Southern Business Review

Volume 6 | Issue 1 Article 3

April 1980

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Robert J. Angell
East Carolina University

Jerry G. Hunt
East Carolina University

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Robert J. Angell and Jerry G. Hunt

INTRODUCTION

It is widely alledged that underwriters are capable of successfully pricing new stock issues such that offerings will be quickly subscribed and distributed to the benefit of both the firm and the underwriting syndicate. For both to benefit, it is necessary that prices are set low enough for the issue to be marketed readily and high enough for the issuing firm to obtain approximately the market value. For this to occur it stands to reason that initial subscribers should not be able to earn large excess returns, *i.e.*, returns substantially greater than returns available in the market.

Numerous studies have addressed underpricing and related issues arising from sale of new common stock. For example, J. G. McDonald and A. K. Fisher [1972] have shown that pricing is such that initial subscribers frequently earn large returns, but subsequent investors were unable to earn excess returns. Roger C. Ibbotson and Jeffrey F. Jaffe [1975], in an analysis of the "hot issues" market, demonstrated that excess return residuals were serially correlated. That such results are possible may be sufficient explanation for the oversubscription of many unseasoned or new issues, permitting the brokers (who may also be underwriters) to ration the new shares of stock. The studies mentioned above analyze the initial offerings, those of a company going public for the first time. Other studies demonstrate significant underpricing in the new issues market. Dennis Logue [1973], as well as Ibbotson and Jaffe, was able to detect significant underpricing. However, he was unable to explain why a monopsonistic industry such as investment banking would use underpricing on a continuous basis. These studies are also supported by the work of Frank K. Reilly and Kenneth Hatfield [1969] and by Reilly's further research [1973, 1977].

A relatively limited amount of research has been undertaken regarding underpricing on stock issues other than *initial* issues. The most notable of these is the analysis of secondary distributions by Myron Scholes [1972]. In his research, Scholes found little if any evidence of significant underpricing, a result contrary to most previous work, including that by John Lintner [1962].

This paper addresses underpricing and related topics regarding issues of new common stock by firms which have previously tapped the public equity markets. Since the previously mentioned studies, as well as others available in the literature, are primarily concerned with initial offerings of common stock, the bulk of the analysis has been on stock which is traded in the Over-the-Counter market when the after market is established. A relevant and related question concerns the performance of such stock offerings compared with other new offerings for firms already listed on the New York Stock Exchange (NYSE) or the American Stock Exchange (AMEX) or already trading OTC with quotes available via

NASDAQ. Once established firms are admitted, the picture changes in that large, financially strong firms would be expected to have more ability or bargaining strength in negotiations with underwriters than smaller, riskier, and financially weaker firms. That is not to say that all small firms are financially weak, but generally firms capable of raising $100 million or more in a single issue of common stock would qualify as financially stronger than the typical OTC or AMEX firm raising $10 million. The SEC and Federal Reserve System use $15 million as a barrier for small and unreported offerings for corporate firms. A recent study by Sidney M. Robbins *et al.* [1979] used $10 million as a measure of small stock issues. This study used $25 million as an upper limit to include small and medium-sized offerings in order to insure that NYSE firms would be included in the sample.

MODELS, ASSUMPTIONS, AND HYPOTHESES

This study was concerned with the question of whether or not significant differences exist in the price performance of new common stock issues on the NYSE, AMEX, and OTC. Specifically, the study covers initial pricing practices and subsequent rates of return available for investors in new issues as a function of the trading status of the stock, *i.e.* NYSE, AMEX, or OTC. Hence, the first hypothesis addresses the question of whether or not there is a difference in the offering price discount (commonly known as underpricing) among the three trading statuses given above. Conventional wisdom, previous research, and casual logical empiricism would indicate that the larger, NYSE-listed issues would demonstrate smaller offering discounts, and hence, "more efficient" pricing patterns. More simply, the offering prices for NYSE-listed issues would more closely approximate the last price before the offering than would be true for AMEX and OTC issues. Employing a definition of the j^{th} discount given by

$$DISC0_j = P1B_j - POF_j \tag{1}$$

where $P1B_j$ is the last price before the offering date, POF_j is the net offering price to the public, and $DISC0_j$ is the discount (underpricing), then the null hypothesis is $DISC0_j = 0$.

For explanatory variable interactions, it was necessary to redefine the discount to account for transaction fees. Therefore, the following form was developed for use in the subsequent models:

$$DISC1_j = B(P1B_j) - POF_j \tag{1a}$$

where B is unity plus some brokerage fee, *e.g.*, $B = 1 + b$, where b is usually about 2-2.5%. The model was tested with the relationship

$$DISC1_j = f(TS_i, PB30_j, PA30_j, SIZE_j, NSHAR_j) \tag{2}$$

where TS_i refers to the i^{th} trading status, PB30 refers to the price 30 days before offering, PA30 refers to the price 30 days after offering, SIZE refers to the dollar volume of the offering, and NSHAR represents the number of shares issued by the offering. The intercorrelations of these variables were not significant.

The secondary relationship to be investigated concerns the performance of the underwriters in pricing the new offering relative to the price performance for the subsequent 30-day and 90-day periods. The relevant comparisons are made using rates of return (single-period returns), since investors in new issues of common stock apparently expect above average returns (excess returns). Here is where the problem of efficiency of pricing is apparent, since the pricing should be high enough (or "fair") to the issuing firm so that large excess returns relative to risk are not earned. Yet, the price must be sufficiently low or attractive so that investors will choose to purchase the shares. Presumably this implies positive excess returns.

According to the most relevant studies, including the Reilly [1969, 1973] and Ibbotson and Jaffe [1975], the first month after offering is the critical time for new issues. However, it may be that more efficient pricing occurs during less ebullient market periods. This is somewhat counter to most conventional views. Ibbotson and Jaffe found that the month following a period of low cumulative residual returns may be better for minimizing the total premiums that develop on new stock issues. This means that if investors earn lower premiums the initial offering price must have been more efficiently set. Hence, the time period selected should permit adequate testing of the hypothesis without undue bias from either boom or bust markets. For this study, the time period covers approximately sixteen months (from September 1977 to December 1978) during which the major market indices both rose and declined.

The premium that does or does not develop on the individual stock issues is the critical variable of interest and is measured as a rate of return. First, rates of return for the 30-day and 90-day periods after offering were computed as follows:

$$R_{kj} = (PA_{tj} - POF_j)/POF_j \qquad (3)$$

where PA_{tj} represents the price of the j^{th} new issue 30 or 90 days after offering date, R_{kj} represents the rate of return of the j^{th} new issue for the k^{th} period, and POF_j, as defined in (1), represents the net offering price to the public.

Second, annualized continuously compounded rates of return for both periods were computed using the relationship

$$AR_{kj} = EXP(TR_{kj}) - 1.0 \qquad (4)$$

where T represents the ratio of a year to t, 360/t, EXP is the Exponential Function, and AR_{kj} represents the annualized rate of return of the same issue and period.

Finally, market adjusted excess returns were computed for the same two periods for each stock issue. The excess returns were computed using a risk and return framework following the market model. That model implies use of an adjustment on the relevant index as follows:

$$ER_{kj} = AR_{kj} - \beta_j(RIND_{kj}), \qquad (5)$$

where ER_{kj} represents the excess return for the j^{th} new issue, during the k^{th} period, $RIND_{kj}$ is the annualized return on the relevant index for the k^{th} period, and β_j is the market sensitivity parameter for the j^{th} issue as computed by Merrill Lynch [1978]. The relevant index is either the New York Stock Exchange Index for NYSE firms, or the American Stock Exchange Index for AMEX firms, or the National Association of Securities

Dealers Automatic Quotation Index for OTC firms. The returns were annualized and continuously compounded as done for the stock issues for the two periods.

There are several variables that might be used in an attempt to explain the variation in either the rates of return or the excess returns. Following the lead of Logue [1973], we focused on the size of the issue, the value of the issue, and the trading status of the issue, *i.e.* NYSE, AMEX, or OTC. Naturally, the trading status variables were categorical, and hence were represented in the regression models by dummy (0,1) variables. Although size and value may be imperfect measures of the expected liquidity in the aftermarket, it appeared that their omission would be a misspecification of the model that we proposed to use. As an expectational variable from the period prior to the offering data, we included the percentage price change from thirty days prior to the offering date itself. Hence, it was similar to a nonnormalized rate of return for the prior period.

Therefore, tests of the second hypothesis might be made using models of returns as explained above. The models of annualized returns would be based on the formulation

$$AR_{kj} = f(TS_i, EPC_j, SIZE_j, NSHAR_j, RIND_{kj}), \tag{6}$$

where TS_i refers to the i^{th} trading status and is a categorical variable, EPC represents an expected price change prior to the offering and was measured by either the actual price change or by a price thirty days before offering, SIZE is the value of the offering in dollars, and NSHAR is the number of shares. As noted previously, $RIND_{kj}$ is the return on the relevant index for the N-day time period.

The models for the excess returns were similar to (6) and given by

$$ER_{kj} = f(TS_i, SIZE, NSHAR, EPC, RIND_{kj}), \tag{7}$$

where the variables are defined as above. One difference was that the SIZE and NSHAR variables were used in logarithm form.

A sample of 104 common stock offering episodes was selected over the sixteen month time period. Neither secondary offerings nor issues with a total value of greater than $25 million were included. The mean value was approximately $11.2 million, the average number of shares was 626,000, and the unweighted mean of the offering price was $18.66. Prices were obtained for the stock 30 days prior to offering (last traded price), the close of the day immediately prior to offering, 30 days after offering, and 90 days after offering. For OTC stocks an average of bid and asked prices was taken as a proxy for the last traded price. The sample data were drawn from various issues of *The Wall Street Journal*. However, the decision to use the beta-based market adjustment reduced the sample to 86 issues for the analysis of the excess returns.

ESTIMATION RESULTS AND ANALYSIS

Results of multivariate analysis are included in this section. As a preliminary to the estimation of the regression models and analysis of covariance, the discounts using the relationship (1) to determine $DISC0_j$ were computed and summarized as given in Table 1. A cursory analysis of these data discloses that there were more positive discounts for OTC than AMEX or NYSE, which is as expected. Recall that $DISC0_j$ was the unadjusted discount of the offering price from the last previous market price. If the discounts using the brokerage-adjusted model ($DISC1_j$) had been used, the number of negative discounts would have been reduced to only four. Two remained for OTC issues and two remained for NYSE issues, implying no obvious pattern. However, analysis of variance of the frequencies by trading status failed to demonstrate any significant differences among the variables. The computed F value with (2,6)d.f. was 0.74.

TABLE 1

FREQUENCIES AND PERCENTAGES OF POSITIVE, NEGATIVE, AND ZERO DISCOUNTS BY TRADING STATUS, FOR NEW STOCK OFFERINGS, UNADJUSTED OFFERING PRICES

	Frequencies			
	OTC	AMEX	NYSE	TOTALS
Positive	33	5	7	45
Zero	4	13	14	31
Negative	11	1	16	28
TOTALS	48	19	37	104
	Percentages			
	OTC	AMEX	NYSE	TOTALS
Positive	73.33	11.11	15.56	100.00
Zero	12.90	41.94	45.16	100.00
Negative	39.29	3.57	57.14	100.00
	Percentages			
	OTC	AMEX	NYSE	
Positive	68.75	26.32	18.92	
Zero	8.33	68.42	37.84	
Negative	22.92	5.26	43.24	
TOTALS	100.00	100.00	100.00	

Source: Data sample and Model (1) results.

Table 2 provides the results of estimating various forms of the model relating the discount to the trading status variables, the liquidity variables, and the expected price variables. It can be seen that there are two reported versions of the discount, and these result from modifications introduced by use of the relationships given by 1B and 1C. One notable result is that almost none of the trading status dummies is significant. The only exceptions occurred for the intercept term (=NYSE) in trial models not included here. The SIZE variable is significant and of the correct sign. The expectational variable PB30 is also significant. All of the R^2 values are low, but the F values are significant. The most probable explanation for this is that there is some statistically significant relationship, but the relationship is quite weak. In particular, there is insufficient evidence to demonstrate that underpricing is a function of the trading status.

Table 3 presents the results of the estimation efforts for the models relating the annualized excess returns to the various explanatory variables as given by relationships (6) and (7). In the results of these estimations, one could impute "true efficiency." "True efficiency" as defined by the inability of investors to earn significant annualized excess returns is demonstrated with most R^2 values of less than ten percent. Such low values were obtained from the best versions of the models, and they illustrate how close to insignificance the annualized returns and excess returns may be. Other versions of the models using annual returns instead of market adjusted returns gave similar returns with some slightly higher R^2 values. (These results are available from the authors.)

TABLE 2

OFFERING DISCOUNT MODELS WITH ADJUSTED MARKET PRICE DIFFERENTIALS

Explanatory Variables	MODEL 1A DISC0	MODEL 1B DISC1	MODEL 1C DISC1
Intercept	0.04915 (0.220)	0.22814 (0.99)	0.15223 (0.61)
OTC	0.03227 (0.27)	0.01818 (0.15	0.01576 (0.13)
AMEX	- 0.12402 (- 0.89)	- 0.12048 (- 0.85)	- 0.13850 (- 0.96)
SIZE	- 0.00004 (- 2.38)**	- 0.00003 (- 1.75)*	- 0.00004 (- 1.92)*
NSHAR	0.00039 (1.39)	0.00022 (0.79)	0.00033 (1.06)
PB30	0.01930 (1.82)*	0.02977 (2.77)***	0.02472 (1.99)**
PA30			0.01110 (0.81)
R^2	10.092%	13.541%	14.124%
F VALUES	2.20*	3.07**	2.66**
D-W	1.954	1.939	1.938

t-values in parentheses

*significant at ≤ 10%
**significant at ≤ 5%
***significant at ≤ 1%

TABLE 3

PARAMETER ESTIMATES OF EXCESS RETURN MODELS FOR 30-DAY AND 90-DAY PERIODS AFTER NEW COMMON STOCK OFFERING DATES

Explanatory Variables	MODEL 2A ER1	MODEL 2B ER1	MODEL 2C ER2	MODEL 2D ER2
Intercept	2.28394 (0.05)	- 8.41991 (- 0.18)	5.45782 (1.67)*	5.33896 (1.63)
OTC	- 0.69570 (- 0.10)	- 0.51323 (- 0.07)	- 1.02497 (- 1.95)*	- 0.97858 (- 1.86)*
AMEX	12.84523 (1.50)	19.05475 (2.23)**	- 0.61611 (- 1.03)	- 0.52667 (- 0.88)
SIZE (LOG)	0.53970 (0.08)	0.67221 (0.09)	- 0.89650 (- 1.74)*	- 0.94202 (- 1.82)*
NSHAR (LOG)	- 0.86141 (- 0.11)	0.71924 (0.09)	0.60280 (1.02)	0.68466 (1.16)
EPC	- 0.28315 (- 0.08)	- 0.06476 (- 0.02)	0.06848 (0.25)	0.07233 (0.27)
RIND1	9.85647 (2.58)***			
RIND2			0.68289 (1.22)	
R^2	15.563%	7.882%	8.050%	6.305%
F VALUES	2.43*	1.37	1.15	1.08
D-W	2.302	2.136	2.261	2.196

t-values in parentheses

*significant at ≤ 10%
**significant at ≤ 5%
***significant at ≤ 1%

Further examination of the excess returns for the two periods elaborates the major findings. Here, R^2 values are much lower than those for the best models in Table 2. The results for the 30-day excess returns were at least significant in one model using the return on the index variable, but the results for the 90-day excess returns neither gave significant F values nor explained much. The R^2 values were about seven percent. In fact, in Models 2C and 2D (covering the 90-day period), few variables including the coefficient for the return on the index were significant. For the 30-day period, Models 2A and 2B indicate significance for the coefficients of the RIND1 and NSHAR (number of shares) variables, and yet the values for R^2 of 15.563 and 7.882 are not satisfactory levels to explain anything, despite the F value of 2.43 in Model 2A.

SUMMARY AND CONCLUSIONS

This paper has attempted to determine whether or not significant differences exist in the price performance, and hence rates of return, among new common stock issues on the NYSE, AMEX, and OTC. The initial response of many, *i.e.* the NYSE demonstrates "fairer" or more efficient pricing patterns, has not been sustained by the statistical results. Although there were more positive discounts of the offering price from the last prior price for OTC-traded stocks, there was so much variation for each trading status that the null hypothesis of no difference in the NYSE, AMEX, and OTC could not be rejected, even at a fifty percent level.

The secondary hypothesis was more difficult to assess. The basic approach was estimating annualized excess returns over both 30-day periods and 90-day periods following issue data. The statistical significance of the parameter estimates and models were mixed. The explanatory power of the models was poor, with values of R^2 ranging from about 15 percent down to six percent. None of the versions of the models was significant at a reasonable level of significance. The trading status dummies for OTC, AMEX, and NYSE were usually not significant. The liquidity and/or marketability variables (SIZE, NSHAR) were significant in some models, but not in any consistent fashion. The expectational variable (EPC) was never significant. The 30-day return on the index (RIND1) was significant but not the 90-day version, RIND2.

A reasonable interpretation of the results of this paper would be that the previous research indicating positive returns for the first 30-day period after offering date may be defended, since the explanatory power of the best model for that period was superior to the similar model for the 90-day period. Yet, with such weak and mixed results, one must question even the positive 30-day returns based on the fact that they were so inconsistent and weak.

A further statistical demonstration of the relative efficiency has clearly been provided by the results of this research. A question as yet unanswered is certainly relevant: what has been the impact of changes in the seventies on the results of this research? Since the data set consisted of the most recent data available, and after May Day and other unbundling of activities of brokers and underwriters, could the new environment and current data account for the greater efficiency of security pricing implied by the results here? It should be recalled that the results include data up to December 1978, and most changes seem to increase efficiency of pricing.

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Robert J. Angell is an Assistant Professor and Jerry G. Hunt is an Associate Professor in the Department of Accounting and Finance, School of Business, East Carolina University, Greenville, North Carolina.