

How Do Underwriters Value Initial Public Offerings?

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PETER ROOSENBOOM, *RSM Erasmus University*

1. Introduction

It is well known that an initial public offering (IPO) involves problems regarding price discovery. The market is not certain about the quality of the IPO firm, while the issuing firm does not know the market demand for its shares. Issuers therefore delegate the offer price decision to an investment bank that underwrites the IPO (Baron 1982). Because underwriters repeatedly bring firms public, they have strong incentives to build a reputation as valuation experts and certify that the offer price reflects fundamental value (Ibbotson and Ritter 1995).

In practice, underwriters determine an ex ante estimate of the fair or market value of the IPO firm's equity, which serves as a basis for setting the preliminary offer price. For this purpose, underwriters normally use several valuation methods and then combine the value estimates of the different methods used in estimating the fair value of the IPO shares. We know very little about the actual IPO valuation process used by underwriters because it is unobservable. However, we obtain a large sample of 228 reports from French underwriters that detail how they value IPO stocks before the shares start to trade on Euronext Paris. This data is unique because earnings and cash flow forecasts of U.S. IPO firms are generally unavailable in Securities and Exchange Commission (SEC) documents, and U.S. underwriters are prohibited from publishing opinions concerning valuation before the IPO (Kaplan and Ruback 1995; Bradley, Jordan, and Ritter 2003).¹ In our empirical analyses, we distinguish between five valuation methods: peer group multiples, the dividend discount model, the discounted cash flow model, the economic value-added method and underwriter-specific valuation methods. We aim to answer three novel research questions: (a) How do underwriters select the methods to value IPO stocks? (b) How do underwriters combine the outcomes of the different valuation methods to arrive at a fair value estimate of the IPO firms' equity? (c) How do underwriters set the preliminary offer price on the basis of the fair value estimate?

This paper makes three contributions to the existing literature. First, we explain valuation practice in an IPO context. The limited track record at the time of

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valuation may affect the choice of valuation method. It can thus be expected that the usefulness of a given valuation model varies with firm-specific factors. It may also be the case that, depending on aggregate stock market circumstances, the different characteristics of alternative valuation models gives them differing appeal to underwriters. We therefore examine whether firm-specific factors, aggregate stock market returns, and aggregate stock market volatility affect the choice of valuation method. We are aware of only one other study that has investigated the choice of valuation method by financial analysts. Demirakos, Strong, and Walker (2004) show that UK analysts tailor their valuation methods to industry circumstances. However, they do not investigate how firm-specific factors and aggregate stock market conditions affect the choice of valuation method. Moreover, they anticipate, but do not test, that analysts may employ different models for dividend payers versus nonpayers. In this paper, we examine whether the choice of valuation model depends on the extent to which the IPO firm plans to pay out future dividends.

Our second contribution is that we investigate how underwriters combine the value estimates of the different valuation methods into their fair value estimate. Underwriters in our sample frequently use two or more valuation methods, which implies that they need to assign weights to each of the two or more value estimates in order to set the fair value estimate. Bayesian theory states that underwriters should use a linear weighted average of all available bona fide value estimates, giving a higher weight to the value estimates that they believe to be more accurate (Yee 2004). Accordingly, Ely and Mande (1996) find that U.S. analysts substitute away from earnings toward dividends when earnings are noisy indications of future earnings. Penman (1998) investigates how to combine the equity valuations of price-earnings and price-to-book multiples into one composite valuation. He shows that more weight should be given to book value and less to earnings multiples when earnings are particularly high or low relative to book value. We are not aware of papers that examine how underwriters weigh the value estimates of the five valuation methods that we examine in this paper.

The third contribution is that we have access to pre-IPO reports that detail how underwriters value IPOs in practice. This differs from Kim and Ritter 1999, Purnanandam and Swaminathan 2004, and Houston, James, and Karceski 2006, who only consider the use of multiples valuation and thus have to estimate the value of IPO firms using their own techniques assuming that the results approximate the valuation process used by the underwriter. The pre-IPO reports enable us to focus on the early stage of IPO valuation during which the underwriter uses one or more valuation methods to arrive at its fair value estimate of the IPO firm's equity. We also examine how the underwriter sets the preliminary offer price on the basis of its fair value estimate. We report that the typical underwriter applies a deliberate discount to the fair value estimate when setting the preliminary offer price. The deliberate price discount is distinct from the well-known IPO underpricing that occurs later in the IPO pricing process.² To our knowledge, we are the first to investigate the cross-sectional determinants of the deliberate price discount.

We document that underwriters widely use peer group multiples to value IPO shares. However, in contrast to previous U.S. studies (e.g., Asquith, Mikhail, and

Au 2005; Houston et al. 2006) we also find many cases where the dividend discount model and/or the discounted cash flow model is used. Our results show that underwriters do not randomly select a valuation method, but base their decision on firm characteristics, aggregate stock market returns, and aggregate stock market volatility in the period before the IPO. For example, they prefer to use the dividend discount model to value firms that go public when past aggregate stock market returns have been poor and when companies plan to pay a large proportion of their future earnings as dividends. The weight that underwriters assign to the value estimates of the different valuation methods in setting their fair value estimate also depends on firm-specific factors and aggregate stock market conditions. For instance, underwriters assign a lower weight to the value estimates of peer group multiples and discounted cash flow methods when valuing firms that plan to pay a high proportion of their future earnings as dividends. Instead they attach a higher weight to the value estimate of the dividend discount model for high-dividend-paying firms. This suggests that underwriters take into account the firm's dividend policy when valuing the IPO firm's equity. We also report that the average underwriter discounts the fair value estimate by 18.2 percent to determine the preliminary offer price. We document that more reputable underwriters offer lower discounts to investors. Companies forecasted to be relatively profitable in the year of going public are associated with lower IPO price discounts. In addition, we report that the IPO price discount is higher for riskier IPO deals with greater valuation uncertainty.

The outline of our paper is as follows. Section 2 positions our paper relative to the prior literature. In section 3, we develop our empirical model and in section 4 describe the data. Section 5 presents the results and section 6 concludes.

2. Prior literature

Most valuation studies concentrate on the accuracy of valuation methods. Cheng and McNamara (2000) and Liu, Nissim, and Thomas (2002) focus on multiples valuation and report that multiples derived from forecast earnings are more accurate than multiples based on other value drivers. Other papers investigate how the selection of comparable firms affects the accuracy of multiples (e.g., Boatsman and Baskin 1981; Alford 1992; Baker and Ruback 1999; Bhojraj and Lee 2002). In general, these authors find that expected profitability, growth, and risk are effective criteria for selecting comparable firms.

Valuation theorists have studied the theoretical properties of several valuation frameworks. Penman and Sougiannis (1998) and Francis, Olsson, and Oswald (2000) compare the accuracy of dividend, free cash flows, and accrual earnings equity value estimates. They find that the value estimate based on accrual earnings is more accurate than the value estimates based on free cash flows or dividends. However, Lundholm and O'Keefe (2001) show that discounted cash flow and accrual valuation models yield identical valuations when consistently applying the same input assumptions to the different models.

The multiples valuation and discounted cash flow models also appear to have similar valuation accuracy. Kaplan and Ruback (1995) show that the discounted cash flow method performs at least as well as the multiples method in valuing

leveraged buyouts. Gilson, Hotchkiss, and Ruback (2000) report that discounted cash flow and comparable firm valuation methods have similar accuracy in the context of bankruptcy court cases.

Kim and Ritter (1999) investigate how the offer prices of U.S. IPO firms are set by selecting multiples from industry peers that went public no more than 12 months before the IPO firm's offer date. They report that forward price-earnings multiples dominate all other multiples in valuation accuracy. Houston et al. (2006) also focus on multiples valuation and study the accuracy of target prices established by analysts 1 month after the IPO and argue that this is informative of how U.S. underwriters value IPOs. They find that the average offer price is set at a 10 percent discount compared with the value estimate using the mean comparable firm multiple listed in the analyst report. However, they do not investigate what determines the size of the discount as we do in this paper.

We conclude that most valuation studies focus on a comparison between the valuation accuracy of the different methods or on the best way to select comparable companies for multiples valuation. Little is known about what determines the choice of valuation method. In a recent paper, Demirakos et al. (2004) find that financial analysts in the United Kingdom are more likely to use multiples valuation as their dominant valuation method in the beverages industry than in the pharmaceutical and electronics industries. They argue that the multiples method is more applicable to the beverages industry because it is characterized by stable and uniform growth prospects compared with the pharmaceutical and electronics industries. In this paper, we examine whether the underwriter selects a specific valuation method based on firm-specific factors, aggregate stock market returns, and aggregate stock market volatility when valuing IPO shares in France. This richer set of determinants distinguishes our study from Demirakos et al. 2004. Another difference is that we examine the determinants of the weights that underwriters assign to the value estimates of the different methods in order to arrive at a fair value estimate of the firm's equity. In the next section, we develop our empirical model.

3. Empirical model

Explaining the choice of valuation method

In this section, we develop an empirical model to explain the choice for a particular valuation method in the context of IPOs. We examine the cross-sectional determinants of the choice for a particular valuation method using the binary logit analysis. We estimate the following models:

Model 1 [2, 3, 4, 5]

$$\begin{aligned} MULTI_i[DDM_i, DCF_i, EVA_i, OTH_i] = & \beta_0 + \beta_1 \text{Ln}SIZE_i + \beta_2 \text{Ln}(1 + AGE_i) \\ & + \beta_3 AIP_i + \beta_4 PROF_i + \beta_5 GROW_i \\ & + \beta_6 DIV_i + \beta_7 TECH_i + \beta_8 MRET_i \\ & + \beta_9 SD_i + \beta_{10} NM_i + \beta_{11} UREP_i + \epsilon_i. \end{aligned}$$

In the five logit regressions the dependent variable equals one if the underwriter uses the peer group multiples method (*MULT*), dividend discount model (*DDM*), discounted cash flow model (*DCF*), economic value-added method (*EVA*), or underwriter-specific techniques (*OTH*), respectively. The multiples valuation is a relative valuation approach whereas the other four valuation methods are direct valuation techniques.³ We include the same set of independent variables for every model. Table 1 shows variable definitions.

We measure firm size (*LnSIZE*) by the natural logarithm of total assets reported on the balance sheet of the most recent financial year before going public. Larger IPO firms are considered to be easier to value than smaller IPO firms because they have more stable and easier to forecast cash flows and dividends (Ritter 1984; Beatty and Ritter 1986). This makes the use of direct valuation methods such as the dividend discount model and the discounted cash flow model more likely.

The natural logarithm of one plus firm age (*Ln(1 + AGE)*) is used as an ex ante proxy for risk. It is argued that the greater the age of the firm, the lower the degree of risk (Ritter 1984). Kim and Ritter (1999) argue that it is more difficult to forecast

TABLE 1
Variable definitions

Variable name	Description
Dependent variables	
<i>MULT</i>	dummy variable equal to 1 if the underwriter uses the multiples valuation
<i>DDM</i>	dummy variable equal to 1 if the underwriter uses the dividend discount model
<i>DCF</i>	dummy variable equal to 1 if the underwriter uses the discounted cash flow model
<i>EVA</i>	dummy variable equal to 1 if the underwriter uses the economic value-added method
<i>OTH</i>	dummy variable equal to 1 if the underwriter uses underwriter-specific valuation methods
<i>MULTW</i>	weight the underwriter assigns to the value estimate of multiples valuation when setting the fair value estimate
<i>DDMW</i>	weight the underwriter assigns to the value estimate of the dividend discount model when setting the fair value estimate
<i>DCFW</i>	weight the underwriter assigns to the value estimate of the discounted cash flow model when setting the fair value estimate
<i>EVAW</i>	weight the underwriter assigns to the value estimate of the economic value-added method when setting the fair value estimate
<i>OTHW</i>	weight the underwriter assigns to the value estimate of underwriter-specific valuation methods when setting the fair value estimate
<i>DISCOUNT</i>	(fair value estimate – preliminary offer value)/preliminary offer value

(The table is continued on the next page.)

TABLE 1 (Continued)

Variable name	Description
Independent variables	
<i>LnSIZE</i>	natural logarithm of assets (in millions €) for the most recent 12-month financial period reported in the prospectus
<i>Ln(1 + AGE)</i>	natural logarithm of (one plus firm age). Firm age is the difference between the IPO year and the founding year in the prospectus
<i>AIP</i>	plant, property, and equipment from the most recent 12-month balance sheet disclosed in the prospectus divided by total assets
<i>PROF</i>	ratio of current year's forecasted earnings before interest and taxes (EBIT) to current year's forecasted sales
<i>GROW</i>	forecasted sales growth during the current year
<i>DIV</i>	future dividend payout ratio (dividends/net income) as disclosed in the prospectus
<i>TECH</i>	dummy variable equal to 1 if a company belongs to the technology sector (using Loughran and Ritter 2004 definition), and 0 otherwise
<i>MRET</i>	market index return during a 90-trading-day interval from 95 trading days before to 5 trading days before the IPO firm's first day of trading. We use the Datastream index for France prior to 1992 and the MSCI France index thereafter
<i>SD</i>	standard deviation of the daily market index returns during a 90-trading-day interval from 95 trading days before to 5 trading days before the IPO firm's first day of trading. We use the Datastream index for France prior to 1992 and the MSCI France index thereafter
<i>NM</i>	dummy variable equal to 1 if a company goes public on the Nouveau Marché, and 0 otherwise
<i>UREP</i>	percentage market share of the IPO lead underwriter in the French IPO market (measured by gross proceeds raised during 1990–99)
<i>UNCERT</i>	coefficient of variation (standard deviation/average) of the valuation estimates of the different valuation methods used by the underwriter. If the underwriter only uses one valuation method valuation, this variable is set equal to 0 (in 30 cases)

future cash flows and dividends for younger firms without established track records because more of their value is represented by expectations about future growth rates, which can substantially vary from firm to firm. We therefore predict that older firms are more likely to be valued using direct valuation methods.

We measure assets in place (*AIP*) as the ratio of plant, property, and equipment and total assets at the end of the financial year preceding the IPO. In general, accounting numbers are believed to be better in capturing the value derived from tangible assets than intangible assets (Lev 2001). This predicts an increased use of accounting-based valuation methods such as the economic value-added method when valuing firms with high asset tangibility.

We hypothesize that underwriters are more likely to value the IPO firm using peer group multiples when they forecast that the company is comparatively profitable in the current year (*PROF*). When firms are forecasted to be only marginally profitable or loss-reporting, it is less appropriate to use multiples valuation because applying price–earnings multiples in these circumstances would result in a low or negative multiples valuation.

We employ forecasted sales growth during the current year (*GROW*) as our proxy for growth opportunities. For rapidly growing firms short-term free cash flows tend to be negative because the cash inflows are lower than capital investments. As argued by Penman 2001 (117), investment is treated as a loss of value in the discounted cash flow method, and free cash flow fails to recognize value that does not involve cash flows. In addition, growing firms tend to retain their earnings rather than pay them out as dividends. Multiples valuation is better suited to value rapidly growing firms because it values investments and growth opportunities. We thus hypothesize that rapidly growing firms are less likely to be valued using the direct valuation methods but more likely to be valued using the multiples approach.

A unique feature of our data is that French IPO firms typically disclose their future dividend payout ratio (*DIV*) in their prospectuses. Firms that make a commitment to pay out a high dividend can be regarded as entering into an ex ante implicit contract that is verifiable in the period following the IPO. Bhattacharya (1979) shows that only high-quality firms can credibly use dividend payout to signal their quality to investors. In his theoretical model, dividends are an immediately costly and easily observable signal that low-quality firms are unable to imitate without turning to expensive outside financing. A commitment to a high and stable dividend payout ratio (*DIV*) can therefore be expected to make the value estimate of the dividend discount model more reliable. In particular, it enables the underwriter to more reliably forecast dividends over a longer planning horizon making the value estimate less dependent on the terminal value calculation. Damodaran (1994, 121) writes that many financial analysts view the dividend discount as useful for valuing stable, high-dividend-paying stocks. We therefore predict that underwriters are more likely to use the dividend discount model when setting the fair value estimate for firms that plan to pay out a large proportion of their future earnings as dividends.

High-tech firms are more difficult to value because a large part of their value is derived from growth options (Kim and Ritter 1999; Bartov, Mohanram, and Seethamraju 2002). Because direct valuation methods such as the discounted cash flow method and the dividend discount model cannot easily incorporate the value of these growth opportunities we expect that technology companies are more likely to be valued using the multiples approach. We therefore include a dummy variable (*TECH*) that equals 1 if the IPO firm is a high-tech company and 0 otherwise.⁴

Value estimates generated by the discounted cash flow model are sensitive to the cash flow and discount rate assumptions of underwriters. Although discounted cash flow valuation may be useful in assessing equity values to a given issuer, DeAngelo (1990) argues that it is not a very credible means of convincing outside

stockholders because of the sensitivity of the value estimate to the assumptions made unless there is a window of opportunity in which investors are more eager to buy stocks. A rising aggregate stock market may indicate such a window of opportunity. We thus include in our model market index returns (*MRET*) during a 90-trading-day interval from 95 trading days before and 5 trading days before the IPO firm's first day of trading. We predict that a period with high aggregate stock market returns before the IPO increases the likelihood of using the discounted cash flow model. In contrast, we expect that the dividend discount model is more often used when aggregate stock market returns are poor. Baker and Wurgler (2004) develop a theory in which firms pay dividends to cater to investor demand. When the aggregate stock market is declining, investors may be more likely to look for safe dividend-paying stocks that give them interim payments on their investment (rather than having to sell their stock in a declining market). This may give the dividend discount model more appeal when aggregate stock market returns are low because it emphasizes the firm's dividend-paying ability.

We also include the standard deviation of the daily market index returns (*SD*) during a 90-trading-day interval from 95 trading days before and 5 trading days before the IPO firm's first day of trading in our model. We argue that investors are likely to be more uncertain about fundamental value when the aggregate stock market is volatile. Underwriters may then cater to the investor's demand for more information about fundamental value by valuing the IPO stock using direct valuation methods. We therefore expect that direct valuation methods such as the dividend discount model, the discounted cash flow model, and the economic value-added method to be used more often when the aggregate stock market is more volatile in the period before the IPO.

We include two control variables in our empirical model. In order to increase the power of our tests, we decide to pool the observations for the Nouveau Marché and Second Marché of Euronext Paris in our analyses. We include a Nouveau Marché dummy variable (*NM*) to control for any potential differences in the choice of valuation method between the two markets. In France, IPO activity is concentrated on these two stock market segments. The Nouveau Marché was established in 1996 to attract young and high-tech issuers. Companies that want to list on this stock market are required to have a book value of equity equal to €1.5 million and to raise a minimum of €5 million in the IPO. At least half of the shares sold in the IPO must be newly issued by the company. In addition, Nouveau Marché IPO firms are required to have a free float equal to at least 20 percent of the shares outstanding after the IPO. The Second Marché was founded in 1983 to attract small family-run businesses in more mature industries. Firms that go public on this stock market have to have been in existence for at least two years and have a free float of at least 10 percent of the shares outstanding after the IPO.

We also include underwriter reputation as a control variable. We use underwriter market share as our proxy for underwriter reputation (*UREP*). We calculate the underwriter market share as the percentage market share of the lead underwriter. Following Ljungqvist and Wilhelm 2002, market share is the sum of gross proceeds (excluding overallotment option) in all IPOs lead managed by the underwriter,

divided by the total proceeds raised during the sample period. Higher reputation underwriters are believed to be experts in valuing companies (Carter and Manaster 1990). This may have an impact on valuation method choice although we do not have any specific a priori predictions about which valuation method would be preferred by higher reputation underwriters.

Explaining the weights attached to valuation estimates

We estimate ordinary least squares (OLS) regressions to explain the weight that underwriters assign to the value estimate of a particular valuation method conditional on the underwriter using that method. The dependent variable is defined as the weight attached to the value estimates of the multiples valuation method (*MULTW*), dividend discount model (*DDMW*), discounted cash flow model (*DCFW*), economic value-added method (*EVAW*), and underwriter-specific techniques (*OTHW*) in setting the fair value estimate, respectively. The weights are obtained from the valuation reports published by the underwriter before the IPO starts trading on the stock market. For example, one underwriter in our sample arrives at a fair value estimate of €151.7 million by assigning a weight of 2/3 to the multiples value estimate of €154.1 million and a weight of 1/3 to the discounted cash flow value estimate of €147 million. In this example, *MULTW* thus equals 2/3 and *DCFW* equals 1/3. We include the same set of independent variables as in the logit regressions. The models are as follows:

Model 6 [7, 8, 9, 10]

$$\begin{aligned} MULTW_i[DDMW_i, DCFW_i, EVAW_i, OTHW_i] = & \beta_0 + \beta_1 \text{Ln}SIZE_i \\ & + \beta_2 \text{Ln}(1 + AGE_i) + \beta_3 AIP_i \\ & + \beta_4 PROF_i + \beta_5 GROW_i \\ & + \beta_6 DIV_i + \beta_7 TECH_i \\ & + \beta_8 MRET_i + \beta_9 SD_i \\ & + \beta_{10} NM_i + \beta_{11} UREP_i + \epsilon_i. \end{aligned}$$

Bayesian theory suggests that analysts should use a weighted linear combination of all available bona fide value estimates with higher weights assigned to those value estimates that are believed to be more reliable (Yee 2004). We therefore expect underwriters to assign a higher weight to the value estimates of direct valuation methods when they believe that these methods are more likely to generate reliable value estimates. As argued before, direct valuation methods are believed to be more appropriate when valuing larger and older firms with low growth opportunities from mature industries. We predict that underwriters will attach a higher weight to the valuation estimate of the multiples approach when valuing relatively profitable, rapidly growing, and/or technology firms for which this method is likely to be more suitable. Assuming that accounting numbers are better able to capture value generated from tangible assets than intangible assets, we predict that the economic value-added method receives a higher weight in the fair value estimate when valuing firms with more assets in place (*AIP*).

As argued previously, we argue that commitment to a high future dividend payout ratio (*DIV*) is expected to make the value estimate of the dividend discount model more reliable. The underwriter is able to more reliably forecast dividends over a longer planning period. This reduces the sensitivity of the value estimate to the terminal value calculation. We thus predict that underwriters assign a higher weight to the value estimate of the dividend discount model when setting the fair value estimate for firms that plan to pay out a high proportion of their future earnings as dividends.

We anticipate that aggregate stock market returns have a positive impact on the weight assigned to the value estimate of the discounted cash flow model. When market index returns (*MRET*) are high, there is a window of opportunity during which investors are more likely to believe the cash flow and discount rate assumptions underlying the discounted cash flow model (DeAngelo 1990). In a period with low aggregate stock market returns, investors may be more interested in buying safe dividend-paying stocks. In this event, investors prefer interim payments rather than relying on future capital gains to generate a return on their investment. Underwriters are expected to assign a higher weight to the dividend discount model in the fair value estimate in this event so as to emphasize the dividend-paying capacity of the IPO firm and to possibly cater to investor demand for dividends.

We expect that underwriters are more likely to rely on value estimates from direct valuation methods, such as the discounted dividend model and discounted cash flow model, during periods when investors are uncertain about the fundamental value of stocks. A period with high aggregate market volatility may indicate such a period. We therefore expect underwriters to assign higher weights to the value estimates of the direct valuation methods when the standard deviation of the market index returns (*SD*) is high in the period before the IPO. As before, the Nouveau Marché dummy (*NM*) and the underwriter reputation (*UREP*) act as control variables.

Explaining the price discount

As a final part of our analysis, we estimate an OLS regression to explain the IPO price discount. After determining the fair value estimate, the typical underwriter applies a price discount to set the preliminary offer price. The discount (*DISCOUNT*) is computed as (fair value estimate – preliminary offer value)/fair value estimate. In this expression, the preliminary offer value is computed as the preliminary offer price times the number of shares outstanding after the IPO. The model is as follows:

Model 11

$$\begin{aligned} DISCOUNT_i = & \beta_0 + \beta_1 \text{Ln}SIZE_i + \beta_2 \text{Ln}(1 + AGE_i) + \beta_3 AIP_i + \beta_4 PROF_i \\ & + \beta_5 GROW_i + \beta_6 DIV_i + \beta_7 TECH_i + \beta_8 MRET_i + \beta_9 SD_i \\ & + \beta_{10} NM_i + \beta_{11} UREP_i + \beta_{12} UNCERT_i + \epsilon_i. \end{aligned}$$

McCarthy (1999) argues that applying a price discount early on in the IPO valuation process may serve two purposes. First, it permits underwriters to expend less market effort and to ingratiate themselves with buy-side clients such as institutional

investors (Baron 1982).⁵ Second, it serves a defensive purpose. If disgruntled investors argue that the issue was overpriced, the underwriter can point to this discount as evidence of conservative pricing (Tiniç 1988).

The information asymmetry theories of Beatty and Ritter 1986 and Baron 1982 argue that IPOs characterized by greater valuation uncertainty will need larger price discounts. In their theoretical models, the price discounts serve to compensate investors for the valuation uncertainty associated with risky IPO deals. We therefore expect higher discounts when underwriters bring smaller, younger, less profitable, rapidly growing, and/or technology firms with low asset tangibility to the market. We also add a more direct measure of valuation uncertainty (*UNCERT*) to the regression model. This variable is measured as the ratio of standard deviation of the different valuation estimates and the arithmetic average of the valuation estimates. In 30 cases, the underwriter only uses one valuation method and we set this variable equal to 0. We predict higher price discounts when valuation uncertainty is greater.

As mentioned earlier, Bhattacharya (1979) theoretically shows that high-quality companies signal their quality by committing themselves to a high dividend payout. Low-quality companies cannot credibly mimic this signal without turning to expensive outside financing again. If investors consider the future dividend payout policy announced in the prospectus as credible, this commitment to a high future dividend payout ratio (*DIV*) can be expected to reduce the need for high price discounts.

Market conditions may be another important determinant of the deliberate price discounts. If market returns (*MRET*) are low and/or market volatility (*SD*) is high, underwriters may need to attract investors through larger discounts and/or avoid accusations of overpricing from investors. We also expect that more reputable underwriters offer lower discounts to investors. Their reputation capital certifies IPO firm quality and reduces the need to compensate investors by means of price discounts (Carter and Manaster 1990). The Nouveau Marché dummy variable (*NM*) is included to control for any differences in price discounts between the two markets.

4. Data and sample description

Sample construction

We start with the complete universe of French newly listed firms from January 1990 to December 1999. New listings are identified by L'Année Boursière, an annual publication of the Société des Bourses Françaises (SBF), the SDC New Issues Database, and Dealogic. We exclude 24 firms that are listed on the Premier Marché (the most prestigious listing venue in France) because these listings generally involve privatization, equity carveouts, or spinoffs. The 29 firms that transferred from the Marché hors-cote (an over-the-counter market that existed until 1998) or that previously traded on a foreign stock market are excluded because their price discovery is straightforward. We exclude 26 financial services firms (SIC codes 6000–6999) because their reporting environments are different from those of other IPO firms. For the same reason, 18 firms that listed either on one of the six regional stock exchanges (Bordeaux, Lille, Lyons, Marseilles,

Nantes, and Nancy) or on the *Marché Libre* (an unregulated trading platform in France) are removed.

These selection criteria (set out in Table 2) result in a sample of 309 non-financial French firms that had an IPO on either the *Nouveau Marché* (98 firms) or the *Second Marché* (211 firms) of Euronext Paris. We obtain valuation reports from the company, from the lead underwriter, from the *Commission des Opérations de Bourse* (COB — the French equivalent of the SEC), or from *Disclosure Global Access* for 228 out of 309 companies. We obtain 66 valuation reports for the *Nouveau Marché* and 162 reports for the *Second Marché*. The valuation reports are from 34 different underwriters.

Descriptive statistics

We first examine the industry distribution for our sample of 228 IPO firms (not tabulated). We group our firms into industries using the industry classifications from Fama and French 1997, which are constructed by grouping various four-digit SIC codes. Many different Fama-French industries are represented in our sample of which business services (22.8 percent), wholesale trade (9.2 percent), and retail (5.7 percent) dominate. We observe that 22.8 percent of our sample firms are active in the technology sector.

Table 3 shows descriptive statistics. Offer prices and financial statement numbers are taken from IPO prospectuses. We collect information about total assets from the balance sheet ending one financial year before the IPO (*SIZE*). Table 3 shows the average (median) *SIZE* equals €54.2 million (€20.9 million). We measure company age (*AGE*) as the number of years the firm has been in existence prior to its IPO. We find that the average (median) *AGE* equals 27.4 years (16 years).

TABLE 2
Sample selection criteria

Year	New admissions	Exclusions because of					
		Premier Marché	Transfers	Financial services	Regional exchange	No valuation report	In sample
1990	16	0	0	7	4	0	5
1991	14	2	0	6	3	0	3
1992	6	1	0	1	2	2	0
1993	9	0	0	2	0	0	7
1994	36	3	1	3	3	4	22
1995	21	3	4	1	0	1	12
1996	52	4	3	2	1	17	25
1997	66	2	7	2	2	16	37
1998	119	5	9	1	1	24	79
1999	<u>67</u>	<u>4</u>	<u>5</u>	<u>1</u>	<u>2</u>	<u>17</u>	<u>38</u>
Total	406	24	29	26	18	81	228

TABLE 3
Descriptive statistics

Variable	Average	Min.	Percentiles				Max.	s.d.	n
			25th	50th	75th				
<i>SIZE</i> (millions €)	54.18	1.75	10.54	20.85	51.72	898.84	96.15	228	
<i>AGE</i> (years)	27.44	2.00	9.75	16.00	30.00	250.00	32.75	228	
<i>AIP</i> (%)	17.91	0.21	5.41	13.38	25.33	84.55	16.37	228	
<i>PROF</i> (%)	10.99	-32.51	7.30	10.50	15.51	48.92	8.86	228	
<i>GROW</i> (%)	31.04	-9.48	11.79	21.44	37.99	303.62	35.17	228	
<i>DIV</i> (%)	20.03	0.00	12.88	20.00	28.13	80.00	13.94	228	
<i>MRET</i> (%)	9.23	-27.60	-2.14	9.46	18.72	42.10	15.90	228	
<i>SD</i> (%)	1.13	0.58	0.91	1.03	1.33	2.01	2.02	228	
<i>UREP</i> (%)	2.61	0.00	0.15	0.32	1.77	12.99	4.40	228	
<i>NMETHOD</i>	2.36	1.00	2.00	2.00	3.00	5.00	0.83	228	
<i>MULTW</i> (%)	50.26	14.29	33.33	50.00	60.00	100.00	19.64	199	
<i>DDMW</i> (%)	40.41	11.11	26.79	33.33	50.00	100.00	19.05	135	
<i>DCFV</i> (%)	36.82	12.50	25.00	33.33	33.33	100.00	19.96	135	
<i>EVAW</i> (%)	30.23	11.11	25.00	25.00	33.33	100.00	15.35	44	
<i>OTHW</i> (%)	40.09	10.00	27.08	33.33	50.00	100.00	19.86	26	
<i>UNCERT</i> (%)	10.54	0.00	2.56	7.88	15.45	80.61	10.95	228	
<i>FAIRV</i> (millions €)	69.53	12.20	27.12	40.98	78.21	591.50	82.33	228	
<i>POFFERV</i> (millions €)	57.54	10.79	21.76	33.33	64.58	553.86	69.62	228	
<i>DISCOUNT</i> (%)	18.21	-9.09	12.92	18.21	24.57	50.94	9.86	228	

(The table is continued on the next page.)

TABLE 3 (Continued)

Note:

The sample consists of 228 IPO firms from January 1990 to December 1999. The number of different valuation methods (*NMETHOD*) that the underwriter uses to value the IPO firm's equity is taken from the valuation report. The fair value estimate (*FAIRV*) can be viewed as an ex ante estimate of the "true" or market value of the IPO and is taken from the valuation report that is published about two weeks before the shares start trading on the stock market. Preliminary offer value (*POFFERV*) is computed as the number of shares outstanding after the IPO times the preliminary offer price. The preliminary offer price equals the mid-point of the price range for 128 IPOs that use the book-building procedure. The preliminary offer price is set equal to the minimum tender price for 81 IPO auctions. The preliminary price equals the fixed-offer price for 19 fixed-price offerings. The first market price is retrieved from Datastream. Other variables are as defined in Table 1.

Table 3 also reports on assets in place (*AIP*). The average [median] company in our sample has 17.9 percent (13.4 percent) of its asset base in plant, property, and equipment in the financial year before the IPO. Profitability (*PROF*) is defined as the current year's forecast earnings before interest and taxes divided by current year's forecasted sales. The average (median) *PROF* equals 11 percent (10.5 percent). Next, we examine forecasted sales growth (*GROW*) during the current year. The average (median) company in our sample is forecasted to experience a sales growth of 31 percent (21.4 percent). We find that the average [median] future dividend payout ratio (*DIV*) equals 20 percent (20 percent) of net income.

The market index return (*MRET*) is measured during a 90-trading-day interval from 95 trading days before and 5 trading days before the IPO firm's first day of trading. We use the Datastream index for France prior to 1992 and the MSCI France index thereafter. The average (median) *MRET* is 9.23 percent (9.46 percent). The market index volatility (*SD*) is measured as the standard deviation of the daily market index returns during the same 90-trading-day interval. The average (median) *SD* equals 1.13 percent (1.03 percent). We calculate the underwriter market share as the percentage market share of the lead underwriter as our proxy for underwriter reputation (*UREP*).⁶ The average (median) *UREP* is 2.6 percent (0.3 percent).

The average (median) number of different valuation methods (*NMETHODS*) used by the underwriter equals 2.4 (2). Multiples valuation is the most popular with 199 underwriters using this method. The dividend discount model and discounted cash flow model are each used by 135 underwriters. The use of the economic value added is not as widespread with 44 underwriters employing this method. Underwriters rarely base fair value estimates on underwriter-specific valuation techniques such as discounting sales, discounting earnings, sum-of-the-parts valuation, etc. These underwriter-specific techniques are used in 26 valuation reports.

A unique aspect of our data is that we are also able to determine the weights that underwriters assign to the value estimates of the different models when arriving

at their fair value estimate. Table 3 shows the weights assigned to the value estimate of each method in the fair value estimate conditional on the underwriter using that method. For this reason, the average weights do not add up to 100 percent.⁷ The average (median) weight assigned to the multiples value estimate (*MULTW*) in the fair value estimate equals 50.3 percent (50 percent).⁸ When underwriters use the dividend discount model they assign an average (median) weight (*DDMW*) of 40.4 percent (33.3 percent). The discounted cash flow value estimate receives an average (median) weight (*DCFV*) of 36.8 percent (33.3 percent). The average (median) weight (*EVAW*) attached to the economic value-added value estimate amounts to 30.2 percent (25 percent). The average (median) value estimate of the underwriter-specific techniques is weighted at 40.1 percent (33.3 percent) (*OTHW*). The different valuation methods may yield diverging value estimates indicating valuation uncertainty. The average (median) valuation uncertainty (*UNCERT*) equals 10.5 percent (7.9 percent).

To complete the picture, Table 3 also shows the statistical properties of the fair value of the IPO firm's equity (*FAIRV*). The average (median) *FAIRV* in our sample equals €69.5 million (€41 million). After the underwriter has determined the fair value estimate, he or she applies the deliberate price discount to come to the preliminary offer value (*POFFERV*). The average (median) *POFFERV*, computed as the preliminary offer price times the number of shares outstanding after completion of the IPO, equals €57.5 million (€33.3 million). Finally, the average (median) deliberate price discount (*DISCOUNT*) is 18.2 percent (18.2 percent).

5. Empirical results

The choice of valuation method

Table 4 shows the results of the binary logit analyses. Consistent with expectations, we find that underwriters are more likely to use the multiples method when the firm is forecasted to be relatively profitable in the current year (*PROF*). We also find that technology firms (*TECH*) and rapidly growing firms (*GROW*) are more likely to be valued using multiples valuation. We infer that the value of technology and high-growth companies is derived from growth opportunities that are more easily valued using multiples valuation. More reputable underwriters (*UREP*) are more likely to opt for multiples valuation.

Table 4 shows that underwriters have a preference for the dividend discount model when the firm is older ($\text{Ln}(1 + \text{AGE})$) and intends to pay out a large fraction of its future earnings as dividends (*DIV*). Other things being equal, underwriters valuing Nouveau Marché IPO firms (*NM*) and technology companies (*TECH*) are less likely to employ the dividend discount model. Underwriters are also less likely to use the dividend discount model when valuing companies that are relatively profitable (*PROF*). When market returns (*MRET*) are low it becomes more likely that the underwriter will use the dividend discount model to value the IPO firm's equity. A possible explanation is that investors are more interested in safe dividend-paying stocks when aggregate stock market returns are low. The negative coefficient on aggregate stock market volatility (*SD*) is inconsistent with our expectations and

TABLE 4
Determinants of the use of valuation method

Model	(1)	(2)	(3)	(4)	(5)
Dependent variable	<i>MULT</i>	<i>DDM</i>	<i>DCF</i>	<i>EVA</i>	<i>OTH</i>
<i>LnSIZE</i>	0.063 (0.214)	-0.157 (-0.922)	-0.137 (-0.725)	-0.276 (-1.447)	0.300 (1.125)
<i>Ln(1 + AGE)</i>	0.231 (0.675)	0.342 (1.742) [‡]	-0.102 (-0.377)	0.380 (1.441)	-0.470 (-1.435)
<i>AIP</i>	0.319 (0.270)	-0.313 (-0.324)	-0.050 (-0.043)	-1.850 (-1.287)	-0.020 (-0.015)
<i>PROF</i>	5.105 (1.982) [‡]	-3.110 (-1.792) [‡]	2.472 (0.993)	0.178 (0.064)	-0.678 (-0.277)
<i>GROW</i>	0.022 (1.713) [‡]	-0.300 (-0.418)	-0.077 (-0.146)	-0.647 (-0.922)	0.497 (0.873)
<i>DIV</i>	0.043 (0.020)	5.537 (3.473) [*]	0.285 (0.193)	0.295 (0.202)	2.300 (1.314)
<i>TECH</i>	1.366 (2.057) [†]	-0.273 (-1.867) [‡]	-0.273 (-0.511)	-0.591 (-1.239)	-1.248 (-1.644)
<i>MRET</i>	-0.696 (-0.438)	-4.758 (-4.044) [*]	6.015 (4.432) [*]	2.768 (2.132) [†]	0.986 (0.719)
<i>SD</i>	65.866 (0.937)	-141.276 (-2.809) [*]	385.462 (5.011) [*]	219.065 (3.898) [*]	-22.918 (-0.337)
<i>NM</i>	-0.940 (-1.491)	-1.205 (-2.411) [†]	0.939 (1.680) [‡]	0.644 (1.259)	0.817 (1.285)
<i>UREP</i>	17.941 (2.161) [†]	-3.180 (-0.769)	1.606 (0.320)	-5.320 (-0.941)	-3.127 (-0.553)
Intercept	-0.804 (-0.224)	2.946 (1.613)	-3.183 (-1.335)	-2.279 (-1.025)	-4.114 (-1.370)
McFadden <i>R</i> ²	13.613	25.559	29.016	14.931	6.617
LR-statistic	23.651 [†]	78.797 [*]	89.455 [*]	33.397 [*]	10.708
<i>n</i>	228	228	228	228	228

Notes:

Table shows the results of binary logit analyses. The *z*-statistics are in parentheses and are based on robust Huber-White standard errors.

* Significant at the 1 percent level.

† Significant at the 5 percent level.

‡ Significant at the 10 percent level.

The variables are as defined in Table 1.

suggests that underwriters are less, rather than more, likely to use the dividend discount model in the face of a volatile stock market. We also do not find support for our conjecture that underwriters are more likely to use the dividend discount model to value large firms (LnSIZE) and firms with relatively low forecasted sales growth ($GROW$).

Underwriters prefer to use the discounted cash flow method when valuing Nouveau Marché companies (NM). One possible explanation is that the discounted cash flow analysis is used to value Nouveau Marché firms because the other valuation methods are difficult to employ. Typically, these companies cannot be valued using the dividend discount model because they do not pay dividends in the immediate future, and it is more difficult to find comparable companies to use for multiples valuation.⁹ We also find that underwriters use discounted cash flow analysis when the market index returns ($MRET$) are high. We conjecture that these market conditions offer a window of opportunity during which investors are more eager to buy stocks and more willing to believe the cash flow and discount rate assumptions underlying the discounted cash flow model. We report that the market index volatility (SD) is positively related to the use of the discounted cash flow model. In these market circumstances, investors may be more uncertain about fundamental value. The discounted cash flow model may give investors the information they need to evaluate the fundamental value of the IPO stock. In contrast to our predictions, we do not find that underwriters use the discounted cash flow model more frequently when valuing larger (LnSIZE), older companies ($\text{Ln}(1 + AGE)$) with lower growth rates ($GROW$).

We report that aggregate market conditions are an important determinant of the choice for the economic value-added method. The use of the economic value-added method is more frequent when aggregate market returns ($MRET$) are high. Similar to the discounted cash flow model, we argue that investors are more receptive to this valuation method in a buoyant stock market. The economic value-added method is also more often used when the overall market is relatively volatile (SD). We infer that the additional information disclosed to investors as part of the economic value-added method may give investors the information about the fundamental value of the IPO firms that they are looking for. Apart from aggregate market conditions, we do not find any determinants of the choice for this valuation method. Contrary to our expectations, we do not find a higher use of economic value-added method when valuing firms with more assets in place (AIP).

Finally, we examine the use of underwriter-specific methods. We do not find any statistically significant determinants that explain the choice for this particular valuation method. Possibly, there is too much heterogeneity among the underwriter-specific methods.

Weights attached to value estimates

Table 5 shows the results of the valuation weights regressions. These regressions are estimated conditional on the underwriter using that particular method to value the IPO firm's equity. The first column shows that the weight attached to the multiples valuation outcome is 3.4 percentage points higher for technology companies ($TECH$).

TABLE 5
Determinants of the weights assigned to the value estimates and of the deliberate price discount

Model	(6)	(7)	(8)	(9)	(10)	(11)
Dependent variable	<i>MULTW</i>	<i>DDMW</i>	<i>DCFV</i>	<i>EVAW</i>	<i>OTHW</i>	<i>DISCOUNT</i>
<i>LnSIZE</i>	0.018 (1.171)	-0.005 (-0.258)	0.005 (0.278)	-0.024 (-0.840)	-0.059 (-1.491)	-0.004 (-0.617)
<i>Ln(1 + AGE)</i>	-0.025 (-1.311)	0.012 (0.604)	-0.028 (-1.100)	0.006 (0.369)	0.082 (1.710)	-0.007 (-0.783)
<i>AIP</i>	-0.004 (-0.044)	-0.025 (-0.297)	0.094 (1.033)	0.053 (0.529)	0.238 (1.375)	0.001 (0.037)
<i>PROF</i>	0.029 (2.144)†	0.165 (0.514)	0.036 (0.144)	-0.570 (-1.230)	-1.533 (-3.603)*	-0.115 (-1.795)‡
<i>GROW</i>	0.020 (1.976)‡	-0.036 (-0.593)	0.065 (0.835)	0.012 (0.107)	-0.056 (-0.468)	-0.003 (-0.180)
<i>DIV</i>	-0.396 (-3.121)*	0.390 (2.215)†	-0.463 (-3.211)*	-0.212 (-0.849)	0.431 (1.227)	-0.022 (-0.481)
<i>TECH</i>	0.034 (1.865)‡	0.024 (0.498)	-0.043 (-0.853)	0.056 (0.802)	0.005 (0.036)	0.029 (1.590)
<i>MRET</i>	0.005 (0.056)	-0.436 (-3.966)*	0.191 (1.377)	0.118 (0.729)	-0.307 (-1.160)	0.008 (0.170)
<i>SD</i>	-8.457 (-2.281)†	-20.454 (-4.575)*	1.470 (0.280)	-6.598 (-0.841)	-24.049 (-2.562)†	4.100 (2.055)†
<i>NM</i>	-0.042 (-0.978)	0.009 (0.181)	0.036 (0.912)	-0.022 (-0.464)	0.080 (0.681)	0.007 (0.353)

(The table is continued on the next page.)

TABLE 5 (Continued)

Model	(6)	(7)	(8)	(9)	(10)	(11)
Dependent variable	MULTW	DDMW	DCFW	EVAW	OTHW	DISCOUNT
<i>UREP</i>	0.129 (0.342)	-0.222 (-0.608)	-0.332 (-0.719)	0.197 (0.211)	-2.208 (-1.871) [‡]	-0.261 (1.655) [‡]
<i>UNCERT</i>						0.179 (2.569) [†]
Intercept	0.578 (3.118) [*]	0.653 (2.761) [*]	0.410 (1.746) [‡]	0.679 (1.751) [‡]	1.125 (2.144) [†]	0.189 (2.107) [†]
Adjusted <i>R</i> ²	7.083	12.821	12.638	18.998	50.146	13.679
<i>F</i> -statistic	2.372 [*]	2.792 [*]	2.762 [*]	1.917 [‡]	3.286 [*]	4.000 [*]
<i>n</i>	199	135	135	44	26	228

Notes:

Table shows the results of OLS regression analyses. In parentheses are the *t*-statistics using White 1980 heteroskedastic-consistent standard errors. The variables are as defined in Table 1.

- * Significant at the 1 percent level.
- † Significant at the 5 percent level.
- ‡ Significant at the 10 percent level.

Underwriters also rely on this method to a larger extent when valuing relatively profitable (*PROF*) and/or fast-growing (*GROW*) firms. Underwriters are less likely to rely on the multiples valuation outcome when the company plans to pay out a relatively high fraction of its future earnings as dividends (*DIV*) and when the stock market is more volatile (*SD*).

Consistent with expectations, underwriters base their fair value estimate on the dividend discount model to a higher degree when the company is planning to pay out a higher proportion of its future earnings as dividends (*DIV*). The dividend discount model carries more weight when market index returns (*MRET*) are poor. A possible explanation is that underwriters cater to investor demand and underline the dividend-paying ability of the IPO stock at a time when investors are generally more interested in dividends. We report that the weight assigned to the dividend discount model is higher when the aggregate market volatility (*SD*) is low. This contrasts with our hypothesis that direct valuation methods are more relied on during periods of aggregate market volatility. We also do not find support for our conjecture that underwriters rely on the dividend discount model to value large firms (*LnSIZE*) and firms with relatively low forecasted sales growth (*GROW*).

Table 5 reports that underwriters put less weight on the discounted cash flow method when the company plans to pay out a substantial proportion of its future earnings as dividends (*DIV*). We do not find any other significant determinants of the weight that underwriters attach to the value estimate of the discounted cash flow model when setting their fair value estimates. In contrast to our earlier predictions, there is no support for the conjecture that underwriters rely more on the discounted cash flow method when valuing older companies ($\text{Ln}(1 + \text{AGE})$) with lower growth rates (*GROW*). Market conditions do not seem to influence the weight that underwriters assign to the discounted cash flow value estimate in setting the fair value estimate.

We do not find any statistically significant determinants of the weight assigned to the value estimate of the economic value-added method. As a final point, the weight given to the value estimate of the underwriter-specific techniques is largely driven by profitability (*PROF*), underwriter reputation (*UREP*), and aggregate stock market volatility (*SD*). Other things being equal, underwriters do not heavily rely on these ad hoc techniques when valuing firms with higher forecasted profitability in the current year or when facing a volatile stock market. More reputable underwriters appear to rely less on these techniques when determining their fair value estimate. However, we need to be careful in interpreting these results given the small number of observations.

The price discount

Table 5 shows the results of the deliberate price discount regression model 11. We find that higher underwriter reputation (*UREP*) is associated with a lower price discount. This suggests that the underwriter's reputation capital certifies IPO firm quality and reduces the need for a high price discount. Other things being equal, companies that are forecasted to be comparatively profitable in the current year (*PROF*) are associated with lower IPO price discounts. Consistent with information

asymmetry theories, we report that valuation uncertainty (*UNCERT*) is positively associated with the IPO price discount. This is consistent with the hypothesis that the discount serves as compensation to investors to invest in riskier IPO deals. Higher aggregate stock market index volatility (*SD*) has the same effect on the IPO price discount. In contrast to our expectations, there is no evidence that underwriters need to attract investors by means of larger discounts when they bring smaller (*LnSIZE*), younger (*Ln(1 + AGE)*), technology (*TECH*), and/or rapidly growing firms (*GROW*) to the market. There is also no support for the conjecture that a high future dividend payout (*DIV*) is associated with a lower discount or that lower market returns (*MRET*) are associated with a higher discount.

Sensitivity analyses

We conduct several unreported sensitivity analyses to check the robustness of our results.¹⁰ First, we check whether underwriter familiarity with valuation methods affects our results. It might be that a particular underwriter always uses the same methods to value the shares of the companies it brings public. We therefore reestimate models 1 to 5 using a set of 16 dummies for the most active underwriters. There are at most seven dummies that are significant, suggesting that familiarity plays some role in explaining the choice for a particular valuation method. However, our previous results remain largely intact. We also exclude the two underwriters that make most frequent use, and the two underwriters that make least frequent use, of a particular valuation method. When reestimating the regressions, the results prove qualitatively similar.

We also included profitability and sales growth for the year prior to the IPO rather than the profitability and sales growth forecasted for the current year in the regressions. Similar results obtain. Our results are also not sensitive to the inclusion of a set of year dummies.

We also tested for possible multicollinearity, which would prevent estimating discrete effects. We therefore calculate variance inflation factors of the independent variables (VIFs). VIFs in excess of 10 suggest severe multicollinearity problems. However, none of the VIFs is higher than 5. This implies that multicollinearity is not a significant problem in our analyses. In our analyses we pool the observations for the Nouveau Marché and Second Marché of Euronext Paris to increase the power of our tests. To some extent, we control for differences between the stock markets by the inclusion of the Nouveau Marché intercept dummy in our regression models. As a robustness check, however, we also reestimate all regressions (with the exception of models 9 and 10 given the limited number of observations) using interaction terms between the Nouveau Marché dummy variable and all other independent variables. We find that in an individual regression model there are never more than two of these interaction terms that are significant. Other things being equal, Nouveau Marché firms are less likely to be valued using multiples when their tangible asset intensity (*AIP*) is high and more likely to be valued using the discounted dividend model and discounted cash flow model when they are more profitable (*PROF*). More reputable underwriters (*UREP*) are more likely to value Nouveau Marché firms using the discounted cash flow model. In addition,

underwriters place a lower weight on the multiples valuation when valuing older Nouveau Marché firms and a higher weight on the value estimate of the dividend discount model when valuing more profitable Nouveau Marché companies. Our other results are the same as before. Overall, there do not seem to be many differences in the regression coefficients between the Nouveau Marché and Second Marché subsamples.

Other possible concerns are with the estimation of models 6 to 10. There are 30 out of 228 valuation reports where the underwriter uses only one particular method to value the IPO stock. This may influence our results because we give a weight equal to 100 percent to this one valuation method. We therefore reestimate models 6 to 10 excluding the 30 observations where the underwriter only uses one method. We find similar results. Another concern is that the potential weight that underwriters can assign to the outcome of the value estimate of each method is inversely related to the number of methods used to value the IPO. To check this, we also reestimated models 6 to 10, adjusting the weight that the underwriter assigns to the value estimate of the particular valuation method by subtracting the inverse of the number of valuation methods that the underwriter uses. Hence, if the underwriter assigns a weight of $2/3$ to the multiples method and he or she uses two valuation methods, the adjusted weight becomes $(2/3 - 1/2) = 1/6$. We find similar results as before when we reestimate the models using the adjusted weights as dependent variables.

Finally, we test for endogeneity of the price discount to valuation uncertainty in model 11 using the Davidson-MacKinnon test.¹¹ We find that the test statistic is not significant (p -value = 0.92). The test for endogeneity of price discount to underwriter reputation is also insignificant (p -value = 0.18). Valuation uncertainty and underwriter reputation can therefore be treated as exogenous variables in the price discount regression as we do in model 11.

6. Summary and conclusions

The valuation literature is particularly thin about how underwriters value the shares of the companies they bring public. Our study aims to fill the gap. We obtain valuation reports from underwriters that give us unique access to detailed valuation analyses for a sample of 228 IPOs on Euronext Paris during the period 1990–99. We try to answer three new research questions: (a) How do underwriters select the methods to value IPO stocks? (b) How do underwriters combine the outcomes of the different valuation methods to arrive at a fair value estimate of the IPO firms' equity? (c) How do underwriters set the preliminary offer price on the basis of the fair value estimate?

We document that underwriters frequently use multiples valuation, the dividend discount model, and the discounted cash flow model to value IPO firm's equity. Other methods such as the economic value-added method and underwriter-specific techniques are less widespread. We find that underwriters prefer to use multiples valuation when valuing technology firms and rapidly growing and/or profitable firms. The dividend discount model is often used when valuing older firms from mature industries that plan to pay out a large fraction of their future

earnings as dividends. The dividend discount model is also more popular when aggregate stock market returns are relatively low. In these market circumstances, using the dividend discount model may cater to investor demand for safe dividend-paying stocks. Other things being equal, the use of the discounted cash flow model and the economic value-added method is more frequent when aggregate stock market returns are high. A possible explanation is that these stock market conditions offer a window of opportunity during which investors are eager to buy stocks and more willing to believe assumptions underlying the discounted cash flow model and the economic value-added method. We also report a higher use of these two methods when the aggregate stock market is relatively volatile. Investors that face a more volatile stock market are in need of information about fundamental value. The discounted cash flow model and economic value-added method may perhaps provide investors with this information at the time they need it most.

We also investigate the weights that underwriters assign to the value estimates of the different methods when setting the fair value estimate. The fair value estimate can be viewed as the underwriter's *ex ante* estimate of first-day market capitalization. Underwriters assign a higher weight to the value estimate of the multiples method when valuing relatively profitable and/or fast-growing firms in the technology sector. The multiples value estimate and the discounted cash flow value estimate receive lower weights when the company plans to pay out relatively high dividends in the future. Underwriters assign a higher weight to the value estimate of the dividend discount model when the IPO firm plans to pay out a larger fraction of its future earnings as dividends. Possibly, underwriters believe the dividend discount model to be more reliable in case the firm plans to pay out more dividends in the future. Other things being equal, underwriters do not heavily rely on ad hoc underwriter-specific techniques when valuing more profitable firms or when facing a more volatile aggregate stock market. More reputable underwriters seem to rely less on their underwriter-specific value estimates when determining their fair value estimate.

As a final point, we investigate the determinants of the price discount that underwriters apply to their fair value estimate to arrive at the preliminary offer value. This discount is thus applied early on in the IPO valuation process and is distinct from the well-documented IPO underpricing. We document that more reputable underwriters are associated with lower discounts. Other things being equal, companies that are forecasted to be comparatively profitable in the current year are also linked with lower price discounts. In addition, we report that the price discount is larger for riskier IPO deals with higher valuation uncertainty.

To conclude, this study extends the findings of Demirakos et al. 2004 by looking at the use of the valuation method in the context of IPOs and including a richer set of determinants in our empirical model. This enables us to go beyond looking at the cross-industry variation in the use of particular valuation models. We report that firm characteristics, aggregate stock returns, and aggregate stock market volatility are important determinants of the choice of valuation method. Underwriters therefore do not seem to select the valuation methods at random but to at least partially base their decisions on industry circumstances, firm-specific factors, and aggregate stock market conditions.

The extant valuation literature focuses on a comparison between the valuation accuracy of different valuation methods or on the best way to select comparable companies for multiples valuation. There is a paucity of research about the determinants of valuation method choice. Future studies could conduct a large survey among financial analysts to shed more light on why and when they use a particular valuation method. Another suggestion for future research is to investigate whether using several valuation methods is associated with higher valuation accuracy. Finally, the use of valuation methods in other contexts such as mergers and acquisitions deserves further attention.

Endnotes

1. In the United States, safe harbor provisions for forward-looking statements in the Private Securities Litigation Reform Act of 1995 do not apply to IPOs. As a result, earnings forecasts in U.S. IPO prospectuses are very rare (Berger 2002).
2. The IPO pricing process begins after setting the preliminary offer price. The underwriter starts by collecting information about investor demand for the shares during a road show or an auction. Any positive information about investor demand is used to adjust the preliminary offer price upward to arrive at the final offer price. On average, the market price on the first day of trading exceeds the final offer price such that investors that were allotted shares in the IPO earn a positive first-day return. This positive first-day return is known as IPO underpricing and is computed as $(\text{first-day market price} - \text{final offer price}) / \text{final offer price}$. This paper focuses on the early stage of pre-IPO valuation and not the later IPO pricing stage. We refer to Derrien and Womack 2003 for a more detailed description of the IPO pricing process in France.
3. A detailed description of the valuation techniques can be found in text books such as Damodaran 1994; Palepu, Healy, and Bernard 2000; and Penman 2001.
4. We identify technology firms following the approach of Loughran and Ritter 2004. High-tech companies are active in Standard Industrial Classification (SIC) codes 3571, 3572, 3575, 3577, and 3578 (computer hardware); 3661, 3663, and 3669 (communications equipment); 3674 (semiconductors); 3812 (navigation equipment); 3823, 3825, 3826, 3827, and 3829 (measuring and controlling devices); 3841 and 3845 (medical instruments); 4812 and 4813 (telephone equipment); 4899 (communications services); and 7370, 7371, 7372, 7373, 7374, 7375, 7378, and 7379 (software). We collect SIC codes from COMPUSTAT Global Vantage and Worldscope Disclosure.
5. Reading through the analyst reports we found that the price discount is indeed often advertised to entice investors to buy the stock. For example, one analyst writes: "The preliminary offer price offers a substantial discount from our fair value estimate. We therefore issue a strong buy recommendation for this stock."
6. When constructing the underwriter market share measure we combine local offices and take into account name changes of underwriters because of mergers and acquisitions in the underwriting industry. Our underwriter market share measure identifies the following top three underwriters: BNP Paribas, Crédit Lyonnais, and Société Générale. We base market shares on the original sample of 309 companies that went public during 1990–99.

7. The average unconditional weights of each of the different value estimates are as follows: multiples valuation 43.9 percent, dividend discount model 23.9 percent, discounted cash flow model 21.8 percent, economic value-added method 5.8 percent, and underwriter-specific techniques 4.6 percent.
8. The most popular trailing and forward multiples in our sample are price–earnings ratios (used by 191 underwriters), followed by price-to-cash flow ratios (94 underwriters), enterprise value-to-earnings ratios (56 underwriters), enterprise value-to-sales ratios (56 underwriters), price-to-sales ratios (55 underwriters), and price-to-book ratios (37 underwriters). We find that the average underwriter selects 6.3 peer groups on the basis of industry and/or size. In a typical valuation report, the underwriter aggregates the value estimates of the different multiples together into one value estimate. We therefore use the weight attached to this aggregate multiple valuation estimate in our analysis rather than the weights assigned to the individual estimates of each multiple.
9. The Nouveau Marché was established in 1996 to attract young and high-tech issuers. We find that only 4.6 percent of French listed firms with coverage on Worldscope in 1996 can be classified as technology firms (using the Loughran and Ritter 2004 definition). This made it difficult for underwriters to find a sufficient number of appropriate comparable firms. The multiples method may therefore have been more difficult to use when valuing Nouveau Marché companies during the initial years.
10. Results are available upon request from the author.
11. We test for endogeneity using the Durbin-Wu-Hausman test as augmented by Davidson and MacKinnon 1993. This test can be formed by including the residuals of each endogenous right-hand-side variable, as a function of all exogenous variables, in a regression of the original model and then testing whether the coefficients on the residuals are significantly different from zero.

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