Auctions vs. Bookbuilding and the Control of Underpricing in Hot IPO Markets

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Market returns before the offer price is set affect the amount and variability of initial public offering (IPO) underpricing. Thus an important question is "*What IPO procedure is best adapted for controlling underpricing in "hot" versus "cold" market conditions?*" The French stock market offers a unique arena for empirical research on this topic, since three substantially different issuing mechanisms (auctions, bookbuilding, and fixed price) are used there. Using 1992–1998 data, we find that the auction mechanism is associated with less underpricing and lower variance of underpricing. We show that the auction procedure's ability to incorporate more information from recent market conditions into the IPO price is an important reason.

Offerings of initial public offering (IPO) shares appear to follow a "boom or bust" cyclical pattern in recent decades, not only in the United States, but also in virtually all countries. In "hot" markets, issuers all "want to get through the window at the same time." In "cold" markets, on the other hand, it is sometimes difficult for issuers to sell stock at *any* reasonable price.[1] Ibbotson, Sindelar, and Ritter (1994) and others have documented several aspects of this IPO cyclicality. For IPOs, the market's "temperature" not only affects the number of successful offerings but also the amount and variability of IPO underpricing. In hot markets, double- or even triple-digit underpricing is common, but in cold markets, underpricing is more subdued.

This article addresses the question of what kind of selling and underwriting procedure might be preferred for controlling the amount and volatility of underpricing. For IPOs in the United States, this issue is relatively unexplored since one selling procedure, namely "bookbuilding" by underwriters, has predominated for several decades. However, the existence of other issuing mechanisms, especially in Europe, raises the question of whether these other

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[1] An interesting and extreme example occurred in the last months of 1998. In a "hot market" in July and August, 47 IPOs were issued in the United States, whereas in the next two months, September and October, only 5 issues came public.

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methods have advantages relative to the (American) bookbuilding procedure. The French stock market offers a unique arena for empirical research on this topic, since three basic and substantially different issuing mechanisms have been used there. Besides the bookbuilding procedure dominant in the United States, the French market provides the additional choices of an auction and a fixed-price procedure to the issuer.

First, we should ask the question of how one should measure IPO pricing efficiency. Underpricing is an almost universal feature of the IPO market. Loughran, Ritter, and Rydqvist (1994) report that underpricing generally occurs in virtually all of the IPO markets around the world. In effect, underpricing appears to be an obligatory cost to the issuer. Not surprisingly, the academic finance literature has examined the underpricing question extensively. Clearly, from most issuers' points of view, excessive underpricing is not optimal since proceeds "left on the table" are a cost and not available for the issuer's or earlier investors' use. However, some positive amount of underpricing appears to have positive benefits.[2]

The question, of course, is "how much underpricing is too much?" There do not appear to be firm answers to that question. Practitioners in the United States suggest that an unconditional target range of 10% to 20% is optimal for first-day underpricing. In the United States, underpricing has averaged about 15% in the last two decades.[3] However, such an average belies significant variance in first-day returns. This underpricing variance, which we will study, appears to relate to market conditions.

Practitioners (underwriters, issuers, and investors) also suggest that another important quality of successful IPO pricing (say, when one compares the "quality" of pricing by various underwriters or procedures) is relatively low cross-sectional *variance* of underpricing. If the market "demands" underpricing of approximately 15% on average, it is the issuer whose stock is underpriced by, say, 60% or more that is likely to be unhappy when considering foregone proceeds.

Some of the IPO literature has focused on the relationship between initial market reactions and the selling mechanism used.[4] Benveniste and Spindt (1989) suggest that the American bookbuilding procedure is efficient, since it encourages investors to reveal their beliefs about the issue's value, at a cost of initial underpricing. On the other hand, Welch (1992) focuses on the fixed-price procedure used in some European countries, and shows that this procedure can cause informational cascades: investors who observe the investment

[2] Krigman, Shaw, and Womack (1999) show that "cold" IPOs (that open at or below their offering price) and "extra hot" IPOs (that open up 60% or more above the offer price on the first day) are poor risk-adjusted performers over the next year compared with those that open up in a range of $+10\%$ to $+60\%$ on the first day. Habib and Ljungqvist (2001) show that underpricing obtains as a result of issuers' minimization of wealth losses.

[3] Ritter (1998) documents a 15.8% underpricing in the period 1960 to 1996.

[4] In the rest of the article we will use the expressions "selling mechanism," "mechanism," "offering procedure," and "procedure" equivalently.

choice made by previous investors can update their beliefs about the value of the issued shares. This possibility forces issuing firms to underprice their shares, choosing a price that is likely to create positive informational and price cascades. Benveniste and Busaba (1997) present a theoretical comparison of those two listing mechanisms. They conclude that the bookbuilding procedure generates higher expected proceeds (and more variable proceeds) than if a fixed-price method is used.

Another strand of the IPO literature focuses on the phenomenon of "hot issue markets," that is, periods that are characterized by a large number of offerings and a high average underpricing [Ritter (1984)]. Big differences in IPO underpricing occur in these cycles, depending on the time period a firm chooses to go public. Market conditions can then make the goal of controlling the underpricing of the shares they issue a difficult task for the underwriters.

We compare the three underwriting/selling mechanisms available on the French market. One is very similar to the bookbuilding mechanism used in the United States. Another is a fixed-price procedure. The third one is an auction-like procedure. We show that the auction procedure is better than the others at controlling underpricing in general, as well as the variance of underpricing of the issued shares in "hot" versus "cold" markets. This result provides empirical support for the theoretical work by Biais, Bossaerts, and Rochet (2002), who suggest the auction procedure is optimal.

In the next section we describe the three important French selling procedures and the main features of the French IPO market. In Section 2 we describe the data and methodology we used in our empirical tests. Section 3 documents the relationship between market conditions and number and underpricing of IPOs. In Section 4 we describe the important results we obtain evaluating the mechanisms. In Section 5 we evaluate theoretical conclusions in light of our findings. Section 6 concludes.

1. The French IPO Market Selling Procedures

Relative to the U.S. markets, where underwriting has been primarily based on the bookbuilding mechanism, the French IPO market gives issuers and their underwriters a choice of mechanisms. This choice is typically made before the preliminary documents announcing the IPO are published, that is, approximately 2 months before the IPO date.[5] In the 1992–1998 period, three IPO selling mechanisms have been most common in France:

- *Offre à prix ferme* (OPF), a fixed-price offer,
- *Offre à Prix Minimal* (OPM), an auction procedure, and

[5] In the rest of the paper, the expressions "IPO date," "offering date," "trading date," and "first-trade date" refer to the date when IPO shares are actually traded for the first time. The expression "pricing date" refers to the date when the IPO price is chosen.

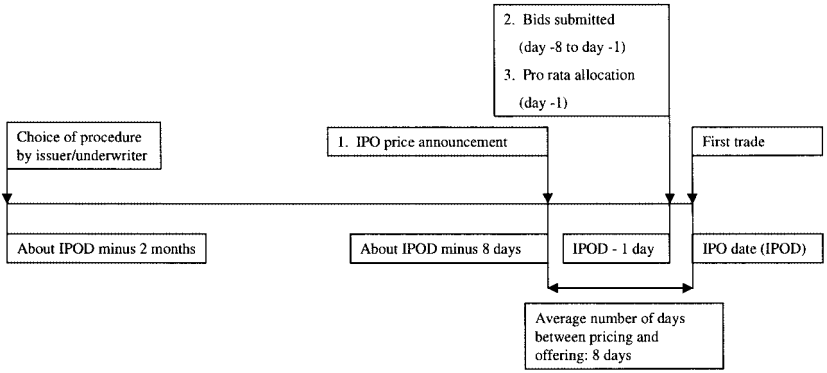

Figure 1
Timing of the fixed-price procedure (OPF)
Step 1: IPO prices is chosen
Step 2: Investors submit quantity bids
Step 3: Non-discriminatory pro rata allocation

- *Placement Garanti* (PG), similar to the American bookbuilding procedure.

The main difference between these three procedures lies in the role of the different actors: OPF and OPM are investor-driven mechanisms, aimed at giving significant decision making to investors. The market authority (the SBF or Société des Bourses Françaises[6]) plays a pivotal role in guaranteeing the fairness of these procedures. The bookbuilding procedure, on the other hand, gives the central role to the underwriter, who presumably has the best understanding of the market as well as the desire and ability to place the shares in "good" hands. The legal and institutional details of those procedures are presented below.

1.1 OPF: the fixed-price offering

In French OPF (*Offre à prix ferme*) offerings (Figure 1), the offer price is set approximately one week (8.27 calendar days, on average, in our sample) before the IPO (first trading) date. This price results from a negotiation between the firm and its underwriter. The day before the IPO, potential investors place orders, specifying the number of shares they desire at the fixed offering price. The SBF collects bids and allocates shares on a pro rata basis.

1.2 OPM: the auction procedure

In French OPM (*Offre à Prix Minimal*, formerly called *Mise en vente*) offerings (Figure 2), a minimum acceptable price is set by the underwriter and

[6] The Société des Bourses Françaises (SBF, 39 Rue Cambon, 75001 Paris) manages the French stock markets.

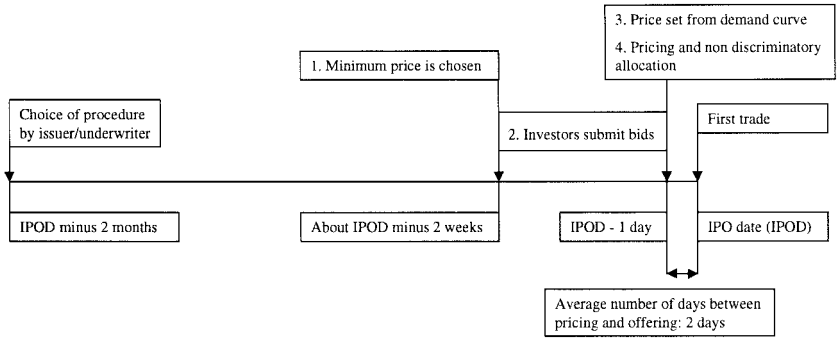

Figure 2
Timing of the auction procedure (OPM)
Step 1: The minimum price is chosen
Step 2: Investors submit price / quantity bids
Step 3: IPO price and upper limit are chosen
Step 4: Non-discriminatory pro rata allocation to investors with bids between IPO price and upper limit

issuer, generally one week before the IPO date (see Figure). On the day before the IPO is slated for trading, investors make price/quantity bids, just as in a sealed-bid auction. After collecting the bids, the SBF computes a cumulative demand curve. The issuer and the underwriter then negotiate with the SBF to choose the offer price and a maximum price.[7] The offer price is a common price that every selected investor will pay for his shares. All bids greater than the maximum price are eliminated. Although there is no written rule, it appears that this maximum price is chosen so that "unrealistic bids" are eliminated. The bids that are considered unrealistic are the ones that are well over the clearing price. This rule is aimed at preventing investors from placing bids at very high prices to make sure that they will obtain shares. This is coherent with the goal of the procedure: that investors place bids that reveal their true valuation of the IPO firm. Investors that have made bids at prices between the offer price and the maximum price receive shares on a pro rata basis. However, if demand is too high, the IPO can be postponed and changed to a fixed-price offering. This generally happens when the ratio of demand to supply is more than 20. This postponement occurred 20 times out of 99 OPM offerings in the 1992–1998 period [see the *TOPM* (Transformed OPMs) column in Table 1 for details about the characteristics of those offerings]. In the following, those postponed OPM offerings are combined with the other OPM IPOs, because they are similar ex ante.

[7] In this negotiation, the SBF defends the investors' interests in pushing for an IPO price that both reflects investors' bids and offers a "reasonable" amount of underpricing to bidders.

Table 1
Descriptive statistics of the sample

		All OPMs	POPM[a]	TOPM[a]	PG	OPF	Total[b]
IPOs by exchange	SM	99	79	20	62	24	191
	NM	0	0	0	73	0	73
	Total	99	79	20	135	24	264
IPOs by IPO year	1998	33	28	5	72	3	108
	1997	21	15	6	30	3	54
	1996	23	16	7	19	3	45
	1995	8	8	0	1	3	13
	1994	11	9	2	11	7	32
	1993	1	1	0	1	5	9
	1992	2	2	0	1	0	3
	Total	99	79	20	135	24	264
Hi-tech	0 (# of IPOs)	47	39	8	63	15	131
	1 (# of IPOs)	52	40	12	72	9	133
Market capitalization	Mean	272.4	253.4	347.4	563.1	642.0	467.1
	Std deviation	253.9	248.6	267.3	891.8	838.7	722.4
	Median	184.9	163.2	214.4	257.8	379.8	235.0
Price range adjustment	Mean	12.82%	10.45%	22.18%	13.16%		
	Std deviation	9.47%	8.78%	5.52%	8.30%		
	Median	11.76%	9.09%	20.92%	11.69%		
First-day return (underpricing)	Mean	9.68%	6.55%	22.07%	16.89%	8.88%	13.23%
	Std deviation	12.25%	9.43%	14.38%	24.49%	10.98%	19.69%
	Median	6.25%	4.80%	20.81%	9.80%	5.82%	7.80%
Days between pricing and first trade		1.99	1.25	5.00	5.53	8.27	4.50
Market Return[c]		1.33%	1.24%	1.67%	2.06%	0.41%	1.55%
Market Volatility[c]		0.59%	0.60%	0.53%	0.67%	0.53%	0.62%

The sample contains all IPOs from 1992 to 1998 on the French "Second Marché" (SM) and "Nouveau Marché" (NM). *OPM* is the auction-like IPO procedure, *PG* is the bookbuilding procedure, *OPF* is the fixed-price procedure. *Hi-tech* is a high-technology dummy variable. *Price range adjustment* is the percentage change between the minimum price set initially (or the lower bound of the price range for PG offerings) and the offer price. *IPO year* is the calendar year in which the company went public. *First-day return (underpricing)* is the simple return calculated between IPO price and the closing price at the end of the first day of quotation. *Market capitalization* is calculated at offer price in millions of French Francs. *Days between pricing and first trade* is the number of calendar days between the day when the offering price is chosen and the IPO date. *Market Return* is a weighted average of the returns of the MIDCAC stock index for the 3 months before the IPO pricing date. The weights are 3 for the most recent month, 2 for the next month, and 1 for the third month before the offering. *Market Volatility* is the standard deviation of the 1-month return of the MIDCAC index in the month before the IPO.

[a] We present separately the results for "pure" OPMs (POPM), and the ones that are finally transformed into OPFs (TOPM.) Although those two categories exhibit different characteristics, we combine them in the subsequent tables, because they are similar ex ante.

[b] We include in the total number of offerings five IPOs, which used procedures that are not used anymore.

[c] These two variables have a negative correlation due to some outliers with high *Market Volatility* and low *Market Return*. When we remove these outliers from the original sample, the correlation coefficient is 0.21, with no significant differences between the three procedures. Removing these observations does not change the results presented hereafter.

1.3 PG: the bookbuilding procedure

In the PG (*Placement Garanti*) procedure (Figure 3), the price is chosen via the typical American bookbuilding approach:[8] first, the issuing firm and underwriter set a price range. Then, in a marketing phase (the "road show"),

[8] Actually, two types of bookbuilding procedures are available: one is strictly equivalent to the American procedure, the other is a mixed bookbuilding/fixed-price procedure in which the price and allocation rules are the same as in the bookbuilding, except for a small fraction of the shares. Those shares, which are reserved for retail investors, are sold via a fixed-price procedure, at the price chosen in the bookbuilding part of the

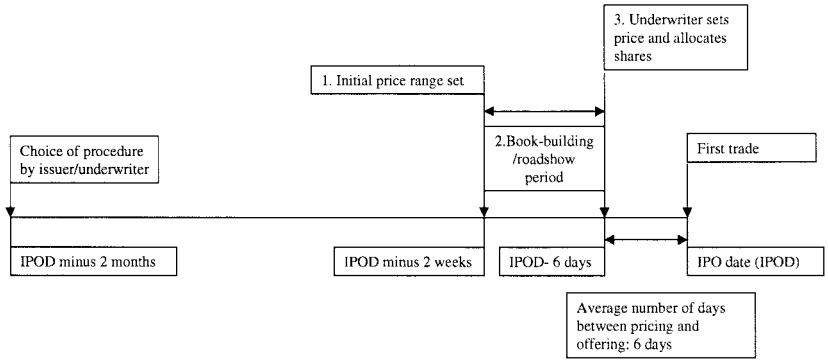

Figure 3
Timing of the bookbuilding procedure (PG)
Step 1: Underwriter sets initial price range, advertises offering through road-show
Step 2: Investors submit price/quantity indications of interest during roadshow
Step 3: Underwriter sets price and allocates with complete discreation.

the firm is presented to institutional investors, who transmit nonbinding indications of interest to the underwriter. Once this bookbuilding period is over (on average 5.53 calendar days before the IPO date in our sample), the issuing firm and the underwriter set a price, taking into account the indications of interest received.[9] Once the offer price has been set, the underwriter, who selectively chooses among investors, allocates the shares.

The main difference between this procedure and the previous mechanisms lies in the underwriter's role in all stages of the IPO. First, in the road show, a step that does not exist in other mechanisms, underwriters market the offering to potential investors. Second, the underwriter has much more price-setting power than in other procedures. Third, underwriters allocate shares in a discretionary manner.

1.4 Setting the first-day price

Whichever mechanism is used, once the shares have been allocated to investors, a call market system sets the potential opening price. The SBF collects sell and buy orders. This leads to a clearing price, which may be the first transaction price. However, if the potential clearing price is higher than the offer price by more than a set percentage (this set percentage is often 10%), then no transaction occurs and the same call market procedure is repeated the next business day, beginning at the augmented (+10%) clearing price.

offering. In the rest of this study we do not separate the two procedures because they are similar in terms of price setting.

[9] The major difference between the French and American types of bookbuilding lies in the fact that, in France, the price range is rarely changed. Most of the time the IPO price is chosen within the initial price range.

2. Data and Methodology

We analyze 264 French equity offerings, comprising all firms initially listed on the "Second Marché" and "Nouveau Marché" during the period from January 1992 to December 1998.[10] We collect institutional information from the preliminary prospectuses and the IPO reports published by the SBF a few days after every IPO. Aftermarket price data come from two sources. Daily prices on the Second Marché were provided by the SBF, whereas for the Nouveau Marché, we used data from the BDM database, a high-frequency trade and quotes database produced by the SBF. The financial characteristics of the firms come from preliminary prospectuses and SBF reports. Table 1 presents descriptive statistics of the offerings in our sample.

We observe in Table 1 that the numbers of OPM and PG offerings are approximately comparable (99 versus 135), whereas there are fewer fixed-price (OPF) offerings in our sample (24). The OPF fixed-price procedure has fallen into disuse in recent years: there were 15 total OPF offerings in 1992–1995, but there have only been 9 since the beginning of 1996. Thus our main comparisons in this article are between the two main procedures (OPM, auction: PG, bookbuilding) currently in use.

We also note that, so far, all IPOs on the Nouveau Marché have used the PG (bookbuilding) procedure, though this is not explicitly required. One reason for the PG choice on the Nouveau Marché is that those offerings are generally smaller-size IPOs, with 279 million French Francs in market capitalization on average versus 539 million for Second Marché offerings. One explanation for this use of PG on the Nouveau Marché is that other procedures do not offer sufficient compensation to the underwriters [the PG procedure (bookbuilding) is characterized by higher underwriter fees]. While the average PG offering has a larger market capitalization compared to the two other procedures, the PG distribution is bimodal: there are a substantial number of both relatively small and relatively large PG IPOs. Their median market capitalization is less different from that of OPM (auction) offerings.

Underwriters explain this distribution of PG offerings as follows: foreign investors are reluctant to participate in auction-like OPMs because they are less familiar with this procedure.[11] Consequently firms that want to attract foreign investors (generally the largest issuers) use the PG (bookbuilding) procedure. So the PG mechanism is used in two distinct situations: first, by large firms issuing shares on the Second Marché, which are typically attempting to attract foreign investors. Second, by all the firms issuing shares on the

[10] We do not consider firms that transfer from "Le Marché hors-cote" (an exchange with very low volume) to another exchange as an IPO. Indeed, in those transfers, the price discovery function of selling mechanisms is made less important by the fact that those firms already had a market price. We also eliminated from our sample the firms that were already listed on other exchanges, for the same reason.

[11] Foreign institutional investors also dislike the fact that the OPM procedure gives them no advantage over "normal investors" in terms of share allocation (as opposed to bookbuilding, in which they are usually given a better allocation by the underwriters).

Table 2
Short-term and long-term performance of the French IPOs

		All OPMs	POPM[a]	TOPM[a]	PG	OPF	Total
10th-day cumulative return (underpricing)	Mean	14.20%	9.63%	32.26%	19.03%	12.99%	16.48%
	Std deviation	25.83%	21.77%	32.64%	31.62%	20.40%	28.38%
	Median	6.30%	3.45%	26.20%	8.78%	9.25%	7.66%
6-month performance	Mean	−3.64%	−4.34%	−1.06%	−5.30%	−1.16%	−3.90%
	Std deviation	37.12%	39.78%	25.63%	43.83%	14.77%	38.28%
	Median	−4.55%	−5.53%	−2.46%	−7.32%	0.82%	−4.20%
12-month performance	Mean	1.29%	0.26%	4.96%	−4.96%	−0.59%	−1.31%
	Std deviation	53.39%	58.55%	37.18%	62.55%	34.03%	54.53%
	Median	−7.38%	−8.31%	−4.70%	−7.10%	5.95%	−5.02%
18-month performance	Mean	−8.68%	−12.53%	5.34%	−13.22%*	−13.36%	−9.48%*
	Std deviation	66.39%	69.59%	52.11%	67.93%	43.52%	64.15%
	Median	−7.00%	−10.87%	17.00%	−15.87%*	−4.83%	−10.87%*
24-month performance	Mean	−9.03%	−10.53%	−3.45%	−4.94%	−4.18%	−6.27%
	Std deviation	79.52%	82.10%	70.81%	82.82%	52.03%	77.76%
	Median	−11.17%	−13.98%	4.06%	−17.67%	−14.11%	−13.21%*

The sample contains all IPOs from January 1992 to December 1998 on the French "Second Marché" and "Nouveau Marché" (the two exchanges on which most companies go public in France.) *10th-day cumulative return (underpricing)* is the simple return calculated between IPO price and the closing price at the end of the 10th day of quotation. Long-term performances (*6-month performance, 12-month performance, 18-month performance, 24-month performance*) are calculated as cumulated average returns starting on the 11th trading day. These returns are adjusted using a benchmark of non-IPO firms in the same size and book-to-market quintiles. *OPM* is the auction-like IPO procedure, *PG* is the bookbuilding procedure, *OPF* is the fixed-price procedure. We include in the total number of offerings five IPOs which used procedures that are not used anymore.

[a] We present separately the results for "pure" OPMs (POPM), and the ones that are finally transformed into OPFs (TOPM.) Though those two categories exhibit different characteristics, we combine them in the subsequent tables, because they are similar ex ante.

* Significantly different from 0 at 5% level, assuming independence across IPOs.

Nouveau Marché, that is, the smallest firms in our sample. This accounts for the high variance in the market capitalization of PG offerings.

Table 1 also shows that the number of days between the pricing date (i.e., the date on which the offering price is chosen) and the trading date (the date on which the shares first trade) varies depending on which procedure is used. OPF and PG offerings average 8.27 and 5.53 days, respectively, between those two dates, whereas OPM offerings have on average only 1.99 days. We will show later that this difference has an important impact on the underpricing of newly listed firms.

In Table 1 we also note that the average first day underpricing is equal to 13.23%, in line with other countries' figures [see Loughran, Ritter, and Rydqvist (1994)]. Table 2 shows the longer-run performance of IPO stocks. Long-term performance is calculated using cumulative average benchmark portfolio-adjusted returns. Every year each IPO firm is assigned to one of 16 portfolios of non-IPO firms on the basis of size and book-to-market. Eighteen-month mean and median-adjusted excess returns (beginning after the 10th trading day) are significantly negative for the entire sample.[12] We

[12] However, significance is probably overestimated due to clustering among IPOs.

also note that no procedure leads to systematic underperformance in the (two-year) long run.

3. Market Return and Its Effect on IPO Underpricing

In this section we document a strong relationship between recent returns in the overall market and the underpricing of IPOs. Market return is often said to play an important role in determining an IPO's underpricing.

In order to confirm the hypothesis that recent market return influences underpricing, we compute regressions where the mean and, separately, the variance of the underpricing of the IPO firms in our sample is explained by firm-specific and recent market return independent factors.We focus on factors known before pricing in order to avoid the influence of factors that play a role once the firm has been listed (such as market conditions after the IPO date or price support by the underwriter). In these regressions we use two different dependent variables: first day underpricing, and the "squared deviation" of first day underpricing constructed as the squared residuals from the first regression (the one with first day underpricing as dependent variable).

We use the following firm and industry control variables: *Exchange* is a dummy variable equal to 1 if the firm is listed on the Second Marché, 0 otherwise.[13] *Hi-tech* is a dummy variable equal to 1 if the firm is a high-technology firm, 0 otherwise. *Ln_mktcap* is equal to the natural logarithm of market capitalization (postissue shares times offer price) at IPO date.[14]

In order to examine market conditions, we construct a series of *Market Return* and *Market Volatility* variables. The *Market Return* variables are constructed using a market index provided by the SBF (the MIDCAC stock index). To construct this variable, the market stock index return for each trading day in the preoffering period for each IPO is calculated. Then, for each individual offering, the *Market Return* variable is constructed for the 3-month, 1-month, and 1-week periods before the IPO offering date (or alternatively, pricing date) as a buy-and-hold return.[15] These returns are normalized to produce an average monthly return over each of these periods. A 3-*month weighted Market Return* variable is constructed as a weighted average of the buy-and-hold returns of the MIDCAC index in the 3 months before

[13] "Le Second Marché" was created in 1983 to allow small firms to go public and is often seen as a transition before reaching the main exchange ("La cote officielle"). Its listing requirements are less stringent than on the main market. Its alternative, "Le Nouveau Marché," was created in 1996 on the model of NASDAQ, to attract start-up companies, especially in high-technology industries. Between 1992 and 1998, most of the French equity offerings occurred on those two smaller markets; a few large or special offerings, like privatizations, occurred on the main exchange.

[14] We run the same regressions including other firm-specific variables (age of the firm at IPO date, book-to-market value of the firm at IPO date, dummies corresponding to the announced goals of the IPO, rank of the lead underwriter). These variables do not significantly affect the results presented hereafter.

[15] We had no specific priors on the length of the preoffering period that might affect underpricing. Hence we investigated four different time periods which encompass the time frame when an IPO is being planned and implemented. The impact of market momentum was very significant in all of them.

the IPO date. The weights are three for the most recent month, two for the next, and one for the third month before the offering. This weighted sum is divided by six, so that the observed coefficient is also a weighted monthly market return. (By assigning these weights, we hypothesize that investors' perceptions take the last three months into account, but give more weight to recent periods.) Similarly we calculate a *Market Volatility* variable which, for each observation, is equal to the standard deviation of the daily return of the MIDCAC market index over the period considered.

Table 1 presents the mean values of our *3-month weighted Market Return* and *1-month Market Volatility* variables, calculated for each IPO as of its pricing date. The mean *Market Return* before an IPO is equal to 1.55%, and the average *Market Volatility* is equal to 0.62%. One should compare those numbers to the average values of those variables over the entire 1992–1998 period: 0.58% and 0.55% for *Market Return* and *Market Volatility*, respectively. The big difference in *Market Return* confirms the well-documented idea that firms prefer to go public in "hot" markets. However, *Market Volatility* appears less important in triggering IPO decisions. We find this logical, in that higher market return implies a higher valuation level attainable for the prospective new issue, while higher market volatility, at least in traditional models like Beatty and Ritter (1986), is associated with a more risky environment for issuance.

We first regress the first-day return (underpricing) of the 264 French IPOs in our sample on firm-specific control variables and on each of the four *Market Return* variables described previously. Table 3 presents the results of those regressions.

The results in Table 3 show that *Market Return* is the most significant variable in all regressions. Market capitalization and the high-technology dummy variable also exhibit significant t statistics, but the explanatory power of the weighted model (adjusted $R^2 = 0.254$ in column 4) is driven by the *Market Return* variable. When this variable is removed, the adjusted R^2 is 0.047. Moreover, we note that the economic significance of the *Market Return* variable is very large: a market increase of 1% (monthly) in *Market Return* results, on average, in an additional 2.32% of first-day underpricing.

Next, in Table 4, we regress first-day IPO underpricing and, in addition, "squared deviation" of underpricing on market return and volatility variables. From this table on, we continue to use the *3-month weighted Market Return* variable from Table 3 because we believe that this variable adequately and most completely summarizes the effects of market return, but our results are still valid with the other specifications. In Table 3 we test whether this second market condition variable, *Market Volatility*, measured as the standard deviation of daily returns in the period before the offering, can also explain

Table 3
Regressions of first-day return (underpricing) on the preoffering market conditions (*Market Return*) and firm-specific variables for 1992–1998 French IPOs [Dependent variable: first-day IPO return (underpricing)]

	Four specifications of the *Market Return* variable below			
	3-month *Market Return*	1-month *Market Return*	1-week *Market Return*	3-month weighted *Market Return*
Intercept, firm, and industry control variables				
Intercept	−0.350	−0.400	−0.355	−0.392
	(−2.363)**	(−2.549)**	(−2.177)**	(−2.649)***
Exchange	−0.033	−0.041	−0.055	−0.032
	(−1.181)	(−1.384)	(−1.781)*	(−1.117)
Ln_mktcap	0.035	0.041	0.040	0.038
	(3.101)***	(3.337)***	(3.107)***	(3.357)***
Hi-tech	0.060	0.061	0.057	0.063
	(2.686)***	(2.697)***	(2.440)**	(2.827)***
Market Return variable (buy-and-hold MIDCAC stock index returns) ending on IPO first trading date				
Market Return	2.122	1.442	0.617	2.322
	(6.741)***	(5.489)***	(4.074)***	(6.590)***
Adjusted R^2	0.246	0.190	0.119	0.254

The sample contains all IPOs from January 1992 to December 1998 on the French "Second Marché" and "Nouveau Marché" (the two exchanges on which most companies go public in France.) *First-day underpricing* is the simple return calculated between IPO price and the closing price at the end of the first day of quotation. *Exchange* is a dummy variable equal to 1 if the firm is listed on the "Second Marché"; *Hi-tech* is a dummy variable equal to 1 if the firm is a high-technology firm; *Ln_mktcap* is equal to the natural logarithm of the market capitalization at the IPO first trading date. *Market Return* is constructed as buy-and-hold returns of the market index (MIDCAC index) chosen in the given period before the IPO first-trade date. 3-month and 1-week indices are, respectively, divided by 3 and multiplied by 4 so that the coefficients are comparable to the 1-month index. The 3-month weighted *Market Return* index is constructed as a weighted average of the returns of the MIDCAC index in the 3 months before the IPO date. The weights are 3 for the most recent month, 2 for the next month, and 1 for the third month before the offering. This weighted sum is divided by 6. The number of observations is 264. (White heteroscedasticity-consistent *t*-statistics are in parentheses.)

* Significant at a 10% level.

** Significant at a 5% level.

*** Significant at a 1% level.

mean underpricing (column 1) and the variance of first-day underpricing (column 2).[16]

We observe that *Market Volatility* also plays a big role in explaining the level of first-day mean and variance of underpricing, with very large coefficients that are all significantly positive (9.765 and 2.524 in columns 1 and 2, respectively, with *t* statistics of 3.439 and 2.224).

In Table 5, we analyze the timing risk due to the number of days between the price announcement and the offering (or first-trade) date. In Table 1 we show that the average number of calendar days between pricing and offering is larger for PGs (5.53 days) and OPFs (8.27) than for OPMs (1.99). Does this matter? In other words, does a change in market conditions occurring between the pricing and offering dates affect underpricing?

To answer this question we construct two more variables, *Transaction Interval Return (TIM)* and *Transaction Interval Volatility (TIV)*. *TIM* is

[16] For this *Market Volatility* variable, we choose a 1-month period before the offering date by a similar procedure as the one presented in Table 1, eliminating 3-month and one-week periods that have smaller explanatory power.

Table 4
Regressions of first-day return (underpricing) and "squared deviation" of return on market preoffering conditions (*Market Return* and *Market Volatility*) and firm-specific variables for 1992–1998 French IPOs

Dependent variable	First-day return (underpricing)	"Squared deviation" of return
Intercept, firm, and industry control variables		
Intercept	−0.489	−0.019
	(−3.122)***	(−1.917)*
Exchange	−0.022	−0.030
	(−0.769)	(−1.560)
Ln_mktcap	0.040	0.006
	(3.514)***	(1.487)
Hi-tech	0.064	0.009
	(2.930)***	(1.053)
Market Return variable (buy-and-hold MIDCAC stock index returns ending on first trading date)		
Market Return	2.544	0.657
	(6.915)***	(3.884)***
Market Volatility variable (standard deviation of daily MIDCAC stock index returns ending on the first trading date)		
Market Volatility	9.765	2.525
	(3.439)***	(2.224)**
Adjusted R^2	0.285	0.178

The sample contains all IPOs from January 1992 to December 1998 on the French "Second Marché" and "Nouveau Marché" (the two exchanges on which most companies go public in France.) *First-day return (underpricing)* is the unadjusted return from IPO price to the closing price at the end of the first trading day. *"Squared deviation" of return* is defined, for each observation, as the squared difference between observed underpricing and underpricing predicted using coefficients from the first column regression. *Exchange* is a dummy variable equal to 1 if the firm is listed on the "Second Marché"; *Hi-tech* is a dummy variable equal to 1 if the firm is a high-technology firm; *Ln_mktcap* is equal to the natural logarithm of the market capitalization at IPO date. The *Market Return* variable is constructed as a weighted average of the returns of the MIDCAC stock index in the 3 months before the IPO first trading date. The weights are 3 for the most recent month, 2 for the next month, and 1 for the third month before the offering. The *Market Volatility* variable is constructed as the standard deviation of the 1-month returns of the MIDCAC index in the immediate month before the IPO first-trade date. The number of observations is 264. (White heteroscedasticity-consistent *t*-statistics are in parentheses.)

* Significant at a 10% level.

** Significant at a 5% level.

*** Significant at a 1% level.

constructed as the buy-and-hold return for the MIDCAC index between pricing and offering dates. Similarly *TIV* is constructed as the standard deviation of the returns for the MIDCAC index over the period between pricing and offering dates.[17] We run the same regressions as previously in Table 4. But this time we also include *TIM* and *TIV* in the *Market Return* and *Market Volatility* variables that are calculated as of the pricing date (instead of the first-trade date in the previous tables).

We observe in Table 5 that the short-run *Transaction Interval Return* has a significant impact on first-day underpricing (with coefficients equal to 0.298 and 0.075 in columns 1 and 2, respectively, and *t*-statistics equal to 3.809 and 2.384). In the same regressions, *TIV* has a significant, negative impact only on average underpricing.

These results show that market return in the near-term months before as well as between pricing and offering dates has a significant impact on the

[17] When this period was only one day, we took the standard deviation of the return for this day and the day before.

Table 5
The impact of *Market Return* and *Market Volatility* between pricing day and offering day on the mean and "squared deviation" of first day underpricing for French IPOs

Dependent variable	First-day return (underpricing)	"Squared deviation" of return
Intercept, firm, and industry control variables		
Intercept	−0.427	−0.084
	(−2.568)**	(−1.071)
Exchange	−0.014	−0.017
	(−0.521)	(−1.884)*
Ln_mktcap	0.036	0.007
	(2.943)***	(1.331)
Hi-tech	0.063	0.009
	(2.769)***	(1.055)
Market Return (buy-and-hold MIDCAC stock index returns)		
Market Return as of pricing date	2.387	0.650
	(6.676)***	(3.936)***
Transaction interval return (TIM)	0.298	0.075
	(3.809)***	(2.384)**
Market Volatility (standard deviation of daily MIDCAC stock index returns)		
Market Volatility as of pricing date	10.694	2.940
	(3.609)***	(2.856)***
Transaction interval volatility (TIV)	−1.312	−0.107
	(−2.023)**	(−0.428)
Adjusted R^2	0.291	0.191

The sample contains all IPOs from January 1992 to December 1998 on the French "Second Marché" and "Nouveau Marché" (the two exchanges on which most companies go public in France.) *First-day return* is the unadjusted return from IPO price to the closing price at the end of the first day of quotation. *"Squared deviation" of return* is defined, for each observation, as the squared difference between observed underpricing and underpricing predicted using coefficients from the first column regression in Table 3. Other firm and control variables are as in Tables 2 and 3. *Market Return as of pricing date* is constructed as a weighted average of the returns of the MIDCAC stock index in the 3 months before the pricing date as in Table 2. *Market Volatility as of pricing date* is constructed as the standard deviation of the returns of the MIDCAC stock index in the 1-month period before the IPO. *Transaction interval return (TIM)* is constructed as the buy-and-hold return for the MIDCAC index between pricing and offering dates multiplied by 22 and divided by the number of days between pricing and offering dates (to obtain a figure comparable to our other "monthly" returns.) Similarly, *Transaction interval volatility (TIV)* is constructed as the standard deviation of the returns for the MIDCAC index over the period between pricing and offering dates (when this period was only one day, we took the standard deviation of the return for this day and the day before) multiplied by the square root of 22 and divided by the square root of the number of days between pricing and offering. The number of observations is 256. (White heteroscedasticity-consistent *t*-statistics are in parentheses.)

* Significant at a 10% level.

** Significant at a 5% level.

*** Significant at a 1% level.

outcome of an offering. Thus, in sum, market return and volatility leading up to an IPO have substantial explanatory power for the level and variance of underpricing. The next section asks an additional question: are certain underwriting/selling procedures better than others in controlling these statistical moments of underpricing?

4. IPO Procedures and Their Control of Underpricing in Hot Market Conditions

One important goal of most owners of an IPO firm is to obtain the highest possible proceeds from an equity offering.[18] On the other hand, discussions

[18] This is not universally true. For example, Broadcast.com, a recent Internet IPO, *intentionally* asked underwriters to substantially underprice the shares. The shares opened up +277%, creating substantial attention in the financial press for the company as "the hottest IPO ever" (at that time).

with practitioners suggest that the typical aim of underwriters is to underprice (at least) modestly and to control aftermarket price variation (especially on the downside). If we accept those two objectives, we can define, for our purposes, an "efficient" selling mechanism as a mechanism that will underprice less and/or with lower cross-sectional squared deviations of first-day underpricing.[19] Hence we will focus throughout this analysis on these two aspects of the aftermarket behavior of newly listed firms: first, the average level of first-day underpricing of the IPO, and second, the variance of this underpricing (proxied by our *"squared deviation" of return* variable).[20]

Our first hypothesis, discussed and confirmed in Section 3, was that previous market conditions are a very significant driver of the level and variability of initial underpricing. We now consider IPO selling mechanisms: which procedure is most efficient in adjusting to recent market conditions in the pricing of IPOs?

In Table 1 we presented underpricing results conditional upon the IPO procedure used. First, we observe an unconditional average level of initial underpricing of 13.23%, consistent with previous studies on the French market.[21] We also showed that the PG procedure (bookbuilding) had both the highest average underpricing and the highest variance of underpricing in our time period [$\mu = 16.89\%$ and $\sigma = 24.49\%$ versus 8.88% and 10.98% for OPF (fixed-price) and 9.68% and 12.25% for OPM (auction-like offerings)]. However, these are unconditional differences in underpricing mean and variance and do not control for the known effects of some issuer differences such as size, industry, and the impact noted in the previous section, recent market return and variability.

Is one of the three underwriting procedures in the French markets more efficient in controlling the impact of market return and uncertainty on short-term underpricing? We test this carefully in Tables 6–11. In these tables, as in the previous ones, we use two types of explanatory variables. First, we use a set of firm-specific control variables as proxies for size and industry factors (*Exchange, Ln_mktcap*, and *Hi-tech*) that have been motivated by previous work and are known to have an impact on the aftermarket behavior of

[19] In this definition we focus on pricing issues; we do not consider questions related to the composition of shareholding after the IPO, as Brennan and Franks (1997) or Stoughton and Zechner (1998) do, or any other aspects of the outcome of equity offerings.

[20] We also examined the results of the cumulative underpricing from offer price to 10 days after the offer date. The results are essentially the same, suggesting that this is not a "first-day" temporary price-pressure phenomenon that drives any of the differences.

[21] See, for instance, Leleux (1993) for a summary of the results found in previous studies, and Biais and Faugeron-Crouzet (2002) for more recent results. If we compare our results conditioning on the procedure used with those presented in Biais and Faugeron-Crouzet (2002), we note that, although results are comparable for fixed-price (OPF) offerings, their study presents a higher average underpricing for OPM offerings (15% versus 10.5% in our sample of OPM offerings). This might be explained by the fact that they study the 1983–1996 period, and institutional changes at the end of this period potentially had a substantial effect on initial underpricing. In Loughran, Ritter, and Rydqvist (1994), offering mechanisms are categorized on the basis of how the offer price is set and how the shares are allocated. They find levels of underpricing of 9%, 12%, and 27%, respectively, for auctions, bookbuilding, and fixed-price offerings.

Table 6
Regressions of mean and "squared deviation" of first-day underpricing on firm-specific variables, *Market Return* and *Market Volatility* variables, splitting by procedure

Dependent variable	First-day return (underpricing)	First-day return (underpricing)	"Squared deviation" of return	"Squared deviation" of return
Intercept, firm, and industry control variables				
Intercept	−0.428	−0.415	−0.098	−0.085
	(−2.542)**	(−2.526)**	(−1.335)	(−1.248)
Exchange	0.007	0.015	−0.012	−0.008
	(0.188)	(0.404)	(−0.793)	(−0.534)
Ln_mktcap	0.033	0.032	0.007	0.007
	(2.671)***	(2.651)**	(1.496)	(1.427)
Hi-tech	0.065	0.068	0.008	0.010
	(2.784)***	(2.892)***	(0.896)	(1.094)
IPO procedure dummies				
OPM (auction)	−0.013	0.036[b]	0.004	0.009
	(−0.482)	(0.817)	(0.639)	(1.412)
PG (book-building)	0.024	−0.068[b]	0.011	0.017
	(0.783)	(−1.268)	(1.096)	(1.516)
Market Return (buy-and-hold MIDCAC stock index returns) ending at pricing date				
Market Return	2.333		0.667	
	(6.491)***		(3.907)***	
Market Return ∗ *OPF*		1.873		0.183[a]
		(2.320)**		(1.496)
Market Return ∗ *OPM*		1.062[a]		0.184[a]
		(3.460)***		(3.889)*
Market Return ∗ *PG*		3.277[a]		1.059[a, a]
		(5.739)***		(3.648)***
Market Volatility (standard deviation of daily MIDCAC stock index returns) ending at pricing date				
Market Volatility	10.685		3.421	
	(3.547)***		(3.101)***	
Market Volatility ∗ *OPF*		8.197		1.640[b]
		(1.226)		(2.171)**
Market Volatility ∗ *OPM*		2.677[a]		0.402[a]
		(0.746)		(0.675)
Market Volatility ∗ *PG*		19.315[a]		6.640[a, b]
		(3.589)***		(3.083)***
Adjusted R^2	0.261	0.303	0.176	0.232

The sample contains IPOs from 1992 to 1998 on the French "Second Marché" and "Nouveau Marché." *First-day return* (*underpricing*) is the simple return calculated between IPO price and the closing price at the end of the first day of quotation. *"Squared deviation" of return* is defined, for each observation, as the squared difference between observed underpricing and underpricing predicted using coefficients from the first column regression. Other firm and control variables are as in Tables 2 and 3. *OPM*, *PG*, and *OPF* are IPO procedure dummies. *Market Return* is a weighted average of the returns of the MIDCAC stock index in the 3 months before the date of pricing as in Table 2. *Market Volatility* is the standard deviation of the returns of the MIDCAC stock index in the 1-month period ending at pricing date. Those indices are split by procedure, by multiplying them by the procedure dummies. We only consider IPOs that used one of the three procedures and for which we know the pricing date. The number of observations is 252. (White heteroscedasticity-consistent *t*-statistics are in parentheses.)

[a, b, c] Coefficients are significantly different from each other at a 1% level (and, respectively, at a 5% level or a 10% level).

* Significant at a 10% level.

** Significant at a 5% level.

*** Significant at a 1% level.

an offering. Second, we use the *Market Return* and *Market Volatility* variables constructed previously to reflect recent market return and uncertainty. However, in Table 6, we calculate these variables as of pricing date (versus the slightly later first-trade date previously) to focus on the ability of each

Table 7
Sensitivity of underpricing to market "hotness" depending on the IPO procedure used (auction or book-building) and on the reaction to investors' bids

		Procedure		
Market "hotness" quintile	Measure	PGU (PG priced at upper bound)	PGL (PG priced below upper bound)	OPM
1	No. of IPOs	1	9	9
	Mean UP	0.00%	−0.02%	3.12%
	Median UP	0.00%	0.00%	0.07%
2	No. of IPOs	5	10	20
	Mean UP	14.56%	6.42%	3.29%
	Median UP	12.12%	4.05%	2.52%
3	No. of IPOs	13	13	25
	Mean UP	8.56%	6.96%	11.35%
	Median UP	3.52%	5.56%	10.00%
4	No. of IPOs	20	12	22
	Mean UP	14.85%	14.79%	11.08%
	Median UP	14.81%	12.78%	7.01%
5	No. of IPOs	31	16	23
	Mean UP	40.23%	12.65%	14.65%
	Median UP	34.62%	5.16%	10.00%

The sample contains IPOs from January 1992 to December 1998 on the French "Second Marché" and "Nouveau Marché." *UP (underpricing)* is the simple return calculated between IPO price and the closing price at the end of the first day of quotation. *PGU*, *PGL*, and *OPM* are procedure dummies. *PGU* is equal to 1 for bookbuilt IPOs priced at the upper bound of the initial price range. *PGL* is equal to 1 for bookbuilt IPOs priced within the bounds of the initial price range. The *Market Return* variable is constructed as a 3-month weighted average of the returns of the MIDCAC stock index in the 3 months before the IPO pricing date as in Table 2. This variable is used to determine *Market "hotness" quintiles.* We remove from our previous sample the IPOs that did not use the PG (bookbuilding) or OPM (auction) procedure and the ones for which information on reservation price or initial price range is missing. The number of observations is 229.

procedure to incorporate all relevant market "hotness" information into IPO pricing.

The underpricing differences for the three different listing mechanisms (measured by the impact of the procedure dummies in Table 6, columns 1 and 3) are small and statistically insignificant when examined unconditionally. That is, the procedures do not have different impacts on underpricing until one conditions on *Market Return* or *Market Volatility*. The second set of regressions (columns 2 and 4) shows the differential impact of market conditions given each listing procedure.

In Table 6 column 2, our key finding is that the *Market Return* variable has a significantly larger impact on underpricing in bookbuilt (PG) and fixed-price (OPF) IPOs (3.277% and 1.873% per 1% market change, respectively) than in auction (OPM) offerings (1.062% per 1% market change). Difference tests indicate that the coefficients for auction and bookbuilding procedures are statistically different at a 1% level. This shows that the auction mechanism is more efficient in controlling the effects of market conditions on underpricing.

If we look at the impact of recent market volatility on average underpricing, we observe that only bookbuilding exhibits a significantly positive coefficient (19.315, with a t-statistic of 3.589). A difference test also shows that the coefficients for auction and bookbuilding procedures are statistically

Table 8
The impact of *Market Return* and *Market Volatility* on *Price Range Adjustment, Underpricing*, and *Total Price Adjustment*: a comparison between OPM and PG procedures

Dependent variable	Price range adjustment	First-day underpricing	Total price adjustment
Intercept, firm, and industry control variables			
Intercept	0.155	−0.274	−0.123
	(1.854)*	(−1.333)	(−0.436)
Exchange	−0.047	0.052	0.001
	(−3.245)***	(1.242)	(0.013)
Ln_mktcap	0.002	0.020	0.023
	(0.343)	(1.316)	(1.105)
Hi-tech	0.027	0.072	0.113
	(2.691)***	(2.882)***	(3.278)***
IPO procedure dummies			
OPM	−0.022	0.007	−0.015
	(−0.629)	(0.090)	(−0.137)
PGL (PG priced within range)	−0.097	−0.053	−0.168
	(−2.999)***	(−0.666)	(−1.525)
Market Return (buy-and-hold MIDCAC stock index returns) ending at pricing date			
Market Return ∗ *OPM*	0.740[b]	1.064[a]	2.006[b]
	(3.847)***	(3.461)***	(3.871)***
Market Return ∗ *PGL*	0.718[c]	2.000[c]	3.041
	(2.964)***	(2.317)**	(2.870)***
Market Return ∗ *PGU*	0.101[b, c]	4.268[a, c]	5.086[b]
	(0.385)	(4.645)***	(4.362)***
Market Volatility (standard deviation of daily MIDCAC stock index returns) ending at pricing date			
Market Volatility ∗ *OPM*	−3.214	2.472	−0.437
	(−1.186)	(0.676)	(−0.067)
Market Volatility ∗ *PGL*	1.811	13.140	17.027
	(0.698)	(1.654)	(1.671)*
Market Volatility ∗ *PGU*	−3.552	8.015	4.333
	(−0.866)	(0.801)	(0.758)
Adjusted R^2	0.261	0.342	0.341

The sample contains IPOs from January 1992 to December 1998 on the French "Second Marché" and "Nouveau Marché." *Price range adjustment* is equal to the difference, in percent, between the minimum price set before the pricing (or the lower bound of the price range for PG offerings) and the offering price. *First-day underpricing* is equal to the difference, in percent, between the offering price and the closing price at the end of the first day of quotation. *Total price adjustment* is equal to the difference, in percent, between the minimum price set before the pricing (or the lower bound of the price range for PG offerings) and the closing price at the end of the first day of quotation. Other firm and control variables are as in Tables 2 and 3. The *Market Return* variable is constructed as a weighted average of the returns of the MIDCAC stock index in the 3 months before pricing date as in Table 2. *Market Volatility* is constructed as the standard deviation of the returns of the MIDCAC index in the 1-month period before pricing date. *OPM*, *PGL*, and *PGU* are IPO procedure dummies. *PGU* is equal to 1 if PG = 1 and the IPO was priced at the upper bound of the initial price range. *PGL* is equal to 1 if PG = 1 and the IPO was priced within the bounds of the initial price range. We only consider IPOs that used the PG or OPM procedure and for which we have information about initial price range (for PGs) or reservation price (for OPMs.) This restricts our sample to 225 observations. (White heteroscedasticity-consistent *t*-statistics are in parentheses.)

[a, b, c] Coefficients are significantly different from each other at a 10% (and, respectively, 5% or 1% level).

* Significant at a 10% level.

** Significant at a 5% level.

*** Significant at a 1% level.

different at a 1% level. Underpricing when the bookbuilding procedure (PG) is used is more sensitive to market volatility than when the auction mechanism (OPM) is used.

In the regressions explaining "squared deviation" of first-day return (Table 6, columns 3 and 4), we find that positive *Market Return* and *Market Volatility* are correlated with the variability of underpricing. But this result

Table 9
Test for endogeneity of the choice of procedure, isolating "Second Marché" offerings

Dependent variable	First-day return (underpricing)	First-day return (underpricing)	"Squared deviation" of return	"Squared deviation" of return
Intercept, firm, and industry control variables				
Intercept	−0.404	−0.406	−0.113	−0.101
	(−2.222)**	(−2.350)**	(−1.389)	(−1.386)
Exchange	X	X	X	X
Ln_mktcap	0.034	0.033	0.008	0.007
	(2.578)***	(2.617)***	(1.407)	(1.356)
Hi-tech	0.035	0.039	0.012	0.015
	(1.420)	(1.576)	(1.107)	(1.266)
IPO procedure dummies				
OPM (auction)	−0.003	0.043	0.006	0.016
	(−0.104)	(1.013)	(1.193)	(2.332)**
PG (bookbuilding)	0.033	−0.038	0.016	−0.017
	(1.181)	(−0.685)	(1.800)	(−0.901)
Market Return (buy-and-hold MIDCAC stock index returns) ending at pricing date				
Market Return	1.991		0.484	
	(5.141)***		(2.458)**	
Market Return ∗ *OPF*		1.989		0.168
		(2.597)***		(1.284)
Market Return ∗ *OPM*		1.053[b]		0.186[c]
		(3.434)***		(3.890)***
Market Return ∗ *PG*		3.352[b]		1.011[c]
		(3.967)***		(2.034)**
Market Volatility (standard deviation of daily MIDCAC stock index returns) ending at pricing date				
Market Volatility	6.654		2.181	
	(2.185)**		(2.075)**	
Market Volatility ∗ *OPF*		8.210		1.644
		(1.286)		(2.096)**
Market Volatility ∗ *OPM*		2.371		0.468[c]
		(0.654)		(0.739)
Market Volatility ∗ *PG*		14.616		4.914[c]
		(2.175)**		(1.812)*
Adjusted R^2	0.258	0.313	0.131	0.192

This table presents the same regressions as Table 5 (regressions of mean and "squared deviation" of first-day underpricing on firm-specific variables, *Market Return* and *Market Volatility* variables, splitting by procedure) for "Second Marché" offerings only. This reduces our sample to 179 observations. All variables are as defined in Table 5. (White heteroscedasticity-consistent t-statistics are in parentheses.)

[a, b, c] Coefficients are significantly different from each other at a 1% level (and, respectively, a 5% or 10% level).

* Significant at a 10% level.

** Significant at a 5% level.

*** Significant at a 1% level.

is mostly driven by the higher cross-sectional variability in PG offerings: the *Market Return* coefficient for PG offerings, 1.059, is again significantly different from the one for OPMs, 0.184, at a 1% level, and also from the OPF coefficient, 0.183, at a 1% level. The *Market Volatility* ∗ PG coefficient (6.640) is also significantly larger than the *Market Volatility* ∗ OPM and *Market Volatility* ∗ OPF coefficients (equal to 0.402 and 1.640, respectively) at the 1% and 5% levels, respectively. Thus the variability of underpricing is more sensitive to *Market Volatility* for bookbuilt (PG) offerings than for auction (OPM) and fixed-priced (OPF) counterparts.

Table 10
Test for endogeneity of the choice of procedure, isolating issuers that did not choose their IPO procedure

Underwriter	OPF	OPM	PG	Total	Spec. PG	Spec. OPM	No Spec.
Banques Populaires	3	33.5	3	39.5	0	1	0
Crédit Agricole	5.5	12.5	10	28	0	0	1
Crédit Lyonnais	2.5	2	15	19.5	1	0	0
BNP	1	7	9	17	0	0	1
CIC	5	6.5	5	16.5	0	0	1
Société Générale	3.5	1.5	8	13	1	0	0
Banque d'Orsay	0	10.5	1	11.5	0	1	0
Crédit du Nord	0	5.5	5.5	11	0	0	1
Pinatton	0	1.5	8.5	10	1	0	0
Paribas	0	1	8	9	1	0	0

Dependent variable	First-day return (underpricing)	First-day return (underpricing)	"Squared deviation" of return	"Squared deviation" of return
Intercept, firm, and industry control variables				
Intercept	−0.483	−0.544	−0.109	−0.132
	(−2.284)**	(−2.581)**	(−1.211)	(−1.398)
Exchange	0.023	0.042	−0.001	0.006
	(0.502)	(0.892)	(−0.061)	(0.239)
Ln_mktcap	0.035	0.032	0.008	0.007
	(2.182)**	(2.075)**	(1.279)	(1.150)
Hi-tech	0.100	0.102	0.015	0.016
	(3.109)***	(3.266)***	(1.059)	(1.143)
IPO procedure dummies				
OPM (auction)	−0.064	0.107	−0.018	0.046
	(−1.604)	(1.881)*	(−1.030)	(2.535)**
PG (book-building)	X	X	X	X
Market Return (buy-and-hold MIDCAC stock index returns) ending at pricing date				
Market Return	2.579		0.789	
	(5.708)***		(3.375)***	
Market Return ∗ *OPF*		X		X
Market Return ∗ *OPM*		1.030[a]		0.180[a]
		(2.588)**		(3.342)***
Market Return ∗ *PG*		3.482[a]		1.138[a]
		(5.548)***		(3.288)***
Market Volatility (standard deviation of daily MIDCAC stock index returns) ending at pricing date				
Market Volatility	13.896		4.449	
	(3.488)***		(2.494)**	
Market Volatility ∗ *OPF*		X		X
Market Volatility ∗ *OPM*		2.457[a]		0.296[a]
		(0.574)		(0.376)
Market Volatility ∗ *PG*		23.786[a]		8.165[a]
		(3.961)***		(2.771)***
Adjusted R^2	0.293	0.341	0.185	0.192

This table presents the same regressions as Table 5 (regressions of mean and "squared deviation" of first-day underpricing on firm-specific variables, *Market Return* and *Market Volatility* variables, splitting by procedure) for issuers that presumably did not choose their IPO procedure. We consider an IPO company did not choose its IPO procedure if it went public on "Nouveau Marché," or its underwriter was specialized in either OPM or bookbuilding. This reduces our sample to 169 observations.

In the first table we estimate the degree of specialization of the 10 largest underwriters in our sample. We count the proportion of PG and OPM offerings for each underwriter in which they were lead underwriters. If one of these procedures was used by an underwriter 80% of the time or more, we consider this underwriter is specialized. The *Spec. PG, Spec. OPM*, and *No Spec.* columns are equal to 1 if the underwriter is specialized in bookbuilding, auction, or in neither of these two mechanisms, respectively.

In the second table, we replicate Table 5, keeping only "Nouveau Marché" IPOs or IPOs led by a specialized underwriter and using the procedure in which this underwriter is specialized. All variables are as defined in Table 5. (White heteroscedasticity-consistent *t*-statistics are in parentheses.)

[a] Coefficients are significantly different from each other at a 1% level.

* Significant at a 10% level.

** Significant at a 5% level.

*** Significant at a 1% level.

Table 11
Test for endogeneity of the choice of procedure, two-stage least square regressions

Stage 1 Logit regression Dependent variable	PG
%shares-created	1.655**
Goal-exit	2.036***
Goal-structure	0.155
Goal-acquisition	0.227
Rank-underwriter	0.070**
Pseudo-R^2	0.129

Stage 2 regression Dependent variable	First-day return (underpricing)	"Squared deviation" of return
Intercept, firm, and industry control variables		
Intercept	−0.601	−0.159
	(−2.438)**	(−1.932)*
Exchange	−0.041	−0.027
	(−0.891)	(−1.577)
Ln_mktcap	0.051	0.016
	(2.456)**	(2.178)**
Hi-tech	0.064	0.010
	(1.970)*	(0.942)
Predicted PG variable		
PG (book-building)	−0.095	−0.076
	(−0.570)	(−1.303)
Market Return (buy-and-hold MIDCAC stock index returns) ending at pricing date		
Market Return ∗ OPM	0.817[c]	0.026[b]
	(0.913)	(0.105)
Market Return ∗ PG	4.705[c]	1.723[b]
	(2.855)***	(2.856)***
Market Volatility (standard deviation of daily MIDCAC stock index returns) ending at pricing date		
Market Volatility ∗ OPM	16.714	1.498
	(0.127)	(0.642)
Market Volatility ∗ PG	9.755	6.242
	(0.744)	(1.574)
Adjusted R^2	0.248	0.234

This table presents the same regressions as Table 5 above (regressions of mean and "squared deviation" of first-day underpricing on firm-specific variables, *Market Return* and *Market Volatility* variables, splitting by procedure) using the two-stage least square regression methodology.

In the first stage, we run a logit regression with *PG* (a dummy variable equal to one when the IPO used the bookbuilding procedure) as the dependent variable and the following set of independent variables: *%shares-created*, the ratio of shares created in the IPO to existing shares before the IPO; *rank-underwriter*, the rank of the lead underwriter of the offering (1 being the highest rank), determined by the number of IPOs in which it was the lead underwriter in our sample period; *goal-exit*, *goal-structure*, and *goal-acquisition*, dummy variables equal to 1 when the goal of allowing one of the pre-IPO shareholders to exit the capital (of rebalancing the capital structure or acquiring a company, respectively) was announced in the pre-IPO prospectus. We restrict our sample to IPOs that used the PG or OPM procedure, and to "Second Marché" offerings. The number of observations is 107.

In the second stage we run the same regressions as in Table 5 (columns 2 and 4), replacing the PG and OPM procedure dummies by their predicted values using the coefficient of the first-stage regression. All other explanatory variables are as defined in Table 5. (White heteroscedasticity-consistent *t*-statistics are in parentheses.)

[a, b, c] Coefficients are significantly different from each other at a 1% level (and, respectively, a 5% or 10% level.)

* Significant at a 10% level.

** Significant at a 5% level.

*** Significant at a 1% level.

4.1 Artificial pricing constraints

An important difference between the French and American bookbuilding procedures is the role of the upper price limit. In both mechanisms, an initial price range is announced prior to the IPO. In the United States, IPOs are often priced outside this price range. In France, although this is not explicitely required, IPOs are almost always priced within the bounds of this price range.[22] We know from Hanley (1993) that a partial adjustment phenomenon exists and that the pricing relative to the initial filing price range affects underpricing significantly. We find partial adjustment and the price limits to be relevant in the French markets as well. We examine next how these issues relate to market conditions.

In Table 7, we sort IPOs by market "hotness" at the pricing date and by procedure.[23] We construct the previous *3-month weighted Market Return* variable for each calendar trading day in the 1992–1998 period and sort these days into quintiles. Each IPO in our sample is assigned to one of these quintiles sorted on the value of the *3-month weighted Market Return* as of the pricing date. We analyze only the two main procedures, bookbuilding (PG) and auctions (OPM), and we split the PG group in two subgroups. The variables *PGU* and *PGL* stand for PG offerings that are priced at the upper bound of the initial price range and within the initial price range, respectively. For *PGU*, *PGL*, and *OPM* offerings, Table 7 presents statistics on how many IPOs fall in each quintile and their mean and median underpricing.

First, it is no surprise that there are more IPOs in hot market conditions, but of interest is that this phenomenon is relatively stronger for PGs than for OPMs (60.8% of PGs took place in quintiles 4 or 5 of market "hotness" versus 45.5% of OPMs). This may mean that underwriters are less willing to take firms public in less hot markets using the bookbuilding (PG) procedure since the risks of a poor listing are higher. Second, we notice that many bookbuilt IPOs were priced at the upper bound of their initial price range when the market was bullish (66% of bookbuilding offerings listed in quintile 5 conditions versus 62.5%, 50%, 33.3%, and 10% in quintiles 4, 3, 2, and 1, respectively).

The key issue of higher underpricing in hot market conditions is shown by the IPOs that fall in the 5th (hottest market) quintile. They are more underpriced on average than the ones in other quintiles. For bookbuilt IPOs priced within the initial price range (*PGL* in Table 7), underpricing does not exceed average unconditional underpricing rates of about 15%. The picture is very different for PGs priced at the upper bound of the initial price range (*PGU* in Table 7). These bookbuilt IPOs priced at the upper pricing limit

[22] In the 135 bookbuilt IPOs in our sample, only 1 was priced above the upper limit of its initial price range. This IPO was simultaneously listed on the NASDAQ. In the rest of the article we consider this IPO as priced at the upper bound of its initial price range.

[23] Throughout the rest of the article, we will not consider fixed-price IPOs, since the question of how well market "hotness" information is incorporated into the IPO price is less relevant for this virtually defunct procedure.

have a mean (and a median) underpricing of 40.23% (34.62%). Especially when bookbuilt IPOs are priced at the upper bound of the initial price range, they are very sensitive to market conditions.

In Table 8, we test how good the two procedures are at incorporating market hotness into the share price. We posit that an IPO procedure can be considered efficient in controlling market conditions if it incorporates this information in the pricing process rather than in the aftermarket trading. *Underpricing* is our measure of how much information (that was not incorporated into the IPO price) is incorporated into the aftermarket price. We construct two more measures: the first, *Price Range Adjustment*, reflects the amount of information incorporated into the IPO price in the pricing process (i.e., in the period leading to pricing an offering): it is equal to the difference in percent between the minimum price announced in OPM offerings (or the lower bound of the initial price range in the case of bookbuilding[24]) and the IPO price (statistics on this variable are presented in Table 1). The second measure, *Total Price Adjustment*, reflects the way the price has moved in the whole IPO process, from the original reservation price (or the lower bound of the initial price range in the case of bookbuilding) to the closing price at the end of the first trading day. These three variables are linked by the following formula:

$$(1 + \textit{Price Range Adjustment}) * (1 + \textit{Underpricing}) = 1 + \textit{Total Price Adjustment}.$$

We run three regressions with the three measures above used as dependent variables and our usual firm characteristics and market condition variables as independent variables. Table 8 presents the results of these regressions. In the first regression (column 1, dependent variable: *Price Range Adjustment*), the impact of *Market Return* on price adjustment is significantly positive only for OPMs and PGLs. This impact is significantly larger for these two types of offerings than for the PGU type (at the 5% and 10% levels, respectively). This means that more market hotness information is incorporated into the IPO price in OPMs and PGLs than in PGUs. The opposite is true in column 2 (dependent variable, *Underpricing*): *Market Return* has a larger impact for PGUs than for the two other types (the difference is significant at 1% for OPMs, 10% for PGLs).

The results in Tables 7 and 8 suggest that when bookbuilding is used, the upper limit imposed on pricing is more likely to be binding in hot markets. When this limit is binding, market hotness information is not incorporated properly into the IPO price. Thus it is incorporated into the aftermarket price, which results in excess underpricing. On the contrary, when the markets are

[24] Taking the midpoint of the initial price range instead of its lower bound does not change the results significantly.

not particularly hot, bookbuilding does a good job of incorporating market hotness information into the IPO price, as the auction procedure does in all market conditions.

4.2 Endogeneity of procedure choice and the robustness of the results

The choice of IPO procedure is endogenous: perhaps issuers whose IPOs are likely to be more sensitive to market conditions prefer to choose the bookbuilding procedure, and vice versa. This potential endogeneity problem could possibly bias our regression coefficients and conclusions. To address this question, we use three distinct methodologies.

4.2.1 Isolating Second Marché IPOs. So far we have considered offerings on two distinct exchanges: Second Marché and Nouveau Marché. The latter is designed for young companies, the former for more established firms. Consequently these exchanges attract companies with different characteristics: as we have seen previously (see Table 1 for details), firms that go public on Nouveau Marché are significantly smaller. They also exhibit more underpricing than their Second Marché counterparts (16.96% versus 11.81% on average). Moreover, all Nouveau Marché IPOs in our sample used the bookbuilding procedure (for a discussion on the motives for this choice, see the discussion in "Data and Methodology"). This has an impact on the characteristics of our PG (versus OPM) offerings. In order to eliminate this bias, we repeat the tests that appear in Table 5, considering only Second Marché IPOs.

The results in Table 9 are quite similar to the previous ones: our main result, the significant difference between the impact of *Market conditions* for bookbuilt versus OPM IPOs remains significant (see Table 9, columns 2 and 4).

4.2.2 Isolating issuers that did not choose their IPO procedure. Next, we isolate the firms in our sample that did not choose the procedure they used. Two types of firms can be in this situation: firms that go public on the Nouveau Marché, and firms whose underwriter specializes in one of the two procedures. Clearly the choice of exchange (Nouveau Marché or Second Marché) is made before the choice of procedure, the Nouveau Marché being designed for young and small companies.[25] Firms using the Nouveau Marché IPOs have not had a choice: in our sample, they all used the bookbuilding procedure. Discussions with underwriters and practitioners suggest that a firm that wants to go public generally chooses as a lead underwriter a bank with which it had a previous relationship. Some underwriters specialize in

[25] Listing requirements are quite different on the two exchanges. For instance, the Second Marché has some requirements on equity and past earnings, which prevent most technology start-ups from choosing this market.

one of the two procedures. The reason for this specialization is that the two procedures require very different organizational structure. Bookbuilding requires a large team to advertise the issue and deal with the placement of the shares. This is not the case in auctioned IPOs. To estimate the degree of specialization of underwriters, we count for each the number of PG and OPM offerings in which they were lead underwriters. If one of these procedures was used by an underwriter 80% of the time or more, we consider this underwriter to be "specialized."

This procedure allows us to estimate, for each IPO in our sample, whether the company chose its mechanism. We assume that a firm did not choose its IPO procedure if it went public on the Nouveau Marché or if its lead underwriter was "specialized" and the procedure it used was the one this underwriter is specialized in. Seventy-three IPOs chose the Nouveau Marché and 97 chose Second Marché offerings (60 OPMs and 37 PGs). Consequently we have a subsample of 170 out of 234 PG and OPM offerings that arguably did not choose their IPO procedure. Table 10 presents the "specialization" of the 10 largest underwriters (in number of deals) and a reestimation of Table 6. This reestimation does not change our previous conclusions.

4.2.3 Two-stage least squares regressions. Our third robustness test follows Jenkinson, Ljungqvist, and Wilhelm (2001). The idea of the methodology is to estimate the choice of procedure using variables that are exogenous with respect to our dependent variable (*underpricing*). In the first stage we run a logit regression, with the *PG* dummy as the dependent variable and exogenous variables as our explanatory variables. This allows us to predict the probability of choosing the bookbuilding (versus OPM) procedure for each IPO in our sample using the coefficients obtained in the logit regression. In the second stage we replace our dummy variables (*PG* and *OPM*) by their predicted values and run the same regressions as in Table 6.

The first step is to choose our exogenous variables. All the variables we have used so far happen to be endogenous with respect to underpricing (i.e., each of them has a significant impact on underpricing). In order to run this endogeneity test, we use seven new variables. Six of them come from the prospectus issued before the offering:

- *age*: the age of the company, in number of years, at the IPO date.

- *bm*: the book value of equity-to-market capitalization of the company at the IPO date.

- *%shares-created*: the ratio of shares created in the IPO to existing shares before the IPO.

- The goal of the offering, as announced in the prospectus. Three possible (not mutually exclusive) goals were announced: exit of a major shareholder, rebalancing of the capital structure of the company, acquiring

another company. We build three dummy variables (*goal-exit*, *goal-structure*, and *goal-acquisition*), equal to 1 when the corresponding goal was announced in the pre-IPO prospectus.

We build another variable (*rank-underwriter*), which is equal to the rank of the lead underwriter of the offering (1 being the highest rank), determined by the number of IPOs in which it was the lead underwriter in our sample period.[26]

These variables were chosen because we believe they can influence the choice of procedure. For instance, when a company issues new shares in its IPO, it may have to spend more marketing effort to convince investors that the projects the money will be invested in have positive net present value (NPV). However, some of the variables we chose (e.g., *age* or *bm*), which are linked with ex ante uncertainty, may also have an impact on underpricing. In order to make sure that the variables we use to estimate the probability of choosing the bookbuilding procedure are not linked with underpricing, we regress underpricing on each of these variables and eliminate those that exhibit coefficients with p-values smaller than 10%. This first step leads us to eliminate the *age* and *bm* variables. In order to eliminate some "exchange effects," we also take the conservative decision of considering only Second Marché offerings in the first-stage regression.[27] This and missing values leave us with 107 observations in the first stage, 149 in the second stage.

The results of the two-stage least square regression are presented in Table 11. In the first stage, three variables have significant explanatory power: the larger *rank-underwriter*, the higher the probability of choosing bookbuilding. This may come from the fact that the largest underwriter over the 1992–1998 period was specialized in OPM offerings and that other "large" underwriters did both bookbuilt and auctioned offerings. The *goal-exit* variable has a positive coefficient too, which may come from the fact that outside investors such as venture capitalists tend to select the bookbuilding procedure. Finally, as we suspected, the larger the number of shares created in the IPO, the higher the probability the firm chose bookbuilding. However, the pseudo-R^2 obtained is quite low (12.9%), meaning that the explanatory power of these variables on the choice of procedure is small.

The second stage of the regression replicates Table 6, replacing the procedure dummies by their predicted values obtained with the coefficients of the logit regression. Our main result [the significant difference between the impact of *Market Conditions* on underpricing when the bookbuilding (versus OPM) procedure is used] still holds. The economic significance (difference in

[26] We implicitly assume that the rank of the underwriter has not changed over the 1992–1998 period. However, the data suggest that the ranking has not changed in this period, that is, underwriters with a large IPO activity in 1992 still have a large IPO activity in 1998.

[27] Indeed, some of the variables we use behave differently on the two exchanges. For instance, firms that go public on Nouveau Marché are required to issue new shares. Consequently the *%shares-created* variable is much larger, on average, for Nouveau Marché IPOs.

the mean procedure coefficients) is as great as before, although the p-values are lower than in previous tests. This can be explained by the fact that several observations were lost due to missing values and the small explanatory power of the variables used in the first-stage regression.

5. Linkage to Theories of Underpricing and Optimal Selling Mechanisms

How do these findings inform previous theories and assumptions about underpricing and selling procedures? Are our results consistent with prior theory or do they suggest alternative interpretations? Our research raises and hopefully sheds light on the following theoretical questions: Why do market "conditions" (i.e., previous market return and volatility) have a significant impact on underpricing? What features of the bookbuilding and auction mechanisms account for their differential impact on underpricing in "hot" markets?

A common theme in the theories explaining IPO underpricing links underpricing with information asymmetry. In a pioneering study by Rock (1986), informed investors only subscribe to high-quality issues, leaving uninformed investors with a disproportionate share of "losers." Thus underpricing must occur on average if uninformed investors are to be adequately compensated to participate disproportionately in weaker deals. This is the winner's curse. In another asymmetric information model by Benveniste and Spindt (1989), informed investors are paid a "bribe" in the form of underpricing to reveal their private valuation information. In both models, some investors have private information about the true value of the IPO, and the level of underpricing depends on the amount of uncertainty or information asymmetry.

Rittter (1984) and Beatty and Ritter (1986) argue that ex ante uncertainty should increase underpricing, and the evidence supporting the uncertainty/underpricing relationship is strong. Market volatility in the months when an IPO is being planned could quite naturally increase this uncertainty and lead to more underpricing.

The impact of market volatility on uncertainty (and thus underpricing) is standard, but the consequences of market return are less clear. We posit that large market movements are associated with changes in investors' expectations. But how much these changes in expectations will affect the market price of IPO shares [i.e., how high (low) a price investors are willing to pay for IPO shares in good (bad) market conditions] is quite uncertain. The incentives of the parties involved in the IPO could lead them to choose to anchor on "midterm" prices, not taking the informational contents of good or bad market conditions fully into account.[28] Indeed, in good market conditions, underwriters may prefer to adjust only partially: this allows them to

[28] This "partial adjustment" is different from the one obtained in Benveniste and Spindt (1989): in their model, only *private* information matters. The adjustment we describe here is related with *public* information (namely, market "temperature").

favor large regular investors, which will presumably obtain large rents from an underpriced offering, and to avoid setting too high a price. On the other hand, in bad market conditions, issuers may refuse to lower the IPO price too much relative to their initial expectations. Such behaviors can explain the link between underpricing and market conditions. From this point of view, an IPO procedure that gives little power to underwriters, like the French OPM auction, is likely to mitigate the impact of market conditions on underpricing.

Let us now analyze the IPO selling mechanisms in more detail. Theoretical models of IPO procedures show that both bookbuilding and the French auction-like mechanism provide investors with incentives to place bids that reveal their beliefs while fixed-price offerings cannot [see Benveniste and Spindt (1989), Biais, Bossaert and Rochet (2002), and Biais and Faugeron-Crouzet (2002)].

However, we report above that in France an auction-like mechanism is more efficient than bookbuilding at controlling the underpricing reaction to market "temperature." The French implementation of bookbuilding effectively sets an upper price limit.[29] As we show in Table 7, this limit affects the underpricing of newly listed shares in very hot markets. When information in investors' bids corresponds to an IPO price *within* the limits of the price range, bookbuilding does a good job of digesting this information in the offering price [consistent with the idea modeled in Benveniste and Spindt (1989)]. Alternatively, when information revealed in investors' bids corresponds to a price above the initial price range, this information is not properly incorporated into the IPO price and large underpricing results.

In the United States, the IPO offering price need not lie within the initial price range. This institutional difference limits a complete "horse race" comparison of pure bookbuilding and auctions. However, even in the United States, bookbuilding appears particularly vulnerable to the partial adjustment phenomenon, first documented by Hanley (1993) for U.S. shares. Issuers and their investment bankers appear to anchor on valuations in the initial price range, and when demand is much greater than expected, the pricing is not increased sufficiently to choke off the excess demand, creating above-average underpricing.

While bookbuilding regulations are very similar in France and the United States, another question is why the upper limit of the initial price range is binding in France but not in the United States. This might reflect weaker competition among underwriters on the French IPO market than in the United States. Indeed, French companies going public tend to choose their regular bank as their lead underwriter instead of creating competition between potential underwriters. Thus we hypothesize that the (lack of) efficiency of the bookbuilding procedure is related to the market power of underwriters

[29] As we note in Section 4, the upper price limit is not legally binding but was only exceeded once in 135 bookbuilt offerings.

and privileged investors and to the competitiveness of the IPO market. However, as Chen and Ritter (2000) show, even the U.S. market for IPOs is far from perfectly competitive.

On the other hand, the French auction (OPM) mechanism, which is market driven rather than underwriter driven, has fewer frictions and reflects all investors' valuations more completely in the offer price, reducing underpricing. As Biais and Faugeron-Crouzet (2002) show, this mechanism encourages potential investors to disclose their true beliefs in their bids. In this perspective, the elimination of bids with prices over a given limit and the possibility to postpone the offering and transform it into a fixed-price offering is interesting. First, these two features of the OPM procedure mitigate the winner's curse that exists in "classic" auctions. Second, they prevent investors from placing orders at very high prices (i.e., market orders). Thus, whatever the conditions at the IPO date, informed investors are provided adequate incentives to place informative bids when the OPM auction mechanism is used.

6. Conclusion

We have shown that *Market Return*, a proxy for the overall market's price momentum in the 3 months prior to an offering, is a significant ex ante predictor of the level of underpricing in French IPOs. While this result has been hinted at or assumed in past research on U.S or other markets, we offer direct evidence of its important effect on IPO underpricing in the French market.

Because the impact of this market return is so substantial, we next examined which underwriting mechanism best controls its effect on IPO underpricing. In the United States, the bookbuilding mechanism is used exclusively, except for the smallest offerings. In France, three distinct mechanisms remain, and two are dominant. The first is the PG procedure, which resembles the U.S. bookbuilding procedure. The second is the OPM procedure, an auction-like mechanism. The third mechanism, a fixed-price mechanism, has faded in popularity in recent years.

We show that the initial price of the auction offerings incorporates more information about the current and recent past market conditions than in the bookbuilt offerings. This result raises an important question: if the auction procedure dominates the bookbuilding procedure in mitigating underpricing in varied market conditions, what features of the bookbuilding procedure make it dominant in the United States and very significant (and increasing) in the rest of the world? Wouldn't issuers and investors be better served by auction-type sales?

However, there is another interpretation of the difference in underpricing between auction and bookbuilding. As is hypothesized by Kutsuna and Smith (2001), bookbuilding may allow issuers to reveal their quality credibly to investors. Thus bookbuilding allows them to obtain a higher price for their

shares, but also entails a revelation cost that might take the form of higher underpricing. Our article does not explore this hypothesis, which is left open for further research.

This study has focused mainly on the underpricing factor, showing that bookbuilt IPOs do not incorporate current market return into the offering price as well as auction IPOs. Indeed, factors other than underpricing are clearly important to both issuer and underwriter [Sherman (2000)]. While mitigating underpricing is a worthy objective to issuers, it clearly is not their only objective. Controlling underpricing is clearly not the most important issue to underwriters who suffer an agency conflict of interest, pitting their issuing clients against their investor clients. Investor clients are repeat customers, issuers are not, or at least, are less so. The underwriter's benefit of access to investors' capital for future offerings through underpricing may dominate the "cost" of potential future punishments by underpriced issuers.[30]

Because underwriters have pricing control and because they currently control the key access to important institutional investors, issuing firms appear to settle for a second-best underpricing outcome when the bookbuilding procedure is used. But they perhaps gain an ostensibly better-selected set of initial owners or other potential benefits from using the bookbuilding procedure.

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[30] While Dunbar (2000) shows that investment banks lose future business if they underprice too much, Beatty and Welch (1996) and Krigman, Shaw, and Womack (2001) show that in the 1990s, the largest and most reputable underwriters have the highest underpricing as well. In fact, Krigman, Shaw, and Womack find that firms switching underwriters have far *lower* underpricing than those that do not switch (when conducting their first seasoned deal). See Michaely and Womack (1998) for other aspects of this agency conflict.

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