquid) on the gross fee. Since our estimation equation is specified in log-transformations for the dependent and independent variables, our regression coefficients may be interpreted as the elasticity of fees with respect to liquidity. As such, the magnitude of the effect on gross fees from a unit change in liquidity can be computed

for the average firm in our sample.<sup>16</sup> Using the coefficients estimated in Table 4, we estimate the following measure:

$$Economic\ Magnitude = \hat{\beta}_1 \left[ \frac{Average\ Investment\ Banking\ Spread}{Average\ Liquidity\ Measure} \right] * (Q_L^1 - Q_L^5) * 100,$$

where  $\hat{\beta}_1$  is the estimated regression coefficient on the liquidity measures and  $(Q_L^1 - Q_L^5)$  represents the average value of the liquidity measure in the first liquidity quintile (least liquid) minus the average value of the liquidity measure in the fifth liquidity quintile (most liquid).

The results from this analysis are reported in the last column of Table 4. The difference in fees for the low liquidity versus high liquidity stocks is substantial. For example, when we use the liquidity index measure as a proxy for the stock market liquidity of the issuing firm, the effect of a change from the fifth liquidity quintile (most liquid) to the first liquidity quintile (least liquid) on the gross fee is equal to 101 basis points, which represents a large percentage (about 21.0 percent) of the average gross fee in our sample. All of the liquidity variables have an economically large magnitude, with depth and trading volume having the largest effect. Overall, changes in the liquidity index have the largest effect on gross fees, consistent with our construction of this measure as a more comprehensive gauge of total liquidity. These results demonstrate an economically meaningful effect of liquidity on the direct cost of raising capital.

### C. Results by Issue Size Quintile

There may be economies of scale in raising external capital (e.g., Lee, et al. (1996)). Our results support this finding. However, our analysis above suggests that the effect of liquidity on

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<sup>16</sup> Since in our context  $\beta = \frac{\partial \ln(Y)}{\partial \ln(X)} = \frac{\partial Y}{\partial X} \frac{X}{Y}$ , it follows that a change in  $X$  has an effect on  $Y$  for the average firm

approximately equal to  $\beta \frac{\bar{Y}}{\bar{X}} \Delta X$ .

fees is in turn related to the size of the issue. Especially large issues may be relatively harder to place into an illiquid market, requiring more effort from intermediaries which translates into proportionately larger fees. Simply put, the effect of liquidity on investment banking fees should be stronger where liquidity is needed most.

In order to test the hypothesis that the liquidity premium is largest for large issues, we replicate the analysis in Table 4 allowing the effect of liquidity on the investment banking fee to change with the size of the offering. To accomplish this, we construct five dummy variables equal to one if the offering size is in the  $n^{th}$  size quintile based on the total principal amount of the offering. We then test the hypothesis that the effect of liquidity on investment banking fees ( $\beta$ ) in the largest offering size quintile is the same as in the other quintiles ( $\beta_1, \beta_2, \beta_3, \beta_4 = \beta_5$ ).

We present the results of this analysis in Table 5. As expected, we find that the magnitude of the liquidity effect increases monotonically with size for the gross fee. However, the liquidity effect is much stronger for the largest offering size quintile. We are able to reject the joint hypothesis that the liquidity effect in the largest size quintile is the same as in the other quintiles.<sup>17</sup> Further, we are unable to reject the hypothesis that the coefficients on the first four size quintiles are equal. In sum, our evidence suggests that the liquidity premium is non-linear with respect to size and is greatest for the largest quintile of offering size.

<Insert Table 5 about here>

As in sub-section IV.B, we also compute the economic magnitude of the measured liquidity effect by size quintile. The last column of Table 5 presents the equivalent analysis as in the last column of Table 4 based on our liquidity index and broken out for each size quintile.

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<sup>17</sup> This is based on a Wald test of the joint hypothesis that  $\beta_1, \beta_2, \beta_3, \beta_4 = \beta_5$ . Reported p-values are based on the asymptotic  $\chi^2_5$  distribution where the degrees of freedom are given by the number of linear restrictions.

These results confirm what the regression results suggested – that liquidity matters the most where it is most needed. For example, we find that issues in the largest size quintile in our sample pay a 164 basis point premium for being in the worst liquidity quintile compared to the best liquidity quintile. The parallel effect for the smallest issues in our sample is 86 basis points which, while large, is just over half the magnitude for large issues.

## **V. Robustness**

### **A. Matched Sample Technique**

The regression results presented in Section IV show a negative relation between stock market liquidity and various measures of liquidity. However, these results may be spurious if there are strong nonlinearities between liquidity and our control variables. For example, since liquidity is correlated with firm size, issue size, share price, and volatility, it may be that our measures of liquidity proxy for some non-linearity in the relationship. To mitigate this potential misspecification, we estimate the effect of liquidity on investment banking fees using a matched sample methodology. For each observation, we find another SEO in our sample that closely resembles that observation in price, offer size, and volatility (standard deviation of stock returns).

After matching the firms, we examine how the differences in the liquidity index between the sample and matching firms affect the investment banking fees. The advantage of this procedure is that we are comparing observations in our sample that, ideally, differ only in their liquidity. As a result, inferences concerning differences in the investment banking fees should be independent of the functional relationship between these measures and firm size, price, or total risk.

The results from this analysis (not reported) suggest that the relationship we document is not a product of non-linearities. Consistent with our previous results, we find that more liquid stocks (measured by the liquidity index) pay lower investment banking fees.<sup>18</sup>

## **B. Alternative Specifications**

In this sub-section we examine the sensitivity of the results reported in the previous sections to our choice of control variables. We accomplish this by re-estimating the regressions in our paper including additional controls for asymmetric information and risk (dummy variable for analyst coverage, R&D scaled by assets, net fixed assets scaled by assets), profitability (return on assets), investment opportunities (market-to-book ratio), momentum effects (lagged returns), and other firm characteristics (debt-to-equity ratio). We find that our previous results are insensitive to these alternative specifications. Overall, the inclusion of various firm-specific factors has no qualitative effect on either the statistical or economic magnitude of our results.

## **C. Additional Sensitivity Checks**

Apart from firm-specific factors that could confound our results, there may also be systematic relations between liquidity and investment banking fees driven by time trends in either liquidity or gross fees. For example, both liquidity and the cost of raising capital may be improving over our sample period. As a result, we want to be sure that our results are not simply driven by time trends in our variables. To this end, we replicate the analysis in our paper for the

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<sup>18</sup> We also perform these matched-sample tests and our regression analysis using an alternative, non-cash measure of the costs of raising external capital. Consistent with the idea that market liquidity facilitates the placement of a security issue, we find that it takes less time to bring a liquid security to the market. Specifically, we find that the time between the initial filing of the offering and the offer date is about 18 days less for liquid (top liquidity quintile) stocks than for their illiquid (bottom liquidity quintile) counterparts, which represents a decline of about 50 percent of the average filing period.

following four time sub-samples: 1993-1994, 1995-1996, 1997-1998, and 1999-2000.

Consistent with our previous results (both statistically and economically), we find that investment banks charge lower fees to firms with better liquidity in each of the four two-year periods. This evidence indicates that our main results are not driven by time series patterns in liquidity and gross fees.

In addition to systematic time-series patterns in the data, we also test the sensitivity of our results to our sample period selection. That is, our data are drawn for the period of six months prior to the registration of the offering. However, since some firms do not file a gross fee on their initial prospectus, it is possible that this fee is negotiated just prior to the offering. As a result, we also estimate the effect of liquidity using only the month of the registration, the month prior to the offering, as well as for 3 month and 12 month periods prior to the registration. All of our results are qualitatively unchanged for these different periods. This may not be surprising given the strong time-series persistence in many of our liquidity measures (for example, monthly volume displays a unit root).

## **VI. Conclusion**

One of the most important current issues in the market microstructure literature is whether liquidity affects firm value. Contributing to this literature, this paper presents empirical evidence that a firm's stock market liquidity can have a direct effect on the cost of raising external capital. By examining a large sample of seasoned equity offerings, we are able to measure both the direct cost of raising capital (the investment banking fees) as well as the market liquidity of the underlying stock prior to the offering. Consistent with the idea that investment banks play a market-making role (essentially the role of a large-block trader) in placing a

seasoned offering, we find that firms with better market liquidity pay significantly lower investment banking fees.

Our results are economically significant. We estimate that the effect of a change from the most liquid quintile to the least liquid quintile on the gross fee, controlling for other factors, is approximately 101 basis points, which represents about 21.0 percent of the average gross fee in our sample. We also find that this effect is stronger for large equity issues, suggesting that the marginal cost of illiquidity is higher for large issues.

Stock market liquidity may be an important determinant of firms' ability to access external capital markets. Our results suggest that firms may have an incentive to promote improvements in their stock market liquidity, as it can lower the cost of raising capital. Together with the literature on liquidity premiums in asset prices, our results underscore the economic importance of capital-market microstructure issues such as regulation, optimal market design, and competition. To the extent that better market microstructure can improve liquidity, it may also improve firms' ability to raise capital.

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**Table 1**  
**Summary Statistics**

This table reports summary statistics for our sample firms. Our sample consists of all seasoned equity offerings listed on the Securities Data Company's *Global New Issues* database over the period 1993-2000 that satisfy the following criteria: a) the company is not a financial institution (SIC codes 6000 through 6999); b) the size of the offering is greater than \$20 million; c) the company is present in both the CRSP and TAQ databases; d) the company has at least six months of transaction data prior to the seasoned equity offering; e) the offering is a firm commitment; and f) the offering is not a shelf registration. All firm characteristics are constructed for a period of six months prior to the offering date. The market value of equity, share price, turnover, and volume reflect average monthly figures from CRSP. Return volatility is constructed as the standard deviation of daily returns. Quoted, effective, and relative effective bid-ask spreads, quoted depth, and average trade size are collected from the TAQ database and reflect average monthly figures. The liquidity index is constructed as the average scaled cross-sectional ranking over seven measures of liquidity (quoted, effective, and relative effective bid-ask spreads, volume, share turnover, average trade size, and average depth at the bid and ask prices). The more liquid the stock, the larger the liquidity index. Investment banking fees and offering size are collected from the SDC database.

<b>Sample description</b>						
<b>Firm Characteristics</b>	Mean	Std. Dev.	25 <sup>th</sup> %	Median	75 <sup>th</sup> %	N Obs.
Offering Size (principal) (Million \$)	130	163	43	74	140	2,387
Market Value of Equity (Million \$)	1,178	2,889	160	354	892	2,387
Share Price (\$)	27.5	16.3	16.6	24.0	34.4	2,387
Return Volatility	0.034	0.016	0.022	0.031	0.041	2,387
<b>Investment Banking Fees</b>						
Gross Fee (%)	4.800	1.066	4.226	5.000	5.500	2,387
Management Fee (%)	0.991	0.201	0.867	1.000	1.125	2,205
Underwriting Fee (%)	1.042	0.247	0.881	1.043	1.200	2,203
Selling concession (%)	2.812	0.599	2.468	2.932	3.216	2,345
<b>Liquidity Measures</b>						
Quoted Bid-Ask Spread	0.347	0.197	0.202	0.274	0.469	2,387
Effective Bid-Ask Spread	0.212	0.139	0.098	0.172	0.305	2,387
Relative Effective Bid-Ask Spread	0.010	0.012	0.004	0.007	0.013	2,387
Quoted Depth (100s)	24.0	38.1	9.4	10.0	21.8	2,387
Average Trade Size	1,556	823	987	1,409	1,910	2,387
Share Volume (Millions of Shares)	3.13	5.40	0.54	1.25	3.19	2,387
Share Turnover	0.983	0.831	0.416	0.723	1.276	2,387
Liquidity Index	0.500	0.185	0.363	0.494	0.633	2,387

**Table 2**  
**Gross Investment Banking Fees by Size-Liquidity Portfolios**

This table describes the gross investment banking fee for seasoned equity offerings by quintile of liquidity, conditional on the size quintile of the offering. Portfolios are created by forming size quintile portfolios based on the size of the offering. Five portfolios are then formed within each size portfolio based on the quintile of the liquidity index. Each portfolio contains 95 or 96 observations. The liquidity index is constructed as the average scaled cross-sectional ranking over seven measures of liquidity (quoted, effective, and relative effective bid-ask spreads, volume, share turnover, average trade size, and average depth at the bid and ask prices). The more liquid the stock, the larger the liquidity index. Investment banking fees and the principal amount of the offering are collected from the SDC database. Average gross fees are constructed as the equally weighted mean gross fee within each size-liquidity portfolio. All firm characteristics are constructed for a period of six months prior to the offering date. \*\*\*, \*\*, and \* denote significance at the 1, 5, and 10 percent levels, respectively.

Size Quintile	Liquidity Quintile					%Δ (Q1-Q5)
	Least Liquid	2	3	4	Most Liquid	
Smallest	5.80	5.69	5.62	5.76	5.36	8.16 ***
2	5.47	5.33	5.26	5.30	4.96	10.28***
3	5.23	5.17	4.94	4.73	4.57	14.30 ***
4	4.87	4.71	4.74	4.33	3.91	24.79 ***
Largest	4.35	3.91	3.61	3.27	3.01	44.64 ***

**Table 3**  
**Gross Investment Banking Fees by Stock Return Volatility-Liquidity Portfolios**

This table describes the gross investment banking fee for seasoned equity offerings by quintile of liquidity, conditional on the stock volatility quintile of the issuing firm. Portfolios are created by forming volatility quintile portfolios based on the stock volatility of the issuing firm. Five portfolios are then formed within each size portfolio based on the quintile of the liquidity index. Each portfolio contains 95 or 96 observations. Stock return volatility is constructed as the standard deviation of daily returns. The liquidity index is constructed as the average scaled cross-sectional ranking over seven measures of liquidity (quoted, effective, and relative effective bid-ask spreads, volume, share turnover, average trade size, and average depth at the bid and ask prices). The more liquid the stock, the larger the liquidity index. Investment banking fees and the principal amount of the offering are collected from the SDC database. Average gross fees are constructed as the equally weighted mean gross fee within each volatility-liquidity portfolio. All firm characteristics are constructed for a period of six months prior to the offering date. \*\*\*, \*\*, and \* denote significance at the 1, 5, and 10 percent levels, respectively.

Volatility Quintile	Liquidity Quintile					%Δ (Q1-Q5)
	Least Liquid	2	3	4	Most Liquid	
Smallest	4.68	4.43	3.97	3.66	3.09	51.72 ***
2	5.28	4.96	4.66	4.24	3.65	44.46 ***
3	5.38	5.23	5.13	4.93	4.27	25.99 ***
4	5.54	5.41	5.30	5.19	4.30	29.03 ***
Largest	5.72	5.51	5.25	5.20	4.92	16.40 ***

**Table 4**  
**The Effect of Liquidity on Investment Banking Gross Fees: Regression Analysis**

This table reports in columns (1) – (8) OLS regression results relating investment banking fees to seven measures of stock market liquidity and other control variables. The regression specification is:

$$\text{Log}(\text{Investment Bank Gross Fee}) = \alpha + \beta_1 \text{Log}(\text{Liquidity}) + \gamma \text{Controls} + \varepsilon,$$

where the *Investment Bank Gross Fee* is the percent of the SEO proceeds paid to investment banks (the percentage gross fee), *Liquidity* refers to one of seven liquidity measures described below and *Controls* represents a vector containing the following factors: principal amount, market value of equity, share price, return volatility, lead manager reputation, multiple book-runners indicator, Amex and Nasdaq indicators, and year dummies. The market value of equity, share price, turnover, and volume reflect average monthly figures from CRSP. Return volatility is constructed as the standard deviation of daily returns. Quoted, effective, and relative effective bid–ask spreads, quoted depth, and average trade size are collected from the TAQ database and reflect average monthly figures. The liquidity index is constructed as the average scaled cross-sectional ranking over our seven measures of liquidity. The more liquid the stock, the larger the liquidity index. Investment banking fees are collected from the SDC database. Lead manager reputation is the market share of the lead manager. Multiple book indicator is equal to one if there are multiple book-runners, zero otherwise. Amex and Nasdaq indicators are based on the primary listing of the firms’ shares. All firm characteristics are constructed for a period of six months prior to the offering date. Robust standard errors are reported in parentheses below coefficient estimates. \*\*\*, \*\*, and \* denote significance at the 1, 5, and 10 percent levels, respectively. The last column of this table reports estimates of the economic magnitude of the effect of liquidity on investment banking fees. Following the definition of elasticity, we compute the effect of a change from the fifth to the first liquidity quintile on investment banking fees using the following equation:

$$\text{Economic Magnitude} = \hat{\beta}_1 \left[ \frac{\text{Average Investment Banking Fee}}{\text{Average Value of Liquidity Measure}} \right] * (Q_L^1 - Q_L^5) * 100$$

where  $\hat{\beta}_1$  is the coefficient on the liquidity measures computed in Columns (1) through (8), and  $(Q_L^1 - Q_L^5)$  represents the average value of the liquidity measure in the first liquidity (least liquid) quintile minus the average value of the liquidity measure in the fifth (most liquid) quintile.

**Table 4 (continued)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	<i>Economic Magnitude (basis points)</i>
<b>Log(Quoted Spread)</b>	0.029 *** (0.012)								22
<b>Log(Effective Spread)</b>		0.0380 *** (0.004)							39
<b>Log(Relative Effective Spread)</b>			0.0263 *** (0.020)						27
<b>Log(Depth)</b>				-0.074 *** (0.010)					116
<b>Log(Trade Size)</b>					-0.054 *** (0.010)				38
<b>Log(Total Volume)</b>						-0.026 *** (0.005)			50
<b>Log( Turnover)</b>							-0.026 *** (0.005)		29
<b>Log(Liquidity Index)</b>								-0.190 *** (0.001)	101
Log(Principal Amount)	-0.086 *** (0.008)	-0.087 *** (0.008)	-0.087 *** (0.008)	-0.079 *** (0.008)	-0.078 *** (0.008)	-0.083 *** (0.008)	-0.083 *** (0.008)	-0.082 *** (0.001)	
Log(Firm Size)	-0.065 *** (0.007)	-0.007 *** (0.007)	-0.065 *** (0.007)	-0.049 *** (0.007)	-0.066 *** (0.007)	-0.047 *** (0.008)	-0.073 *** (0.007)	-0.053 *** (0.001)	
Log(Share Price)	-0.038 *** (0.013)	-0.045 (0.013)	-0.012 (0.009)	-0.070 *** (0.010)	-0.043 *** (0.010)	-0.033 *** (0.009)	-0.008 (0.010)	-0.044 *** (0.010)	
Log(Return Volatility)	0.128 *** (0.012)	0.124 *** (0.001)	0.127 *** (0.011)	0.129 *** (0.011)	0.121 *** (0.012)	0.162 *** (0.013)	0.161 *** (0.013)	0.146 *** (0.012)	
Lead Manager Reputation	0.060 (0.079)	0.078 (0.49)	0.034 (0.078)	0.029 (0.078)	0.045 (0.078)	0.043 (0.078)	0.048 (0.078)	0.050 (0.078)	
Multiple Book Indicator	-0.078 *** (0.030)	-0.060 ** (0.027)	-0.060 *** (0.028)	-0.072 ** (0.028)	-0.073 ** (0.029)	-0.079 *** (0.029)	-0.078 *** (0.029)	-0.078 *** (0.029)	
Amex Indicator	0.058 *** (0.018)	0.052 *** (0.018)	0.055 *** (0.018)	0.026 (0.018)	0.058 *** (0.018)	0.059 *** (0.018)	0.060 *** (0.018)	0.052 *** (0.018)	
Nasdaq Indicator	0.041 *** (0.013)	0.021 (0.017)	0.032 *** (0.016)	-0.026 * (0.014)	0.061 *** (0.011)	0.045 *** (0.011)	0.046 *** (0.011)	0.024 *** (0.012)	
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
N	2,387	2,387	2,387	2,387	2,387	2,387	2,387	2,387	
Adjusted R-squared	0.617	0.624	0.623	0.630	0.623	0.621	0.621	0.623	

**Table 5**  
**The Effect of Size on the Relation between Liquidity and Investment Banking Fees**

This table reports in Column (1) OLS regression results relating investment banking fees to our liquidity index measure of stock market liquidity. The regression specification is:

$$\text{Log}(\text{Investment Banking Fee}) = \alpha + \sum_{j=1}^5 \beta_j \text{Liquidity Index} * I_{\text{Size Quintile}=j} + \gamma \text{Controls} + \varepsilon.$$

where the *Investment Bank Gross Fee* is the percent of the SEO proceeds paid to investment banks (the percentage gross fee), *Liquidity Index* is the average scaled cross-sectional ranking over seven measures of liquidity (quoted, effective, and relative effective bid-ask spreads, volume, share turnover, average trade size, and average depth at the bid and ask prices),  $I_{\text{Size Quintile}=j}$  is a dummy variable equal to one if the issue belongs is in the size quintile  $j$ , zero otherwise, and *Controls* represents a vector containing the following factors: principal amount, market value of equity, share price, return volatility, lead manager reputation, multiple book-runners indicator, Amex and Nasdaq indicators, and year dummies. The market value of equity, share price, turnover, and volume reflect average monthly figures from CRSP. Return volatility is constructed as the standard deviation of daily returns. Quoted, effective, and relative effective bid-ask spreads, quoted depth, and average trade size are collected from the TAQ database and reflect average monthly figures. Investment banking fees are collected from the SDC database. Lead manager reputation is the market share of the lead manager. Multiple book indicator is equal to one if there are multiple book-runners, zero otherwise. Amex and Nasdaq indicators are based on the primary listing of the firms' shares. All firm characteristics are constructed for a period of six months prior to the offering date. Robust standard errors are reported in parentheses below coefficient estimates. \*\*\*, \*\*, and \* denote significance at the 1, 5, and 10 percent levels, respectively. Column (2) reports estimates of the economic magnitude of the effect of liquidity on investment banking fees by size quintile. Following the definition of elasticity, we compute the effect of a change from the fifth to the first liquidity quintile on investment banking fees using the following equation:

$$\text{Economic Magnitude} = \hat{\beta}_1 \left[ \frac{\text{Average Investment Banking Fee}}{\text{Average Value of Liquidity Index}} \right] * (Q_L^1 - Q_L^5) * 100$$

where  $\hat{\beta}_1$  is the coefficient on the liquidity index computed in Column (1), and  $(Q_L^1 - Q_L^5)$  represents the average value of the liquidity measure in the first liquidity (least liquid) quintile minus the average value of the liquidity measure in the fifth (most liquid) quintile.

**Table 5 (continued)**

	Regression coefficient: <i>Liquidity Index</i> (1)	Economic Magnitude (basis points) (2)
Smallest Size Quintile: $\hat{\beta}_1$	-0.163 *** (0.046)	86
Size Quintile 2: $\hat{\beta}_2$	-0.164 *** (0.039)	86
Size Quintile 3: $\hat{\beta}_3$	-0.170 *** (0.035)	89
Size Quintile 4: $\hat{\beta}_4$	-0.193 *** (0.037)	102
Largest Size Quintile: $\hat{\beta}_5$	-0.314 *** (0.048)	164
<i>Wald tests (p-value)</i>		
$H_o^1 : \beta_1, \beta_2, \beta_3, \beta_4 = \beta_5$ <i>Jointly</i>	0.000	
$H_o^2 : \beta_1 = \beta_2 = \beta_3 = \beta_4$	0.793	

**Figure 1**  
**Gross Investment Banking Fees vs. Principal Amount.**

This figure presents a scatter plot of gross investment banking fees for seasoned equity offerings against the size of the offering. Our sample consists of all seasoned equity offerings listed on the Securities Data Company's *Global New Issues* database over the period 1993-2000 that satisfy the following criteria: a) the company is not a financial institution (SIC codes 6000 through 6999); b) the company is present in both the CRSP and TAQ databases; c) the company has at least six months of transaction data prior to the seasoned equity offering; d) the offering is a firm commitment; and e) the offering is not a shelf registration.

