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Daniel P. Klein
Bowling Green State University

R. Corwin Grube
Drake University

O. Maurice Joy
University of Kansas

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This paper examines compensation for the underwriting activity in firm commitment initial public offerings (IPOs) of common stock in the U.S. When compensation for origination, management and marketing efforts are excluded from total underwriter compensation, we find that the portion of the total compensation assigned for the underwriting activity itself exceeds theoretical compensation only for issues that sell out very quickly. We interpret this finding as empirical evidence supporting the incentive for underwriters to underprice IPOs. Finally, we find excess compensation to underwriters is positively related to the riskiness of the IPO and negatively related to the degree of competition among investment bankers and the size of the IPO.

I. INTRODUCTION

Recently, Kunimura and Iihara [12] and Bae and Levy [2] have suggested that positive excess compensation, on average, is earned by underwriters in firm commitment offerings of seasoned stock in the United States.[1] The purpose of this paper is to determine whether, on average, excess compensation is also earned by underwriters in firm commitment initial public offerings (IPOs) of common stock in the U.S. We also identify characteristics of issuing firms and underwriters that are associated with excess compensation when it does occur.

Daniel P. Klein • Bowling Green State University, College of Business Administration, Bowling Green, Ohio 43403.
R. Corwin Grube • Drake University, College of Business & Public Administration, Des Moines, Iowa 50311.
O. Maurice Joy • University of Kansas, School of Business, Lawrence, Kansas 66045.

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In a firm commitment underwriting, underwriters typically perform three activities for the issuing company. These activities include origination and management, distribution, and underwriting (or the actual purchase) of the issue. When underwriters purchase shares of stock from issuing companies in firm commitment offerings, they accept the risk that the shares might only be sold at a price below the offer price; and that, for a time, unwanted inventory of stock might have to be carried. Furthermore, according to the Rules of Fair Practice of the National Association of Securities Dealers, offered shares cannot be sold above the offer price before the underwriting account is officially closed. Thus, it is important for the underwriter to appropriately price the shares in order to minimize the risk of a failed offering, yet still earn an appropriate return for the activities performed. Smith [24,25] has pointed out that the offering of new shares at a fixed offer price is analogous to the sale of a call option to potential investors. In this case, the option is sold by the underwriter since it is assumed that the underwriter has officially taken possession of the shares at the time of the offer. The sale of a call option backed by the possession of shares represents a covered call position and is effectively modeled as a put option. This is the approach taken here and, thus, borrows from the previous work by Smith [24,25].

Following Bae and Levy [2], Kunimura and Iihara [12], Smith [23], and Marsh [14], the Black-Scholes Option Pricing Model (OPM) is used to estimate the theoretical value of the underwriting risk premium. Any difference between the actual compensation paid to the underwriter for accepting the risk of the underwriting and the theoretical value determined by the Black-Scholes OPM is viewed as excess compensation earned by the underwriter.[2]

The paper is important for several reasons. First, no prior work provides an estimate of the excess compensation available to underwriters in firm commitment initial public offerings of common stock. This paper fills that gap. Second, underwriter compensation is a significant portion of total issue costs in IPOs and thereby deserves additional study (see Ritter [21]). Finally, as Logue [13], Johnson and Miller [11] and Tinic [26] suggest, new issue underpricing and the amount of compensation paid to underwriters may be related. Accordingly, the underwriter compensation results obtained here may also provide evidence, at least indirectly, on IPO underpricing.

The results of the paper indicate that when the actual portion of the total underwriter compensation that is designated for the underwriting activity only is compared to the estimated underwriting risk premium as based on a 1 day option maturity, underwriters earn significant excess compensation. However, the excess compensation turns negative if the implied option maturity is longer than 3 days, suggesting that investment

bankers have an incentive to sell the issue out quickly. Underpricing, then, becomes a viable means of ensuring a speedy distribution. The excess compensation results of this paper support the findings of Bae and Levy [2] for offerings of seasoned securities.

The remainder of the paper is organized as follows. Section II discusses the OPM characterization of underwriter risk premium used here. Section III presents the data, empirical tests and results. Section IV identifies firm and underwriter characteristics associated with excess returns in IPOs. Section V contains a summary and the paper's conclusions.

II. MODEL SPECIFICATION

As mentioned previously, Smith [24, 25] recognized that underwriters of firm commitment offerings implicitly sell a call option to investors. Investors have the right but not the obligation to purchase shares from the underwriter at the offer price. Once the underwriter purchases shares from the issuing firm, however, the underwriter has an inventory of shares. Hence the call option sale represents a covered call option position for the underwriter. The covered call option position is routinely modeled as a put option since the short sale of a put option and the covered call position are essentially equivalent.[3] To make reading of the paper consistent, the covered call position will be referred to as the put option from this point forward.

Bae and Levy [2] provide a detailed derivation of the put option value of underwriting services in firm commitment offerings and show that the value of the underwriting contract, U, is

$$U = -e^{rt}p + (X - B)$$

where p represents a put option, X represents the offer price of the issue, and B represents the bid price paid by the underwriter to the issuing company. Thus, in this case, $(X - B)$ represents compensation paid to the underwriter by the issuing firm, net of underwriting expenses typically faced by underwriters in firm commitment offerings. The value of the put option premium should reward the underwriter for having accepted the risk associated with the transfer of stock from the issuing company. In an efficient market, and if underwritings are costless, then the value of U must be equal to 0.

Like fungible options traded on an exchange, most of the parameters of the put option model are straightforward or can be easily estimated. An exception is the maturity of the put. Because we are, in part, dealing with the sale of a call option to investors, the maturity of the put option (i.e.,

the valuation of the covered call position) corresponds to the length of time the investment banker is exposed to underwriting risk. It appears the legal liability of underwriters in an IPO extends for 30 days.[4] Many IPOs, however, are oversubscribed and sell out on the offering date. As a result, it is not clear whether an option maturity of 30 days, one day, or some intermediate value is appropriate. Kunimura and Iihara [12], for example, use eight days as the maturity of the put option in their work on seasoned issues of common stock. Bae and Levy [2] use maturities ranging from one to five days in their analysis of seasoned offerings. Marsh [14] uses a maturity of approximately 25 days in his work on valuing underwriting agreements in UK rights issues, since the exercise price in a British rights offering is set roughly 25 days before the exercise date. Taking the assumptions of previous work into account, we employ three different maturities for the put option in our work: 30 days, corresponding to the Master Agreement Among Underwriters; 8 days, corresponding to the work by Kunimura and Iihara [12]; and, 1 day, corresponding to the length of time it typically takes a new issue to be fully distributed. Other parameter estimates for the put option are described below.

1. Stock Return Variance, $VAR(i)$, is the annualized rate of return variance based on stock returns generated over the first 30 trading days;
2. Exercise Price, $C(i)$, equals the offer price;
3. Stock Price, $X(i)$, equals the offer price;
4. Riskless Return, $R(f)$, is the rate of return on U.S. T-Bills with maturity equal to that of the put option.

The variance estimate is similar to that used by Ritter [20]. It requires data that are not known to the underwriter at the time of the pricing decision; however, as he notes, since no trading scheme is being employed, there is little harm in using this data to obtain model estimates.[5]

The maturity of the put option specifies the maturity of the riskless asset used to arrive at the option value. In particular, the 30 day T-Bill rate on the effective date of the registration statement is selected as the riskless rate of interest when option maturity is 30 days. When option maturity is 8 (1) days the 8 (1) day T-Bill rate is used.

The offer price is the price at which investors can purchase stock from the underwriter and so corresponds to the exercise price of the put option. Likewise, the offer price is the first market price of the stock and is closest in time to the effective date of the registration statement. As a result, offer price is used as an estimate of both the current market price of the stock and the exercise price of the put.

III. DATA, EMPIRICAL TESTS, AND RESULTS

The SEC's Registrations and Offerings Statistics (ROS) File is used to identify the population of non-Regulation A IPOs.[6] The 1987 version of the ROS File covers the period 1973-1987 and identifies approximately 2800 such offerings.[7] Our sample period is limited to 1977-1987 since data on the ROS File (and other sources) are incomplete prior to 1977.[8] The 1977-1987 period contains 2658 or approximately 95% of the IPOs that appear on the ROS File between 1973 and 1987. Between 1977-87 there were 1250 IPOs that were issued that included warrants issued to the underwriter. Of the remaining issues 139 were part of a unit offering that included other securities. The value of the warrant provision is difficult to estimate and, in addition, may affect the size of actual underwriter compensation paid by the issuing firm.[9] As a result, these offerings are excluded from the sample. Similarly, the amount of underwriter compensation due solely to the stock transaction in unit offerings is ambiguous and these firms are also excluded from the sample. After eliminating the above firms as well as the offerings of financial institutions, a total of 1130 IPOs were available between 1977-87. From this total of 1130 available firms, a random sample of 209 firms was selected for study here. A sampling procedure was necessary since nearly all IPOs initially trade in the OTC market and data collection was costly.

Summary values for selected variables by year are shown in Table 1. For the sample, the gross spread ranged from as little as 4% to over 10% and averaged 7.41% over the 11 year period.[10] The gross spread was negatively correlated with issue size: the spread to underwriters for the quartile of largest IPOs averaged 6.64% and for the quartile of smallest IPOs 8.37%. These results are consistent with those reported by Mendelson [15] for larger IPOs during the 1945-1963 period and Ritter [21] for larger IPOs during the 1977-82 period. The average gross spread results for the random sample used here are also consistent with the full sample results as provided by Aggarwal and Rivoli [1]. Aggarwal and Rivoli, studying firm commitment IPOs over the same time frame, and for a sample of 1556 firms, found the average gross underwriter spread to be 8.24%. Thus, the gross spread results of the sample used here are reasonably representative of the full sample. The average offer price of $13.00 per share is similar to that reported by Miller and Reilly [17] who found common stock IPOs averaged $11.13 per share during the 1982-83 period. The average issue size of $26.2 million exceeds the $17.4 million reported by Carter and Manaster [6]. This disparity in issue size is caused primarily by our 1987 data.[11] Excluding 1987 data, the average issue size for our sample is $19.4 million, comparable to the Carter and Manaster study. Finally, the average first day (offering day) return of 7.64% is a measure of issue underpricing and is similar to the 9.87% reported by Miller and Reilly

[17]. A test of the pooled mean of 7.64% against zero permits rejection of the null hypothesis of zero at the 95% confidence level (t=6.10). Thus our sample exhibits the significant underpricing phenomenon reported in prior IPO work. Relative to other IPO studies, our sample contains somewhat larger issues but with other firm characteristics comparable to those found in prior work.

Panel A of Table 2 presents the excess return results from employing the Black-Scholes OPM to estimate the theoretical underwriter risk premium as a put option.[12] The results in Panel A also assume that underwriting expenses are zero. That is, the entire spread, $(X - B)$, represents payment made to the underwriter for taking on risk. Thus, excess compensation is measured for each IPO as the difference between the actual gross spread and the estimated risk premium. These values are then aggregrated cross sectionally. Excess compensation results are shown for option values with 30, eight, and one day maturities, respectively. The cross-sectional variance of these differences is estimated to perform a t-test of the paired difference sample mean. For the 30 day maturity, the results show, on average, actual compensation for risk exceeds estimated compensation by 0.96% (t=5.55). When the maturity of the put option is reduced to eight days to provide results comparable to Kunimura and Iihara [12], average excess compensation increases to 4.37% (t=42.8). When maturity is specified at one day, average excess compensation is 6.40% (t=94.7).

The Panel A results reported above assume that the gross spread represents the fee paid by the issuing company for the underwriting activity. As noted previously, underwriters originate, manage and distribute an IPO in addition to underwriting the issue. A review of the *Investment Dealers Digest* shows that between 10% and 30% of the gross spread is typically specified for the underwriting activity — the remainder is compensation for origination, management and distribution efforts. Since the fee for underwriting activity is the portion of the gross spread charged by the investment banker for risk taking, it may be more appropriate to compare the estimated risk premium to the underwriting activity fee. It is assumed that the underwriter receives just enough compensation to cover the costs associated with management and distribution of the issue. The underwriting activity portion of the gross spread was collected for each offering through information from the *Investment Dealers Digest.* When actual underwriter compensation for only the underwriting activity is considered, a quite different set of results occurs. These results are shown in Panel B of Table 2. Here excess compensation is negative (and significant) for put option maturities of 30 and eight days but positive and significant for the one day maturity. Assuming the *Investment Dealer Digest* breakdown of fees is appropriate for each issue, these results suggest positive excess compensation

Table 1
Summary Statistics by Year for IPOs
Issued Between 1977 and 1987

Year	*# Sample Firms*	*Average Gross Spread*[a]	*Average Annual Std. Dev. of Returns*
1977	6	7.83%	50.11%
1978	11	7.61%	68.88%
1979	19	7.82%	63.36%
1980	12	7.60%	76.42%
1981	22	7.64%	66.81%
1982	11	7.26%	53.32%
1983	44	7.12%	53.36%
1984	17	7.66%	41.86%
1985	18	7.28%	52.50%
1986	34	7.27%	53.22%
1987	15	7.31%	53.22%
All	209	7.41%	50.94%

Year	*Average Offer Price*	*Average First Day Return*[b]	*Average Issue Size (in Millions)*
1977	$10.46	4.91%	$ 6.51
1978	15.48	11.41%	9.94
1979	12.99	8.26%	8.87
1980	17.38	18.22%	19.10
1981	12.86	3.75%	12.48
1982	14.00	3.44%	18.85
1983	14.55	7.19%	25.73
1984	9.58	1.71%	20.98
1985	12.21	6.99%	23.98
1986	13.00	11.08%	23.95
1987	11.28	6.46%	114.76
All	$13.00	7.64%	$ 26.24

Notes: [a] As a percent of Offer Price
[b] (Closing Bid Price - Offer Price)/Offer Price

for underwriters occurs only in IPOs that sell out quickly. For IPOs that do not sell quickly, underwriters experience economic losses i.e., negative excess compensation, associated with their underwriting activities.

These results provide strong empirical evidence on the incentive for underwriters to sell out IPOs quickly and, hence, avoid economic losses on their underwriting activities. They also provide strong evidence on the incentive for underwriters to underprice new issues. Underpricing is the most direct way to create excess demand for new shares and to ensure they sell quickly. Accordingly, our results could also be interpreted as empirical evidence on the incentive for underwriters to underprice IPOs: absent

Table 2
Excess Compensation Earned by Underwriters in IPOs: 1977-87

Put Option Maturity	*Excess Return*	*t-value*
Panel A: Gross Spread[a]		
30 Days	0.96%	5.55
8 Days	4.37%	42.81
1 Day	6.40%	94.73
Panel B: Compensation for Underwriting Services Only		
30 Days	−4.82%	29.29
8 Days	−1.41%	16.95
1Day	0.62%	18.64

Note: [a] (Offer Price - Net Offer Price)/Offer Price

underpricing, underwriters are exposed to substantial risks of economic losses associated with underwriting activity.

Finally, although put option value is not a linear function of time and as a result, excess compensation results are not a linear function of time, a linear approximation is useful for small changes in option maturity. Using this approximation, we note that excess compensation averages zero at about 2.8 days. This suggests, on average, shares that sell in less than three days provide underwriters with positive excess compensation; shares that require more than three days provide underwriters negative excess compensation.[13] Whether any particular IPO provides positive or negative excess compensation for underwriters depends upon the weighted average length of time required to sell shares. For example, if 90% of an issue is sold on the first day of the offering and 10% is sold on the 20th day, the weighted average length of time required to sell shares would be three days and the underwriter would earn approximately zero excess compensation on the entire issue.

Since the underwriting portion represents, on average, 22% of the total underwriter compensation for this sample, the 0.62% average excess compensation for a 1 day option maturity represents 38% of the average payment made by the issuing company for the underwriting activity and 8.4 % of the sample average gross spread. These are, by no means, small percentages; especially if the great majority of issues sell out on the first day of the offer. Consequently, for these quick selling issues, the proportionately large amount of excess compensation relative to the payment for the underwriting activity suggests the capture of quasi-rents by underwriters. Thus, the results support the idea of the payment of reputational capital as suggested by Beatty and Ritter [4], Booth and Smith [5], and Carter and

Manaster [6], among others. However, one cannot exclude the possibility that the capture of these quasi-rents makes up for losses associated with slow moving issues. As noted before, the excess compensation associated with the underwriting activity disappears within 3 days. If the cost of holding inventory is also added on, underwriters would realize zero returns sooner than 3 days post-offer.[14]

IV. FIRM, MARKET AND UNDERWRITER CHARACTERISTICS AND EXCESS COMPENSATION

We next perform a cross-sectional analysis to identify firm, market, and underwriter characteristics associated with excess compensation. We employ a multiple regression model for this purpose where the selection of independent variables for the regression equation follows prior work. We also include a (0,1) dummy variable for Hot/Cold new issue markets based upon work by Ibbotson [9], Ibbotson and Jaffe [10], and Ritter [20].
The independent variables are:

VAR(i) = annualized rate of return variance based on stock returns generated over the first 30 trading days (in natural log form);
ISS(i) = dollar value of shares offered for sale for security i (in natural log form);
COMP(i) = underwriter competition measured as a (0,1) dummy variable indicating the presence or absence of a leading investment banking firm in the offering;
$H(i)$ = a 0,1 dummy variable indicating a hot or cold new issue market.

VAR(i) is used as a proxy for firm risk. Ritter [20] points out that a measure of volatility is a plausible measure of firm risk since firms with greater aftermarket volatility are also firms with greater pre-offer uncertainty associated with their market value. ISS(i) is a proxy for both firm size and economies of scale associated with underwritings (see, for example, Logue [13] and Hansen, Fuller and Janjigian [8]). Larger firms are expected to float larger issues and should be better known to the investing public. Larger issues also represent greater dollars over which underwriters can spread their fixed costs.

COMP(i) represents a measure of underwriter competition, where COMP(i) = 1 if a national underwriter is the managing underwriter, 0 otherwise. The logic behind COMP(i) is that an issuer who has been able to attract a national underwriter as the managing underwriter has, therefore,

been able to establish a more competitive environment for the underwriting relative to the environment that would exist if a small regional underwriter were managing the issue. The national/regional classification of an underwriter is provided by various Securities Industry yearbooks (also, see Pugel and White [19]).

Finally, HOT(i) refers to a hot or cold issue market and attempts to account for the market environment into which the IPO will be sold. A hot issue, according to Ibbotson and Jaffe [10], refers to a specific IPO that has risen above its offering price by a greater than average premia in the aftermarket. A hot issue market occurs when many such stocks are issued in a specific time period. In terms of the time period for this study, previous research by Ritter [20] and Muscarella and Vetsuypens [18] has identified the time periods of 1980 through the first quarter of 1981 as well as 1983 as hot issue markets. HOT(i) = 1 for a stock issued in a hot issue market, 0 otherwise.

The independent variables used in the regression model represent a relatively short list. However, as based on the results from previous work, some of which has been noted, they represent those variables that, in one measure or another, have been expected to exert an influence on variables such as underwriter compensation.[15]

Before examining excess compensation, we first perform the regressions using actual gross spread as the dependent variable. This allows us to compare our results directly with prior work on underwriter compensation in offerings of seasoned common stock. We expect a positive sign for the coefficient on return variance; a negative sign for issue size; a negative sign for underwriter competition; and a negative sign for Hot/Cold markets indicating increased underwriter compensation in Hot Issue markets. These results are shown as regressions 1 and 2 in Table 3.

Regression 1 shows that gross spread is positively related to the riskiness of the issue, VAR(i); and negatively related to both the size of the issue, ISS(i), and the degree of competition among underwriters COMP(i). There is little association between gross spread and the market environment as measured by the 0,1 dummy variable for Hot/Cold new issue markets. These results are as expected and are similar to those reported elsewhere for new issues of seasoned securities. When we focus on only the underwriting portion of actual gross spread in Equation 2, we obtain similar results.

Next we examine the relationship between excess compensation earned by underwriters and issue riskiness, investment banker competition, market environment and firm size. We expect signs on the regression coefficients to be as above with the exception of return variance, VAR(i). For VAR(i) we expect a negative sign with the logic being that greater return volatility means a greater chance that the investment banker will have to sell the issue below the offer price, thus reducing excess compensation. We report results

Table 3
Underwriter Compensation in IPOs Regressed Against Market, Firm and Underwriter Variables[a]

#	*VAR(i)*[b]	*ISS(i)*	*COMP(i)*	*H(i)*	*F*	R^2
1[c]	0.0078	−0.0985	−0.0195	−0.0056	91.85	0.636
	(1.35)	(15.03)*	(1.63)	(0.50)		
2	0.0299	−0.0880	−0.0571	−0.0269	18.6	0.258
	(2.14)*	(5.60)*	(1.98)*	(0.99)		
3	−0.0038	−0.0071	−0.0018	−0.0006	74.03	0.0637
	(7.79)*	(13.31)*	1.87)	(0.66)		
4	−0.0039	−0.0013	−0.0010	0.0009	81.68	0.608
	(16.16)*	(4.94)*	(1.98)*	(1.86)		
5		−0.0072	−0.0019	−0.0004	78.02	0.526
		(11.78)*	(1.68)	(0.34)		
6		−0.0014	−0.0010	−0.0006	9.62	0.111
		(3.44)*	(1.38)	(0.85)		

Notes: [a] Parentheses show t statistics.

[b] VAR(i) and ISS(i) are in natural log form.

[c] Dependent variables are actual gross spread and actual underwriter compensation for underwriting services only for regressions 1 and 2, respectively; excess compensation based upon actual gross spread for regressions 3 and 5; and, excess compensation based upon underwriter compensation for underwriting services only in regressions 4 and 6.

VAR(i) = annualized rate of return variance based on stock returns generated over the first 30 trading days;
ISS(i) = dollar value of shares offered forsale for security i;
COMP(i) = underwriter competition measured as a (0,1) dummy variable indicating the presence or absence of a leading investment banking firm in the offering;
H(i) = a (0,1) dummy variable indicating a hot or cold new issue market.

* Significant at the 0.05 level of significance.

for excess compensation using a one day put option maturity since excess compensation based upon other option maturities provides similar results. Regression 3 uses excess compensation generated by assuming that the gross spread represents payment for underwriting risk. Regression 4 uses excess compensation based upon only the underwriting portion of total compensation, net of fees paid for management and distribution. The results of both regressions are similar. Excess compensation is strongly negatively related to issue riskiness, issue size and competition among underwriters and to a lesser degree, market environment.

Although the negative coefficient on return variance is not surprising, there are other possible explanations for this finding. First, it may be that we have systematically mis-estimated IPO return variance, i.e., measurement error exists.[16] If so, our variance estimates of high risk stocks are too large

and our variance estimates of low risk stocks are too small. This would contribute to the negative coefficient on return variance in Regressions 3 and 4. To correct for this possible bias, each firm's return variance is adjusted using a Bayesian approach similar to that used by Vasicek [27] and Marsh [14].[17] When Regressions 3 and 4 are reestimated using Bayesian adjusted variances, the results (not shown) are virtually unchanged and suggest that measurement error in the return variance estimate is not responsible for these findings. A second possibility we consider is the limit on underwriter compensation in IPOs proposed by the National Association of Security Dealers (NASD). NASD suggests that underwriter compensation in excess of 14% should be justified by the underwriting syndicate.[18] This restriction, if operative, could cause underwriters to limit their compensation to 14% or less and thereby earn low or even negative excess compensation on high risk issues. This could produce the negative relation between excess compensation and issue riskiness reported above. To address this possibility, we eliminated from the sample all IPOs which had theoretical compensation (put value using one day maturity) greater than 2.8%. Since the underwriting portion of actual compensation averages about 22% of total compensation for our sample, this eliminates IPOs from the sample which have theoretical compensation of 14% or more. Accordingly, this eliminates all IPOs for which the NASD regulation should be operative hence, eliminates the possibility of low or negative excess compensation due to NASD regulations. We reestimated Regressions 3 and 4 (not shown) with the new sample and found no differences in the regression results. This suggests NASD regulations are not responsible for the negative relation between excess compensation and return variance.

It appears that underwriters behave in a way that is consistent with the observed negative relationship between excess underwriting profits and IPO return variance – the results are not due to measurement error or NASD regulations. Another possible explanation we consider for this finding is that underwriters underprice high risk issues more than low risk issues. By underpricing, underwriters ensure these issues sell out quickly thereby minimizing marketing costs and mitigating the underwriting risk proxied by return variance. In effect, realized excess compensation for high variance stocks would be systematically greater than the excess compensation we estimate here. The underpricing literature is consistent with this explanation: it suggests high risk IPOs are underpriced more than low risk IPOs (see Ritter [20] and Bae and Levy [2]). To examine this possibility we included first day return as an independent variable in Regressions 3 and 4 (not shown). The coefficient on first day return was negative, as expected, but not significant ($t=0.2$) in either case. While these results are consistent with the underpricing explanation, they provide only weak evidence for the hypothesis.

Finally, we omit VAR(i) since it appears as an independent variable and also affects our dependent variable. Regressions 5 and 6, as seen in Table 3, replicate Regressions 3 and 4, respectively, but VAR(i) is omitted as an independent variable. Thus, Regression 5 has as its dependent variable excess compensation generated using total underwriter compensation as the actual underwriting risk premium, while Regression 6 uses excess compensation as based on the underwriting activity of the gross spread. When variance was omitted we continued to obtain significant F statistics and the signs on the coefficients were generally not affected.

V. SUMMARY AND CONCLUSIONS

Using the Black-Scholes OPM, and as based on a covered call position established by the underwriter in the dealings with the issuer and investors, put values were estimated and compared to underwriter compensation for a sample of 209 firm commitment IPOs. If the gross spread is viewed as compensation for the underwriting function (i.e., no underwriting expenses exist), positive excess compensation occurs for all option maturities. However, assuming that underwriting expenses do occur for underwriters, and when that part of underwriter compensation designated for marketing, origination and management is excluded, excess compensation is positive for issues that sell out quickly and negative for issues that sell out more slowly. On average, it appears that IPO shares sold to investors in less than three days provide underwriters positive excess compensation for their underwriting services. IPO shares that sell in more than three days produce negative excess compensation. Since most firm commitment IPOs sell out quickly, most issues provide positive excess compensation to investment bankers. This positive excess compensation may represent quasi-rent collected by underwriters for the use of their "reputation". However, a few slow moving issues will increase average maturity substantially and decrease excess compensation. In addition, our findings are consistent with the underpricing literature: underpricing provides investment bankers a means of disposing of IPO shares quickly and avoiding economic losses from underwriting activity.

The results also show the amount of excess compensation earned by underwriters is negatively related to the size of the IPO, the degree of competition among underwriters, and the riskiness of the issue. These results are similar to those obtained for new issues of seasoned common stock and suggest that underwriters earn less excess compensation as issue size, riskiness and underwriter competition increase. The negative relation between excess

compensation and IPO variance is consistent with the underpricing literature, although our results are somewhat inconclusive. It does seem clear, however, the negative relation between excess compensation and IPO return variance is not due to either measurement error in the variance estimates or NASD regulations limiting total underwriter compensation to 14% or less.

A useful extension to this work would be the determination of the actual time required to sell issues in the IPO market. This would provide direct empirical evidence on the degree of efficiency in the market for underwriting services among investment bankers in firm commitment offerings.

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NOTES

1. Kunimura and Iihara [12] also found positive mean excess compensation earned by underwriters in Japan and the United Kingdom.
2. Whether underwriters realize any excess compensation on a particular issue depends upon how long, ex post, the issue takes to sell out. Our concern in this paper is not on whether excess compensation is realized but instead on how underwriter services are priced in the IPO market. We do, however, address below the liklihood of underwriters realizing excess compensation in the IPO market.
3. See, for example, Merton [16].
4. Section #9 of a typical Master Agreement Among Underwriters states, "...this Agreement shall terminate 30 days after the initial public offering date of the Securities...." During this 30 day period underwriters are legally bound to "...the performance of the Underwriter Agreement...." Similarly, during this period the lead underwriter(s) maintain the right to "...postpone the closing date...; ...exercise any right of cancellation...; determine the initial public offering price...; ...make changes in the terms of the offering...."
5. The variance measure utilized does not include the first day return (i.e., offer price vs. first day closing price). However, the closing price of the first trading day is used to help measure the second trading day's return. Thus, 29 daily returns are used to measure return variance. Since the first day's closing price may reflect activities performed by the underwriter to stabilize the market for the stock, daily return variance was also measured excluding the first day altogether. That is, 28 days of returns were used to measure return variance. This second measure resulted in a sample annualized return variance that was 1.5% lower relative to the variance measure that included the first day's closing price. Overall, excess compensation results were not significantly different using this second measure of return variance relative to using the first. Consequently, only results utilizing the first measure of return variance (i.e., 29 days of returns) are reported here.
6. Regulation A of the Securities Act provides for exemption from detailed registration (with the SEC) of any issue with an initial market value of less than $1,500,000 ($300,000 prior to 1978).

7. Firms for which the initial offering of stock was preceeded by a public offering of debt securities were not considered IPOs. This characterization parallels Booth and Smith [5].
8. See Ritter [20].
9. Barry, Muscarella and Vetsuypens [3] provide evidence that warrant provisions, when present, are between 45-80% of the underwriter spread in firm commitment IPOs, depending on the valuation model used. They found that warrants tend to be used more in high-risk offerings and may represent a way to circumvent regulatory compensation limits as well as a means to address information asymmetry between issuing companies and investors. Since these warrants are typically not exercisable for at least one year following the offer, the actual compensation to underwriters possessing these warrants is uncertain and, therefore, not considered in this study.
10. The difference between price per share offered to investors and the price per share paid to the issuing firm divided by the price per share offered to investors is used to measure underwriter compensation in percent terms. This is typical in the IPO literature—see Marsh [14].
11. The 1987 data includes an offering in excess of $1 billion by Consolidated Rail, formerly Penn Central Corporation. Excluding this IPO had no impact on the results reported below hence we continue to include it in the sample.
12. Technically, excess compensation could also occur because the Black/Scholes Option Pricing Model is inappropriate for modeling underwriter compensation in firm commitment IPOs or because the model itself is misspecified. Smith [23] discusses the appropriateness of the model in this context and Rubinstein [22] compares the Black/Scholes formulation of the option pricing model against alternative specifications.
13. A second set of estimated option values was calculated using the closing price on the first trading day as the proxy for the market price of the stock. In the case of OTC stocks, the closing ask price was used as the market price. The use of the first day closing price as a proxy for the market price is based on the assumption that it represents, in an efficient market sense, the equilibrium price of the stock on the offer day. Given the relative amount of underpricing associated with this sample, in particular, and IPOs in general, one would expect that excess compensation would increase since the estimated put valuation would reflect an option that is now out-of-the-money. Such is the result here as the excess compensation for underwriting services only is −2.02%, −0.08% and 0.92% for 30 day, 8 day, and 1 day option maturities, respectively. The excess compensation result for the 8 day option maturity is not significantly different from 0 at the 0.05 level of significance. This result indicates that underwriters earn excess compensation as long as the issue sells out in less than 8 days. Thus, it may provide an upper bound time limit as to when the underwriter must fully distribute the shares or suffer losses for the underwriting activities. Nevertheless, the result provides empirical evidence supporting the underpricing results seen in so many studies.
14. Bae and Levy [2] provide an estimate of the cost of holding inventory and the cost to the underwriter for having to pay the issuing company while still waiting for payment from the investor. They estimate this cost, given a 10% broker call rate and a 10 day lag time in receiving funds from investors, to be $P(0.137\%) + (1- P)(2*0.137\%)$ where P represents the probability of a successful issue.
15. Two other variables have been used as proxies for issuing company risk, the number of years the company has been incorporated (AGE(i)) and the dollar size of the company's assets (ASSET(i)). The notion is that the older the company and the larger its asset base, the less risky the company. However, ISS(i) and ASSET(i) are highly, positively

correlated and AGE(i) has not been found to be consistently related to underwriter compensation. Although not shown here, regressions 1 and 2 were performed with AGE(i) and the natural log of ASSET(i) in place of VAR(i). Only the coefficient for ASSET(i) was found to have any significance, although it lowered the explanatory power of ISS(i). The coefficient for AGE(i) was not significantly different from zero. Overall, the explanatory power of each regression was no greater than the regressions involving VAR(i)

16. See Marsh [14] for an extended discussion.
17. The Bayesian adjusted variance estimate for security i, AdjVar(i), is shown below:

$$\text{AdjVar}(i) = \frac{\text{Var}(S)\text{E}(i)}{\text{E}(i)+\text{E}(S)} + \frac{\text{Var}(i)\text{E}(S)}{\text{E}(i)+\text{E}(S)}$$

where,

Var(i) = the variance estimate for security i;
E(i) = the variance of the estimate of Var(i)=Var(i)/2n;
n = the number of return observations used to estimate Var(i);
E(S) = the cross-sectional sample variance of Var(i) estimates;
Var(S) = the cross-sectional sample mean of Var(i) estimates.

18. NASD Notice to Members 83-15 dated April 8, 1983 specifies guidelines for firm commitment IPOs, secondary offerings and best efforts offerings.

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