

Insider Ownership and Valuation of IPOs in the UK

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〈Abstract〉

Using initial public offerings of 512 UK companies newly admitted to London Stock Exchange between 1985 and 1990, we explored the reason of underpricing of new issues. We particularly examined the underpricing of new issues in terms of signalling hypothesis.

We found that there is a positive relationship between the value of the issuing firms and the fraction of equity retained by entrepreneurs. This finding is consistent with Leland and Pyle's model(1977) and the evidence of Downes and Heinkel(1982). We also found a positive association between the firm value and the degree of underpricing. In addition, our empirical evidence revealed that the underpricing of the UK IPOs is positively related to the fraction of equity retained by the original shareholders. Thus, our results support Grinblatt and Hwang's model(1989) which predicts a positive relationship between the value of firm and the degree of underpricing

1. Introduction

In this paper the phenomenon of underpricing of new issues has been explored from the perspective of signalling hypothesis, which focuses on explaining the association between the fraction of retained inside ownership and firm value. Under the assumption of asymmetric information between the inside investors and the outside investors, entrepreneurs wish to convey their true expectations to outside investors at the time of going public.

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1) Signalling theory has originally been developed on the basis of the information difference between seller and buyer or between employee and employer in a general product market and labour market (Akerlof(1970), Spence(1973)). This theory has been widely applied to an analysis of insurance

In contrast to asymmetric information hypothesis, a signalling hypothesis¹⁾ is derived from the informational asymmetry between entrepreneurs and public investors about the future value of firms. If market prices of stocks do not reflect all information²⁾ available to someone in the capital market, then it is possible for owners to use financial policy decisions to transfer information to the market or outside investors. The entrepreneurs use change of financial structure and dividend policy as major financial policy means for a signalling device. That is, managers with better information about a high quality investment opportunity can signal to potential investors by their likely choices of financing or dividend policy.

Signalling theory suggests that insiders in firms have information that the market or the investing public do not, and that the managers or entrepreneurs have an incentive to convey good information, which is based on unbiased expectations about financial variables including financial leverage or dividend yield, to outside investors or the stock market about the future returns of the firm. It is also assumed that the signal cannot be imitated by bad firms because low-quality firms do not have sufficient cash flows to back it up. Through signalling of information, the informational gap between insiders and outsiders would be lessened or would disappear. Such signalling enables outsiders or the market to truly evaluate firms. These conditions provide good firms with the incentives to remain continually in the stock market. Otherwise, the continued information asymmetry can cause markets to break down if the insiders consistently value their company above the stock market valuation³⁾.

In the paper we will focus on the effect of the fraction of entrepreneur's retained ownership on the pricing of new issues and the value of firms going public in the UK new issues market. First, the relationship between the value of firm and retained ownership will be investigated. Secondly, we will explore whether the value of firms going public is an increasing function of underpricing. Thirdly, the relationship between the degree of underpricing and entrepreneur's ownership and risk of firm will be examined. Finally, we will attempt to examine the relationship between the value of

markets. In corporate finance it has been applied to capital structure theory and dividend policy. In recent articles, some authors attempt to apply signalling hypothesis to the explanation of underpricing of new issues(see Allen and Faulhaber(1989), Grinblatt and Hwang(1989) and Welch(1989)).

2) It implies that the strong-form efficient market hypothesis does not hold.

3) Akerlof's 'lemon market' phenomenon might occur(Akerlof (1970)).

firm and the risk of issuing firm.

The remainder of the paper is organised as follows. Section II discusses the previous evidence on the impact of the ratio of retained ownership on the pricing of new issues and the value of firm going public. In Section III, we will describe the data and discuss the methodology. Section IV presents the empirical results and Section V concludes the article.

II . Review of the Previous Studies

Leland and Pyle(1977) developed a signalling model of financial structure and financial equilibrium in which entrepreneurs are seeking to finance projects(firms) on which they have private information about true expected value of the firm.

In this model, the entrepreneurs could signal their expected cash flows through the fraction of firms' equity retained by entrepreneurs, α . It is assumed that entrepreneurs maximise their expected utility of wealth with respect to (1) the capital structure of the firm; (2) their percentage of ownership of the firm; and (3) their holding of the market portfolio and the riskless assets. Leland and Pyle' s univariate signalling model predicts a positive relation between the value of issuing firms and the fraction of ownership held by the entrepreneur. The entrepreneur' s expected benefits resulting from holding equity have to be more than compensation for the risks in holding wealth in a single share rather than a diversified portfolio. If the future value of firms in question is not higher, the entrepreneurs will not retain their high fraction of equity in the projects. The higher fraction of equity retained by original owners therefore could signal positively about the value of firm. Their model displays as follows⁴.:

$$V(\alpha) = (-bZ/(1+r))[\log(1-\alpha) + \alpha] + K \quad (1)$$

where, V = the value of a firm

α = the fraction of equity retained by the owner(a signal of firm value)

4) Please refer to Leland and Pyle(1977) for more detailed discussion including the derivation of the model. Leland and Pyle' s model(1977) implies that the value of issuing firm is a function of the fraction of equity in the firm retained by the existing shareholders.

r = the risk-free interest rate

b = the coefficient of risk-aversion of the entrepreneur

K = the amount of capital to be raised

$$Z = \frac{\alpha_x^2 \alpha_m^2 - [\text{cov}(x, m)]^2}{\alpha_m^2} \geq 0 : \text{the specific risk of the firm} \quad (2)$$

where x and m are the returns on the firm and the market, respectively.

In contrast to the univariate model of Leland and Pyle(1977) considering the entrepreneur's retained percentage of the firm's equity as a signal of the future expected cash flow, Grinblatt and Hwang(1989) developed a model containing both the fraction of new issues retained by the entrepreneurs and its offering price (underpricing) in signalling the value of the issuing firm. They extend Leland and Pyle's model to the case where a combination of underdiversification and underpricing can be used to signal the mean and variance of the firm's future returns. That is, the issuer that has superior information can overcome the problem of informational asymmetry through conveyance of the true value of firm both by offering shares at a discount and by holding some of the shares of new issues in his personal portfolio. Their signalling model predicts that a firm's intrinsic value is positively related to the degree of underpricing of unseasoned common stocks issued by the firm going public. The model also implies that there is a positive relation between the extent of underpricing of new issues and the firm's post-issue share price.

Their signalling model that the firm value can be determined by the fraction of equity retained by original owners and by the underpricing of new issues can be expressed in the following equation:

$$\mu(\alpha, D) = \mu^L(\alpha) + \frac{1 - \alpha}{1 - \alpha r} D \quad (3)$$

where, μ = the value of firm

$\mu^L(\alpha)$ = the lowest value of a project⁹⁾

α = the fraction of equity owned by entrepreneurs

D = the underpricing discount per share

r = the risk-free rate.

Unlike Leland and Pyle's model(1977), this model implies that the value of issuing firm is a function of insider ownership and the degree of underpricing⁶.

Allen and Faulhaber(1989), and Welch (1989) derived a signalling equilibrium model that incorporates underpricing of initial public offerings to subsequent issues in which the owners of good firms with higher expected cash flows could obtain larger proceeds. In their signalling model, good firms issue unseasoned common stocks at a discount at the time of initial public offering and realise less proceeds than if the issues were fully priced over the market expected price. By underpricing of new issues, a firm signals that it is good quality and receives a higher price for its shares at the subsequent seasoned offerings. In their model, low-quality firms could imitate high-quality firms by underpricing, but there is a probability that the firm's true quality might be revealed prior to a seasoned issue. If a firm is discovered to be low quality after initial public offering, it would obtain only the value of a low quality firm in the sequential issues. The expected proceeds of low quality firms that underprice are less than the expected proceeds if they signal their quality at initial public offering by not underpricing. Thus, only the good quality companies which are better off by underpricing could maximise their proceeds from stock issues over the subsequent offerings.

Their models predict that good firms do not demand less IPO underpricing per se because their loss at IPOs could be compensated for by a higher price at a subsequent issue. In particular, Allen and Faulhaber(1989) attempt to apply their model to explanations of the existence of a hot issue market for initial public offerings under consideration of the empirical evidence that underpricing of new issues occurs in certain periods and in a specific industry.

In summary, Leland and Pyle's(1977) model employed one variable, the fraction of insider holding, as a signal of the value of firm. On the other hand Grinblatt and Hwang(1989) used percentage of ownership retained by entrepreneurs and

5) $\mu^L(\alpha) = \frac{-1}{r^2} b\sigma_L^2 [\ln(1 - \alpha r) + \alpha r] + K$, Where, σ_L^2 is the lower bound of variance of project.

$\mu^L(\alpha)$ is the signalling schedule for the lowest variance issuers.

6) See Grinblatt and Hwang(1989) for more detailed discussion.

underpricing together in their signalling model. Welch(1989) and Allen and Faulhaber (1989) developed the model that only high quality firms with favourable prospects could signal their firms' value by underpricing because they could obtain enough proceeds at the subsequent issues after initial offerings.

Let us discuss the previous empirical evidence on the signalling model. Downes and Heinkel(1982) found that in the investigation of 297 US initial public offerings between 1965-69, the fraction of shares retained by original owners is positively related to the value of firm. This finding is consistent with the prediction of Leland and Pyle's(1977) model. Ritter(1984a) claims that it is hard to accept Downes and Heinkel's evidence for Leland and Pyle's model. The positive association between insider ownership and the value of a firm could be explained in terms of an agency hypothesis⁷⁾, which considers firm value as endogenous with no informational difference between the manager and outside investors' expectation. The lower the percentage of insider ownership, the lower will be the value of the firm because the expected cash flow would be reduced due to managerial shirking. Through an empirical study using 559 US initial public offerings over the period 1965-73, he concludes that the association between a firm's value and insider holdings can be explained by agency hypothesis rather than the wealth effect and signalling hypothesis.

More recently, using 115 Canadian unseasoned new issues during the period 1971-83, Krinsky and Rotenberg(1989) analysed the relation between entrepreneurial ownership retention and the initial value of unseasoned common stocks. They found that the application of Leland and Pyle's(1977) model produces insignificant results. For the first time, Keasy and McGuinness(1992) tested empirically the signalling hypothesis using 190 new issues on the Unlisted Securities Market(USM) in the UK for the period 1984-1986. Their findings on the positive relation between a firm's value and the fraction of equity retained by entrepreneurs is supportive of Leland and Pyle's model. In addition to this signal, they also found that the value of a firm would be associated with the level of capital expenditure, the degree of underpricing, the reputation of reporting accountants and the cost of flotations. Their empirical findings

7) Ritter also suggests wealth effects as another alternative hypothesis for the positive association between firm value and percentage of inside holdings. His wealth effect implies that the higher a firm's value, the less equity the original owners have to sell to raise a given amount of funds.

on the positive relation between the value of firms and the degree of underpricing is consistent with the signalling model of Grinblatt and Hwang(1989).

Using 74 IPOs in Singapore stock market between 1975-88, Lam(1991) found that Leland and Pyle' s model is significant in explaining the relation between firm value and ownership. He did not find critical significance in the application of Grinblatt and Hwang' s(1989) bivariate signalling model to the investigation of the reasons of underpricing of new issues in Singapore.

As reviewed above, the hypothesis of Leland and Pyle' s univariate model that the value of issuing firms is positively related to the fractional inside ownership has been tested and confirmed by many studies. But there are few studies on bivariate signalling model of Grinblatt and Hwang(1989). As reviewed earlier, the empirical findings are also different according to the sample used(see Lam(1991) and Keasy and McGuinness(1992)).

III . Hypotheses, Data and Methodology

1. Hypotheses

In previous section we reviewed the literature which attempted to explore the reasons of underpricing of new issues. We could establish hypotheses for empirical investigation of underpricing of IPOs in terms of signalling theory. First, based on a univariate signalling model of Leland and Pyle(1977) that presents the association between firm value and ownership retention, the following simple hypothesis would be tested.

Hypothesis' I : Given the investment outlay, the value of firms going public is an increasing function of the proportion of equity retained by entrepreneurs.

The finance literature suggests that some financial variables or financial policies have been employed to signal the value of the issuing firms to the outside investors or

the stock market. Our empirical investigation therefore will focus on testing Grinblatt and Hwang's signalling model(1989) which extends Leland and Pyle's univariate signalling model. Leland and Pyle's model is the first signalling model utilising the fraction of inside shareholding as a signal of the value of a firm. Grinblatt and Hwang (1989) recently presented the bivariate signalling model which considers both the fractional inside shareholders and underpricing of new issues as a means of signalling the value of the firm. Their model would explain the pricing of initial public offerings of firms going public in terms of the signalling approach, combining the insider's shareholding and underpricing itself as a signal of the expected cash flow of issuing firm. Furthermore, their model shows the relation between the risk of the expected value of the firm and the price discount of new issues, and the fraction of equity retained by entrepreneurs. As examined above, Leland and Pyle's model could not explain the relation between firm value and underpricing. However Grinblatt and Hwang's model presents the association between firm value and underpricing, and risk and their signalling model yields unique implications which have not been tested empirically.

Prior to formulation of testable hypotheses of Grinblatt and Hwang's model, we will discuss in more detail the implication of Grinblatt and Hwang's model. In particular, the central results of Grinblatt and Hwang's bivariate signalling model(1989) can be expressed by equations (3) and (4). Equation (3) shows that the value of issuing companies is related to the percentage of inside shareholdings and the degree of underpricing of new issues. Equation (4) expresses that there is a relation between the risk of the expected cash flows of firm and the extent of price discount, and the fraction of equity owned by entrepreneurs:

$$\mu(\alpha, D) = \mu^L(\alpha) + \frac{1-\alpha}{1-\alpha r} D \quad (3)$$

$$\sigma^2(\alpha, D) = \sigma_L^2 + \frac{(1-\alpha)\gamma}{(1-\alpha r)\alpha b} D \quad (4)$$

where, μ = the expected value of the firm

σ^2 = the variance of the expected value of firm

σ_L^2 = the lower bound σ^2 , the variance of project

b = risk aversion parameter

α = the percentage of equity retained by entrepreneurs

D = the price discount per share

r = the risk-free rate.

Let us examine the implications of Grinblatt and Hwang's model through equations (3) and (4). In the first place, the signalling schedule of equation (3) has the unique testable implication that the value of the firm is positively associated with the degree of underpricing, holding the percentage of equity retained by original owners constant. This implication can be derived from the partial derivative of equation (3) with regard to D, price discount.

The signalling schedule by equation (4) yields several implications to test empirically. First, the variance of the firm's cash flows and the issuer's fractional holding are negatively related, holding the degree of underpricing constant. Second, the degree of underpricing is an increasing function of the variance, given the issuer's fractional holding. This implication is consistent with Rock's model (1986) and can be presented in equation (5).

$$D(\alpha, \sigma) = \frac{(1 - \alpha\gamma)ab}{(1 - \alpha)\gamma} [\sigma^2 - \sigma_L^2] \quad (5)$$

Third, holding the variance of the firm constant, the degree of underpricing is positively related to the issuer's fractional holdings. This implication is obvious from the partial derivative of equation (5) with regard to α , the insiders' fractional shareholdings and is unique to this model.

When equation (5) solved for the price discount, D, substituted into equation (3), equation (6) for the signalling schedule can be obtained:

$$\mu = \mu^L(\alpha) + \frac{(\sigma^2 - \sigma_L^2)ab}{\gamma} \quad (6)$$

where, μ is the expected value of the issuing firm.

Grinblatt and Hwang's model expressed by equation (6) has several testable implications which are consistent with Leland and Pyle's model. First, the value of the firm is positively related to the variance of its cash flows, keeping the issuer's fractional holding constant. Second, the value of the firm is positively related to the fractional holding of the issuer, holding the variance constant. Third, the fractional holding of the issuer is negatively related to the variance, holding the value of the firm constant.

In addition to the testable implications examined above, this model implies that there is a positive relation between the underpricing and firm value, keeping the variance of expected cash flows constant.

The empirical tests for Grinblatt and Hwang's (1989) model are thus: first, the value of the issuing firm is positively related to the extent of underpricing, holding the fraction of equity retained by entrepreneurs constant. Second, there exists a positive association between the degree of underpricing and the insider's fractional holdings. Third, the value of firms going public is positively related to the degree of underpricing, given the risk of a firm.

Hypothesis II : The value of the issuing firm is positively related to the degree of underpricing of their new issues, holding the fraction of equity retained by original shareholders constant.

Hypothesis III : The degree of underpricing and the insider's fractional holdings are positively associated, given the risk of a firm.

Hypothesis IV : The value of firms going public is positively related to the degree of underpricing, keeping the variance of the expected cash flow constant.

Hypothesis V : Keeping the fraction of equity retained by original owners constant, the degree of underpricing of initial public

offerings is positively associated with the risk of issuing firms.

Hypothesis V : The value of the firm is an increasing function of the variance of its expected cash flows, given the issuer's fractional holding.

2. Sample Selection and Data Description

The sample for an empirical investigation of pricing of initial public offerings was drawn from the firms which went public in the London Stock Exchange from 1985 to 1990. During that period a total of 1,526 new firms⁸⁾ were admitted to the main market (Official List), the USM and the third market of the London Stock Exchange. Our sample was restricted to companies which were listed on the main market and USM by an offer for sale or placing. The companies which employed the methods of introduction, offer for sale by tender and subscription were excluded because the first one did not raise any new funds and the remaining two were rarely used. We excluded initial public offerings of companies which involved a joint offer and placing and only considered ordinary share flotations for UK trading companies(excluding some financial companies such as investment trust). Initial public offerings of 512 UK companies were finally identified.

The list of initial public offerings of sample companies was identified from 'Companies Newly Admitted to Listing' of the Quality of Markets Quarterly(or the Stock Exchange Quarterly) of the International Stock Exchange(London) and the column of "New Issues" in the Investors Chronicle. Basic data such as issuing date, method of issue, offer price, market value, identification of industry(by SE classification) and proceeds were also collected from the above two sources. The fraction of share ownership retained by entrepreneurs and directors was collected from EXTEL CARDS. Daily share prices of sample companies were collected from DATASTREAM. FTA All-Share Index data used as an index for adjusting market

8) 206 new issues listed on the London stock market were overseas companies.

movement were also collected from DATASTREAM.

3. The Definition of Variables

- Market Value of Issuing Firms

In most of the previous studies, the size of capitalization of firms, which is computed on the basis of issue price at the time of going public, have been used as a variable of the market value of firms. This market value concept was employed in empirical tests of signalling hypothesis such as Downes and Heinkel(1982). In contrast, Keasey and McGuinness(1992) used the market value of the issuing firm on the fifth day of trading after flotation⁹.

In our analysis, the market value of issuing firms was computed on the first trading day and again at the time of one week(5th day) and one month(25th day) after trading in the secondary market. Market value on first trading day reflects the true value because share prices of new issues will be established on the basis of more information input by more market participants. In fact, most of the excess returns on IPOs is realised on the first trading day in the UK new issues market. We also computed the market value of issuing firm on 5th trading day and 25th trading day and employ them as dependent variables.

$$MV_{it} = P_{it} \times TNSO_t \quad (7)$$

where, MV_{it} = the market value of firms at time, t(first trading day, after one week and after one month),

P_{it} = share price of firms at time, t,

$TNSO_t$ = total number of outstanding shares after going public.

- Issue Size

This is the amount of new fund raised through initial public offerings at the time of going public.

9) Their use of capitalization on the fifth day post-flotation is based on the finding that most of the premium on new issues is realised over the first five days of trading.

$$K = OP \times NNOS \quad (8)$$

where, OP = offer price of share of IPO,

NNOS = the number of shares of IPOs.

- Underpricing

We computed the underpricing of shares of initial public offerings in the following ways. First, the degree of underpricing of new issues will be estimated in the context of raw returns(R_{it}) and market-adjusted returns(MAR $_i$) over offer price on the first, the fifth and the 25th trading days:

$$R_{it} = \frac{(P_{it} - P_{it-1})}{P_{it}} \quad (9)$$

$$MAR_{it} = R_{it} - R_{mt} \quad (10)$$

where, R_{mt} = market return based on FTA ALL SHARE INDEX

The market-adjusted returns of individual firms calculated by equation (11) are averaged across firms to compute average abnormal returns(AAR $_t$) (see equation(12)). This market adjusted model assumes that the beta of the portfolio of sample firms is equal to that of the market portfolio.

$$AAR_t = \frac{1}{n} \sum_{i=1}^n MAR_{it} \quad (11)$$

We also computed a total amount of price discount(TPD) and price discount(PD) for issuing firm in the following ways.

$$TPD_{it} = (P_{it} - OP_i) \times TNSO_i \quad (12)$$

$$PD_{it} = \frac{(P_{it} - OP_{it})}{P_{it}} \quad (13)$$

The Fraction of Equity Retained by Entrepreneurs

This was measured in the two ways. First, the percentage of equity floated by issuing

new shares was subtracted from the total shareholding, i. e., the percentage of equity retained by entrepreneurs, α , is equal to 1 - the fraction of equity floated. Secondly, Leland and Pyle's signal can be computed in the following way : $\hat{\alpha} = \alpha + \ln(1-\alpha)$. Thirdly, we collected the data for percentage of equity held by directors and large shareholders¹⁰⁾ from the columns of director's interests and share capital in the prospectuses. This proxy for the fraction of equity retained by entrepreneurs to be used in our present study can be defined as 1. To sum up, these three proxy variables for the percentage of equity retained by entrepreneurs can be outlined as follows:

- α = the fraction of equity retained by the existing shareholders: $\alpha = 1 -$
% of equity floated
- $\hat{\alpha}$ = Leland and Pyle's signal: $\hat{\alpha} = \alpha + \ln(1-\alpha)$
- α_1 = the fraction of equity held by directors and large shareholders

- Risk of the Issuing Firm

It is desirable to use the systematic risk(β) as a measure of risk of the issuing firm. However it is not possible to estimate of firms going public because of the absence of trading history. We therefore use the standard deviation of excess returns(market-adjusted return) of issuing firms for the first 25 days after trading. This proxy was employed by Ritter(1984). The age of issuing firms and sales volume were also used as proxies for the risks of firms in the existing studies. Our surrogate for firm's risk, $STD(\sigma_{i,25})$, which is defined as the standard deviation of daily market adjusted returns from the first trading day to 25th day after trading, can be defined in the following equation:

$$STD(= \sigma_{i,25}) = \left[\frac{\sum_{t=1}^{25} (MAR_{it} - AAR_i)^2}{(n-1)} \right]^{1/2} \quad (14)$$

where, AAR_i is the average market adjusted return from the first trading day to 25th

10) Here large shareholders are those who own more than 5% of equity after issue.

trading day.

-. Other Variables

In addition to variables mentioned above, variables such as profit before tax, the age of a firm, method of issues, and industry classification were collected.

4. Testing Models

Downes and Heinkel(1982) established a basic signalling model in order to test the model of Leland and Pyle(1977). Using this model, with the UK data, we investigate the relationship between fraction of equity retained by original owners and firm value. We will employ Downes and Heinkel' s equation in testing Leland and Pyle' s univariate signalling model. Leland and Pyle' s model would be supported if the parameter estimate b_1 in equation (15) is negative and statistically significant.

$$MV_i = b_0 + b_1\hat{\alpha}_i + b_2K_i + \epsilon_i \quad (15)$$

Leland and Pyle' s model will be tested by multiple regression using ordinary least square(OLS) and weighted least square (WLS) methods. The latter is one of the methods to solve the problem of heteroscedasticity arising when using cross-sectional data. In WLS, K , the new money through issuing new shares in the IPOs market is used as the weighting factor.

In addition, Leland and Pyle' s(1977) model could be tested by the following model in which the fraction of equity retained by entrepreneurs is not transformed into Leland and Pyle' s signal ($\hat{\alpha}$). The estimation by equation (16) shows that the value of firm is positively associated with the proportion of equity retained by the existing shareholders. A positive sign and statistical significance for the parameter will be supportive of Leland and Pyle' s model:

$$MV_i = b_0 + b_1\alpha_i + b_2K_i + \epsilon_i \quad (16)$$

Hypothesis II that given the fraction of inside ownership, underpricing of new

issues would function as a signal about firm value could be tested by estimating the following equation. In order to estimate model (17) we will employ the methods of OLS and WLS: Hypothesis II will be supported if the estimated coefficient b_1 for the underpricing parameter is positive and statistically significant.

$$MV_i = b_0 + b_1UP_i + b_2\alpha_i + b_3K_i + \epsilon_i \quad (17)$$

where, UP is underpricing variable and MAR or TPD will be used.

The testing model for hypothesis III assuming the positive relation between underpricing and inside ownership is described in equation (18). Hypothesis V that there is a positive relation between underpricing and risk of firm could also be tested by equation (18). If b_1 is positive and significant, hypothesis III would be supported. Hypothesis V will be supported if b_2 is positive and statistically significant.

$$UP_i = b_0 + b_1\alpha_i + b_2STD_i + \epsilon_i \quad (18)$$

where, UP is underpricing variable and MAR, R^{11} or PD will be employed.

Hypothesis IV that given the risk of the firm, the value of firm is an increasing function of underpricing would be tested by model (19). If parameter estimate b_1 is positive and significant, hypothesis IV will be supported.

$$MV_i = b_0 + b_1UP_i + b_2STD_i + b_3K_i + \epsilon_i \quad (19)$$

Hypothesis VI on the positive association between firm value and risk of firm could be tested by equation (20). A positive and significant coefficient for risk parameter, STD, would be supportive of hypothesis VI that the value of firm is positively

11) R (raw return) is the return unadjusted against the market return and is computed as the difference between the offer price of IPOs and their market price. If raw return is positive, it is thought that the offer price of IPOs is underpriced compared to the market price of IPOs.

associated with the variance of the expected cash flows:

$$MV_i = b_0 + b_1STD_i + b_2\alpha_i + b_3K_i + \epsilon_i \quad (20)$$

IV. Empirical Results

In this section, we will present the results of empirical tests concerning the impact of the fraction of entrepreneur's ownership on the value of firms going public and underpricing of IPOs.

1. Findings of the Association between Firm Value and Ownership Retention

The results of regression estimates for Leland and Pyle's model which predicts the relation between firm value and the proportion of ownership retained by the entrepreneurs are presented in Table 1. We estimated the association between firm value and ownership retention using the Downes and Heinkel's model (1) and model (2) employing inside ownership variable, α , directly without transforming into LP signal, $\hat{\alpha} = (\alpha + \ln(1 - \alpha))$. The predicted signs for LP signalling parameter in regression models (1) and (2) would be negative and positive, respectively. We estimated the relation between firm value and inside ownership by OLS and WLS. Using WLS, we were able to overcome the heteroscedasticity problem due to the variation of the disturbance term in OLS estimation which deals cross-sectional data. WLS assumes that the variance of the disturbance term is proportional to the square of one of the independent variables. In WLS the new money raised in the initial public offerings (K) is used as the weighting factor.

As reported in Table 1, in both OLS and WLS estimates of model (1), an estimated coefficient of α in model(1) is negative as predicted and statistically significant. This finding is consistent with Downes and Heinkel(1982). The estimated result using model(2) also shows correct direction and statistical significance in coefficient of ownership, α . This evidence is similar to the findings of Keasy and McGuinness(1992)

Table 1. Regression Analysis Result on Relation between Firm Value and Ownership Retention (H. 1)

Model	Method	Dependent Variable	b ₀	b ₁	b ₂	Adj-R ²
1	OLS	MV1	-6.64(-1.19)	-25.70(-3.09)***	2.57(50.36)***	.833
		MV25	-5.88(-.89)	-25.84(-2.64)**	2.51(41.79)***	.774
	WLS (I/K)	MV1	-.90(-1.31)	-4.70(-6.98)***	3.30(39.90)***	.758
		MV25	-.85(-1.10)	-4.80(-6.39)***	3.31(35.96)***	.718
2	OLS	MV1	-53.54(-3.38)***	87.78(3.98)***	2.59(50.67)***	.835
		MV25	-54.55(-2.92)**	90.40(3.49)***	2.52(42.02)***	.776
	WLS (I/K)	MV1	-18.35(-8.14)***	27.80(9.67)***	3.36(42.03)***	.776
		MV25	-18.98(-7.53)***	28.80(8.95)***	3.38(37.77)***	.736

Model 1: $MV(1,25) = b_0 + b_1\hat{\alpha} + b_2K + \epsilon$, where $\hat{\alpha} = \alpha + \ln(1-\alpha)$

Model 2: $MV(1,25) = b_0 + b_1\hat{\alpha} + b_2K + \epsilon$, where $\alpha = 1 - \% \text{ of equity floated}$

MV1 and MV25 are market values of firms on the first and 25th day after trading, respectively.

t-statistics in parentheses:

* significant at the 10% confidence level.

** significant at the 5% confidence level.

*** significant at the 1% confidence level.

on the Unlisted Securities Market of UK.

2. Findings of the Relationship between Firm Value and Underpricing

We classify the estimating model into two models and regressed these models by OLS and WLS. That is, the first estimating model employs market adjusted returns as an underpricing variable, on the other hand the second model uses a total amount of price discount as an underpricing variable. As reported in Table 2, except for the OLS estimate of model (1) that MV1 is a dependent variable, the sign of all coefficients b₁ estimated in other models is consistent with the prediction of model and estimated coefficients also have statistical significance. This evidence suggests that the greater

Table 2. Regression Result on Relation between Firm Value and Underpricing (H. II)

Model	Method	Dependent Variable	b ₀	b ₁	b ₂	b ₃	Adj-R ²	
1	OLS	MV1	-52.94(-3.38)***	16.84(1.16)	83.87(3.76)***	2.59(50.66)***	.835	
		MV25	-51.64(-2.77)***	26.26(2.04)**	81.37(3.10)***	2.52(42.13)***	.778	
	(I/K)	WLS	MV1	-19.50(-8.98)***	11.18(6.57)***	27.32(9.89)***	3.37(43.80)***	.793
		MV25	-19.29(-7.91)***	8.09(6.04)***	27.53(8.83)***	3.40(39.21)***	.754	
2	OLS	MV1	-46.98(-3.09)***	.79(6.92)***	77.14(3.65)***	2.30(36.15)***	.849	
		MV25	-43.45(-2.93)***	1.16(17.35)***	71.68(3.48)***	2.18(42.34)***	.859	
	(I/K)	WLS	MV1	-18.26(-8.17)***	.07(2.93)***	27.61(9.68)***	3.33(41.68)***	.779
		MV25	-18.40(-7.62)***	.23(6.86)***	27.79(9.01)***	3.28(37.56)***	.758	

Model 1: $MV(1, 25) = b_0 + b_1MAR(1, 25) + b_2\alpha + b_3K + \epsilon$

Model 2: $MV(1, 25) = b_0 + b_1TPD(1, 25) + b_2\alpha + b_3K + \epsilon$

t-statistics in parentheses:

- * significant at the 10% confidence level.
- ** significant at the 5% confidence level.
- *** significant at the 1% confidence level.

underpricing of unseasoned new issues would signal positively the valuation of firms going public to the market. Our finding is also similar to the result of Keasy and McGuinness' study (1992) that the degree of underpricing is positively related to the valuation of initial public offerings of firms newly listed on USM.

Table 3 presents the regression analysis results of hypothesis IV that the value of the firm is positively related to the degree of underpricing, given the risk of the future cash flows of issuing firms. In the estimating results, the estimated b₁'s coefficients in all regression models are positive and significant except one case. This is similar to the results of hypothesis II. Looking at the testing results of both hypotheses on the association between firm value and underpricing, we could conclude that underpricing might play a role of signalling in the initial public offerings market. In this testing model, the estimated parameter, b₂, of risk proxy variable, STD, is not significant except for the WLS estimates in model 2.

Table 3. Regression Result on the Relation between Firm Value and Underpricing (H. IV)

Model	Method	Dependent Variable	b ₀	b ₁	b ₂	b ₃	Adj-R ²
1	OLS	MV1	6.64(1.59)	35.98(1.18)	-67.70(-.041)	2.56(49.92)***	.830
		MV25	7.97(1.69)*	44.77 (2.36)**	-116.85(-.84)	2.49(41.74)***	.774
	WLS (I/K)	MV1	1.96(3.31)***	15.92(3.40)***	-25.49(-1.00)	3.17(39.13)***	.753
		MV25	1.75(2.83)***	8.23(3.56)***	6.47(.36)	3.20(35.56)***	.716
2	OLS	MV1	7.52(2.00)**	.83(6.98)***	6.74(.09)	2.27(35.25)***	.845
		MV25	8.65(2.37)**	1.17(17.27)***	-33.00(-.44)	2.15(41.71)***	.856
	WLS (I/K)	MV1	1.18(2.19)**	.06(2.24)**	51.05(4.97)***	3.14(38.29)***	.751
		MV25	1.43(2.45)**	.22(6.02)***	44.54(3.99)***	3.09(34.72)***	.728

Model 1: $MV(1, 25) = b_0 + b_1 \text{MAR}(1, 25) + b_2 \text{STD} + b_3 K + \epsilon$

Model 2: $MV(1, 25) = b_0 + b_1 \text{TPD}(1, 25) + b_2 \text{STD} + b_3 K + \epsilon$

t-statistics in parentheses:

* significant at the 10% confidence level.

** significant at the 5% confidence level.

*** significant at the 1% confidence level.

3. Findings of the Relation between Underpricing and Ownership Retention and Risk

As reviewed earlier in Chapter 4, Grinblatt and Hwang's (1989) model predicts a positive association between the degree of underpricing of initial public offerings and the fraction of equity retained by the existing shareholders. This prediction has been investigated by testing hypothesis III on the positive relationship between underpricing and inside ownership. In the testing of this hypothesis, the dependent variables used are market adjusted return (MAR), raw return (unadjusted return, R) and price discount (PD), and the percentage of equity owned by entrepreneurs (1 - percentage of equity floated) is employed as a variable of ownership. All of the estimated coefficients for the ownership retention parameter in every model present correct sign and statistical significance at the 1% confidence level. Thus, on the one hand our hypothesis III could

Table 4. Regression Analysis Results on Relation between Underpricing and Ownership and Risk (H. III and V)

Model	Method	Dependent Variable	b ₀	b ₁	b ₂	Adj-R ²
1	OLS	MAR1	-.12(-5.14)***	.10(3.09)***	4.80(41.44)***	.776
		MAR5	-.14(-4.83)***	.13(3.07)***	5.22(34.86)***	.711
		MAR25	-.20 (-4.72)***	.20(3.29)***	5.33(24.38)***	.551
2	OLS	R1	-.13(-5.49)***	.12(3.68)***	4.75(39.34)***	.759
		R5	-.16(-5.05)***	.16(3.65)***	5.11(32.49)***	.683
		R25	-.20(-3.95)***	.23(3.34)***	4.82(19.20)***	.436
3	OLS	PD1	-.09(-4.11)***	.12(4.05)***	2.74(25.21)***	.570
		PD5	-.10(-4.08)***	.15(4.10)***	2.85(21.85)***	.502
		PD25	-.14(-3.43)***	.20(3.60)***	2.45(11.93)***	.242

Model 1: $MAR(1, 5, 25) = b_0 + b_1 + b_2STD + \epsilon$

Model 2: $R(1, 5, 25) = b_0 + b_1 + b_2STD + \epsilon$

Model 3: $PD(1, 5, 25) = b_0 + b_1 + b_2STD + \epsilon$

t-statistics in parentheses:

* significant at the 10% confidence level.

** significant at the 5% confidence level.

*** significant at the 1% confidence level.

be accepted, however, on the other hand this relation contrasts with the hypothesis that larger ownership would reduce the risk and further could set offer price at high level without leaving much money on the table. Nevertheless, our results show that a higher retention of equity by existing shareholders would convey a positive signal on the future value of firm or the expected cash flows.

Many studies, such as Ritter (1984b), Beatty and Ritter(1986), have attempted to explain the phenomenon of underpricing of initial public offerings in terms of ex ante uncertainty. In our analysis, this relationship is to be investigated by testing hypothesis V on the relationship between underpricing and risk, the results of which test are shown in Table 4. The standard deviation of daily market-adjusted returns over 25 days after trading is employed as a proxy of risk of future cash flows of firms. The positive b₂ is consistent with the prediction of hypothesis V .

Table 5. Regression Analysis Results on Firm Value and Risk
(Hypothesis VI)

Model	Method	Dependent Variable	b ₀	b ₁	b ₂	b ₃	Adj-R ²
1	OLS	MV1	-54.90(-3.44)***	76.63(96)	85.72(3.87)***	2.59(50.67)***	.835
		MV25	-56.22(-3.00)***	94.15(1.00)	87.87(3.37)***	2.52(42.02)***	.776
	WLS	MV1	-20.89(-9.43)***	57.04(6.12)***	28.30(10.19)***	3.37(43.63)***	.791
		MV25	-21.65(-8.69)***	59.85(5.71)***	29.32(9.39)***	3.39(39.04)***	.752
2	OLS	MV1	-9.24(-1.51)	83.86(1.05)	-24.87(-2.98)***	2.57(50.38)***	.832
		MV25	-9.04(-1.41)	102.16(1.08)	-24.83(-2.52)**	2.51(41.80)**	.774
	WLS	MV1	-3.55(-4.51)***	61.22(41.59)***	-5.08(-7.79)***	3.31(41.59)***	.775
		MV25	-3.61(-4.10)***	64.08(5.89)***	-5.19(-7.11)***	3.33(37.32)***	.735
3	OLS	MV1	-18.78(-1.79)**	107.73(2.07)**	19.84(2.24)**	4.28(66.82)***	.904
		MV25	-9.14(-1.20)	148.28(2.26)**	1.23(.11)	4.42(54.59)***	.864
	WLS	MV1	-2.14(-1.72)*	48.33(4.80)***	3.70(2.07)**	3.68(40.68)***	.778
		MV25	-2.49(-1.79)*	55.29(4.91)***	3.84(1.92)*	3.76(37.25)***	.746

Model 1: $MV(1,25) = b_0 + b_1STD + b_2 + b_3K + \epsilon$, where $\epsilon = 1 - \%$ of flotation

Model 2: $MV(1,25) = b_0 + b_1STD + b_2 + b_3K + \epsilon$, where ϵ is signal of LP ($\alpha + \ln(1 -)$)

Model 3: $MV(1,25) = b_0 + b_1STD + b_2 + b_3K + \epsilon$, where ϵ is fraction of equity retained by directors and large shareholders

t-statistics in parentheses:

* significant at the 10% confidence level.

** significant at the 5% confidence level.

*** significant at the 1% confidence level.

4. Findings of the Relation between Firm Value and Risk

The results of hypothesis VI on the relationship between firm value and the variance of its expected cash flows is presented in Table 5. The estimated coefficients b₁ for risk proxy variable, STD, are positive in WLS estimates, but in the OLS estimates they are not clear. Compared to the model explaining the relation between the risk and underpricing, the risk variable, STD, is uncertain in explaining the association between firm value and risk.

Through the testing of these models, the coefficients b₂ for ownership parameter show positive and they are significant. Thus, we could also confirm that ownership retention would positively affect the value of firms going public.

V. Conclusions

Many authors have attempted to explore the reasons of underpricing of new issues in the short-term after listing on the stock market. Most of the existing studies examined the reasons of underpricing of IPOs in the US. We then examined the phenomenon of underpricing of initial public offerings of 512 UK firms newly admitted to London Stock Exchange between 1985 and 1990. In particular, from the viewpoint of signalling theory, we explored the reasons of underpricing of IPOs.

We found that there is a positive relationship between the value of the issuing firms and the fraction of equity retained by entrepreneurs. This finding is consistent with Leland and Pyle's model (1977), and the evidence of Downes and Heinkel (1982). We also found a positive association between the firm value and the degree of underpricing. In addition, our empirical evidence revealed that the underpricing of the UK IPOs is positively related to the fraction of equity retained by the original shareholders. Thus, our results support Grinblatt and Hwang's model (1989) which predicts a positive relationship between the value of firm and the degree of underpricing. However, we found that the relationship between firm value and risk is uncertain.

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