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A Survey of the European IPO Market

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Abstract

Based on a sample of 15 European countries, this survey analyses various features of the European IPO (Initial Public Offering) market over the period from 1995 to 2004: listing requirements, IPO-mechanism choices, performance and secondary market liquidity.

First, the comparison of national primary market regulations, in spite of the commonly observed segmentation between Main, Parallel and New Markets, shows a wide diversity in listing requirements and reveals that the primary market's mechanisms are almost always monitored by investment banks, which then control the initial pricing and allocation of new issues. The examination of issuers' practices looks at the increase in the different types of IPO mechanisms in the late nineties and the widespread use of the book-building mechanism nowadays.

Second, our empirical analysis of IPO short-term and long-term performance confirms, with a few exceptions, widely recognised patterns, but also show discrepancies between countries, periods, sector and primary listing mechanisms. The average initial underpricing amounts to 22% over our pan-European sample and is observed at various levels in each of the 15 countries of the sample. Empirical evidence on long-term performance is less clear. Results are not benchmark-dependent but sometimes differ from one measurement method to another. However, in line with previous studies, significant underperformance is found at the 3-year horizon with all methodologies and in all countries, except Greece and Portugal.

Finally, using a sample of IPOs launched on Euronext between 1995 and 2004, our study examines the relationship between initial returns and post-listing liquidity in the short and in the long-run. We support the 'illiquidity-compensation hypothesis'. Initial underpricing is positively linked to information asymmetry in the after-market. It produces higher turnover immediately after the IPO but has no effect on trading volumes after the first year of trading, so that this liquidity effect cannot be put down to ownership structure but is more likely attributable to the interest underpriced stocks generate.

Contents

Introduction

In recent years, the market for initial public offerings (IPOs) in Europe has been characterised by several important developments. Two major characteristics of this period are the out-performance of 'new economy' IPOs and the growth of book-building as the favourite choice among IPO underwriting procedures. Another striking feature of the landscape of European IPOs is its 'cyclicality'. In the late 90s, the growth of the internet bubble induced a large number of new economy firms to go public, resulting in a hot issue market from 1998 to 2000. This IPO-euphoria period was also characterised by high levels of initial returns, meaning that most IPO companies "left money on the table".[1] Nevertheless, since 2000, with the substantial decline of most New Markets, primary markets have become more apathetic than ever on most stock exchanges. Finally, with the introduction of the euro in twelve European countries, investors in new listings tend to establish their financial strategies at a European level instead of clustering in national markets.

For these reasons, the objective of our study, based on a sample of 2,104 European domestic companies that went public between 1995 and 2004 in 15 different countries, is to provide an updated view of the European IPO market, and in particular, to provide answers to the following questions.

- What are the current differences between the European and the US IPO market?
- Has the decline of growth markets since 2000 changed the characteristics of the IPO market and the practices of issuing firms?
- What are the rationales and consequences of the rise of the book-building procedure for underwriting IPOs?
- Has the EMU (Economic and Monetary Union) had an effect on the performance of IPOs in the eurozone?
- Are there national discrepancies in Europe?
- How does adverse selection explain underpricing of IPOs?
- Is post-IPO liquidity related to the issued stock's initial and long term performance?

The first part of this paper documents the IPO mechanisms available on European exchanges, compares listing requirements and establishes which of the IPO procedures are most used by European issuers. The second part focuses on short-run and long-run performance of IPOs and the economic determinants of performance. Finally, in the third part IPO-performance variables are related to the choice of introduction mechanism as well as to microstructure factors such as information asymmetry and post-IPO liquidity.

I. The European institutional framework of IPOs

Unlike the United States[2], the institutional setting of European IPOs is not overseen by a single regulator but by a patchwork of distinct national regulators whose only common duty, when belonging to the European Union, is to issue regulations in accordance with the legal guidelines

[1] Ritter (1991) defines "money left on the table in an IPO…as the number of shares offered multiplied by the first day capital gain, measured from the offer price to the closing price".

[2] See also Ritter (2003) for a short review of the main differences between European and American IPO markets.

of the European Investment Services Directive[3] (1993), the Prospectus Directive[4] (2003), and the Transparency Directive[5] (2004). As things currently stand, the Committee of European Securities Regulators (CESR) is working on co-ordinating the regulations of the 25 members of the EU but this process has not yet resulted in an effective set of common rules for primary stock markets, apart from the Prospectus Directive. Therefore, our objective is to provide a synthesis of these separate regulations with a focus on common features and specificities. Given the vast number of IPOs in Europe, we have chosen to focus on the stock exchange procedures and activities of 15 representative countries. The London Stock Exchange (LSE), Euronext and Deutsche Börse are chosen since they are the three biggest stock exchanges in Europe. We include other exchanges with an active primary stock market, i.e. Switzerland, Austria, Sweden, Finland, Italy and Spain. Finally, we also look at available IPO data from three emerging markets and Eastern European stock exchanges where a substantial quantity of IPOs result from privatisations, Greece, Turkey and Poland. Thus, our panel of countries consists of Austria, Belgium, Finland, France, Germany, Greece, Italy, the Netherlands, Poland, Portugal, Spain, Sweden, Switzerland, Turkey and the United Kingdom, among which, according to Sentis (2004), Spain, Finland, Sweden, Greece and the United Kingdom ranked among the first 15 countries in the world in terms of the rate of IPOs, calculated as the ratio of the number of IPOs reported to the total number of listed firms on the exchange during the period 1995-2002.

Tables 1, 2 and 3 report the total number of domestic new listings, the funds raised by newly listed domestic companies, and their market value, per year, for each of the 15 countries. These statistics are retrieved mainly from the World Federation of Exchanges (WFE) website. The countries in our sample show the effects of a hot market period from 1998 to 2000, with a sharp downturn in 2001 and a very low listing activity in the years after 2000. For a few countries (France, Belgium, Sweden, Poland), the hot period started in 1997. There are four countries that do not match the general pattern. First, on emerging markets like the Polish, the Turkish and to a lesser extent the Greek market, 1995 and 1996 were also active periods. Second, the British market is characterised by a flatter pattern, with the only peak year being 2000.

The basic features of the going public process that are common to all countries are described in sub-section I.1. In each of the 15 countries of our survey, any firm willing to undertake an IPO on a regulated market must first obtain permission from a regulatory body which can be the Ministry of Finance, the regulatory authority of security markets, or the stock exchange itself, depending on the country. The permission is conditional on the fact that the issuing firm meet certain criteria in terms of size, float capitalisation, age, etc. These listing requirements are detailed in sub-section I.2. To achieve floatation, firms generally have a choice among various initial pricing methods which can be divided into three categories: auctions, fixed-price offerings and book-building procedures. These methods are described in sub-section I.3, which also provides figures on the popularity of these methods over the past ten years.

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[3] The 1993 Investment Services Directive (ISD) sets the legislative framework for investment firms and securities markets in the EU, providing for a single passport for investment services.

[4] The Prospectus Directive 2003/71/EC (PD) sets out the initial disclosure obligations for issuers of securities that are offered to the public or admitted to trading on a regulated market in the EU. It provides a passport for issuers that enables them to raise capital across the EU on the basis of a single prospectus.

[5] The Transparency Directive establishes rules for the disclosure of periodic financial reports and of major shareholdings for companies whose securities are admitted to trading on a regulated market in the EU.

Table 1. IPOs: Number per year and per country domestic firms only - investment funds excluded

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Austria	4	2	4	2	4	7	6	3	8	2	42
Belgium*	1	3	13	18	17	7					
France	22	59	82	226	68	76	36	15	14	20	800
Netherlands	6	7	15	22	17	9					
Portugal	16	5	7	10	5	4					
Finland	10	7	12	12	27	19	9	2	0	1	99
Germany	20	20	35	67	134	134	21	6	0	6	443
Greece	18	20	12	23	37	52	21	15	13	9	220
Italy	12	15	13	21	33	48	18	13	10	9	192
Poland	21	18	62	57	28	13	9	5	5	32	250
Spain**	0	4	7	8	10	5	2	1	1	2	40
Sweden	16	17	50	32	47	44	19	8	4	5	242
Switzerland	6	6	13	17	17	23	14	5	1	3	105
Turkey	30	25	29	20	9	36	1	5	4	12	171
United Kingdom	285	347	217	169	161	366	236	219	194	413	2,607
Total	467	555	571	704	614	843	392	297	254	514	5,211

General source: WFE (WFE European statistics are originally provided by FESE.)

**Source*: WFE for 1996-2004, Euronext Brussels for 1995.

***Source*: Bolsa de Madrid.

Table 2. IPOs: New capital raised per year and per country- investment funds excluded

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Austria	1,421	99	2,732	118	609	2,013	500	1,146	1,496	1,900	12,034
Belgium	136	832	487	1,003	2,178	7,163					
France	153	957	7,332	12,283	6,923	11,663	39,148*	3,696*	600*	9,642*	182,640*
Netherlands	3,954	3,004	7,011	13,821	21,222	28,972					
Portugal	0	0	0	0	0	460					
Finland	40	91	545	342	238	628	0	0	0	0	1,885
Germany	3,537	10,332	2,528	3,228	12,964	25,556	2,882	214	0	6	61,247
Greece	60	337	60	919	899	2,843	1,060	92	61	95	6,426
Italy	3,645	1,611	818	578	1,436	6,807	4,383	1,986	550	2,630	24,444-
Poland	297	39	261	208	107	335	1	2	0	2251	3,501
Spain**	na	1,004	926	4,829	25,151	67,532	19,230	5,690	10,938	21,658	156,959
Sweden	1,806	2,514	1,259	514	538	10,881	301	3,631	0	1,039	22,483
Switzerland	1,395	670	1,664	9,258	9,769	24,361	2,624	8	0	1,530	51,279
Turkey	12	22	76	128	85	2729	0	667	383	1,336	5,437
United Kingdom	3,375	14,293	1,074	5,692	7,355	15,186	10,791	8,229	6,546	10,644	83,186

Source: WFE (WFE European statistics are originally provided by FESE.)

Statistics include domestic firms only and exclude investment funds. All figures are in €.

* Statistics for all Euronext.

** Statistics for BME.

na: not available.

Table 3. IPOs: End-of-year market value per year and per country domestic firms only- investment funds excluded

	1997	1998	1999	2000	2001	2002	2003	2004	Total
Austria	2,732	125	642	2,044	570	55	4,637	76	10,881
Belgium	3,109	5,461	4,754	16,941					
France	37,019	41,821	29,003	54,820	109,640*	7,620*	919*	26,582*	469,618
Netherlands	7,011	12,829	30,004	28,972					
Portugal	2,539	1,306	3,192	46,076					
Finland	1,478	2,800	10,852	8,160	1,881	17,801	988	317	44,277
Germany	2,526	3,278	12,964	25,556	2,882	223	0	1,996	49,425
Greece	354	177	307	1,391	9,847	796	645	392	13,909
Italy	3,065	14,270	84,930	50,023	10,586	19,971	33,664	71,111	287,620
Poland	5,488	8,959	3,414	1,549	647	111	338	8,693	29,198
Spain**	na	10,136	25,151	406	116	136	94	186	36,224
Sweden	11,843	7,159	58,928	46,456	5,805	2,871	613	1,322	134,998
Switzerland	9,583	9,249	9,769	19,682	6,609	2,023	1,270	1,530	59,715
Turkey	285	256	85	3	0	201	30	1,428	2,287
United Kingdom	100,097	67,811	125,537	336,690	168,603	93,397	52,661	38,606	983,403

Source: WFE (WFE European statistics are originally provided by FESE).

Statistics include domestic firms only and exclude investment funds. All figures are in €.

* Statistics for all Euronext

** Statistics for BME

1. The current stock exchange listing process

A request for a stock exchange listing must be made on the basis of an introduction prospectus whose contents are subject to regulation and which is generally filed a few months (120 days on average according to Schuster (2003)) before the admission date. Typically, a universal or an investment bank, called 'the underwriter', is involved in developing the admission statement and is in charge of the underwriting and floatation process. The underwriter is chosen by the IPO candidate after a so-called 'beauty contest' at which banks or other financial institutions present their proposals for the IPO. For most IPOs, the underwriter assembles a banking syndicate, i.e. a combination of several banks or financial institutions. As the 'lead manager', the underwriter is responsible for implementing the IPO while other members of the syndicate only undertake underwriting or placement functions. The banks that make up the syndicate are also selected through a 'beauty contest' in which individual banks present their estimates of the firm's value, the issue price, the demand for the issuer's shares as well as the costs of the issue.

In order to compile the IPO prospectus, lawyers, together with the underwriting bank, conduct due diligence, that is an examination of the company regarding its legal, financial, and commercial aspects. The legal due diligence includes an examination of the company's major contracts, liabilities, patents and other legal facts. The commercial due diligence contains an analysis of the issuing company's fields of business, market positions, development strategies, human resources, management, etc. Financial due diligence entails financial statements, auditors' reports for cases in which audited accounts are required, investment planning, etc. While due diligence is exclusively for internal use, it serves as a basis for the offering prospectus, which, at the minimum, contains information on the shares to be admitted, general information about the issuer and associated companies, a description of the issuer's business activities, a presentation of the issuer's net assets, financial position and results of operations. The actual minimum content of the admission document and listing requirements are usually defined by the regulatory body of the primary market and differ from country to country (cf. I.2).

The next step of the floatation process is to obtain the approval of the admission authority, i.e. the market supervisor or the exchange itself or both. Lastly, the initial pricing and placement of the shares are organised either by the underwriter or in co-ordination with the exchange, depending on the institutional setting (cf. I.3).

2. A comparison of listing requirements across European exchanges

In principle, on every stock exchange, a company has a choice between three regulated market segments in which to list its shares: the 'Main Market' designed for the listing of large companies, the 'Parallel Market' that caters to middle and small capitalisations and the 'New Market' for growth companies. However, a few exchanges make exceptions to this rule. First, the Stockholm stock exchange (OMX, Sweden), the Vienna stock exchange (VSE, Austria) and the Warsaw stock exchange (WSE, Poland) never opened a New Market, and the Swiss exchange (SWX) and Deutsche Börse recently closed their New Markets. Second, the LSE and Euronext Amsterdam do not have a specific market segment for the listing of medium and small capitalisations since their Main Markets accept all firms, independent of size considerations, unless market capitalisation exceeds GBP 700,000 at the LSE and shareholders' equity is over EUR 5 millions on Euronext Amsterdam. At the LSE, the market segmentation between large, middle and small capitalisation stocks only applies to the secondary market, which is organised in different trading platforms according to liquidity and market recognition criteria.

The choice between listing market segments is mainly based upon size and, in some cases, may also depend on listing costs. Listing requirements are always less stringent on Parallel and New

Markets. New markets, introduced in the mid 90s on many exchanges, are usually reserved for young, high-growth and technology-oriented companies and generally have very specific requirements. Table 4 reports listing requirements for all market segments in our 15 European countries.

2.1. Listing requirements on Main Markets

Main markets are characterised by three common requirements, specifically accounting records history, capital size and floating capitalisation.

IPO candidates must always provide **audited accounts for the three business years preceding the listing date.**[6]

Listing on a Main Market is usually conditional on a **minimum expected market value** except in Switzerland,[7] the Netherlands, Finland, Spain, Greece and Turkey where size requirements are defined in terms of equity book value. Among Main Markets with market capitalisation requirements, the most stringent was, as of February 2005, Euronext Paris (EUR 700 millions), followed by Stockholmsbörsen (≅ EUR 33 millions), Borsa Italiana (EUR 20 millions) and Euronext Brussels (EUR 15 millions). For other exchanges that require a minimum market value, the threshold does not exceed EUR five million, the lowest being GBP 700,000 at the LSE. The minimum market size standards have been recently removed on the Belgian, Dutch, French and Portuguese Main Markets, since Euronext merged its national regulated markets into a single list, called 'Eurolist', in 2005.

Finally, **at least 25% of the shares** must be **offered to the public** in all countries except Turkey, the Netherlands, and Spain. The minimum requirement at the ISE (Istanbul Stock Exchange) does not exceed 15%. BME (Spanish Stock Exchange) defines its floating requirement differently since a Spanish firm is authorised to list if at least 100 shareholders own less than 25% of the capital. Euronext Amsterdam had the lowest requirement among all exchanges with 10% as of April 2005, when Euronext unified its regulated lists and generalised the 25% minimum float requirement.

2.2. Listing requirements on Parallel Markets

Parallel or second markets generally have the lowest listing requirements. On many of these markets, no minimum market capitalisation is necessary to be listed, and if there is a minimum, the value is about EUR one million, the only exception being Euronext Paris with the highest requirement in the range of EUR 12-15 million. The minimum percentage of **shares to be offered to the public** generally equals **10%** and reaches 20% in a few cases (Greece, Spain and Switzerland). In terms of accounting track records, typically, **financial statements** must be provided over a period of **two years prior to the IPO**, implying a minimum period of existence of two years for the issuing firm.

[6] This common rule results from the convergence of national regulations.

[7] On SWX, the market value requirement was waived on the 1st of January 2001. Before that date, the minimum expected market value was equal to CHF 25 million.

Table 4. Listing requirements on European regulated markets

Country	Exchange	Admission authority	Main Market	Parallel Market	New Market
Austria	Vienna Stock Exchange (VSE)	VSE	**Official Market** ***General Standard*** Shares with a par value Market value > EUR 2.9 millions Free float > EUR 725,000 Non par value shares Total number of shares > 20,000 Market value > EUR 725,000 Free float > 10,000 shares Financial statements for the 3 preceding business years ***Prime Standard*** Same as General Standard Accounting in accordance with U.S. GAAP and IFRS	**Semi-Official Market** ***General Standard*** Shares with a par value Market value > EUR 725,000 Free float > EUR 181,250 Non par value shares Total number of shares > 10,000 Market value > EUR 362,500 Free float > 2,500 shares Financial statements for the 1 preceding business years ***Prime Standard*** Same as General Standard Accounting in accordance with U.S. GAAP and IFRS	---
Belgium ***until April 2005***	Euronext	CBF	**Premier Marché** Market value > EUR 15 millions Value of the shares offered to the public > EUR 5 millions Free float > 25% Filed audited accounts over a period of 3 years prior to the date of the listing Financial reporting in accordance with Belgian standards and IFRS	**Second Marché** Now reserved to listing of real-estate investment certificates Closed in 2005 Market value > EUR 1 million Filed audited accounts	**Nouveau Marché** Created in 1997 – Closed in 2005 High-growth companies Capitalisation > EUR 2 millions At least 3 years of existence Issuance > EUR 5 millions Capital increase > 50% of offered shares Free float > 25% (10% in some cases) Lock-up period for managers: na
France ***until February 2005***	Euronext	AMF and Euronext Paris	**Premier Marché** Market capitalisation > EUR 700/800 millions Filed audited accounts over a period of 3 years prior to the date of the listing Number of shares distributed to the public > 25% or > 600,000 shares	**Second Marché** Created in 1983 – closed in 2005 Market capitalisation > EUR 12/15 millions Filed audited accounts over a period of 2 years prior to the date of the listing Number of shares distributed to the public > 10% and > EUR 4.5 millions	**Nouveau Marché** Created in 1996 – closed in 2005 High-growth companies Shareholders' equity > EUR 1.5 millions Issuance > 100,000 shares and > EUR 5 millions Free float > 20% Capital increase > 50% of offered shares Lock up period: 3 years for 80% of the shares until 1998; from 1998 to 2003 80% during 1 year or 100% during 6 months; since 2003 1 year for 100% of the shares

Table 4. Cont'd

Netherlands ***until April 2005***	Euronext	Euronext Amsterdam	**Officiëlle Markt** Shareholders' equity > EUR 5 millions Number of shares distributed to the public > 10% Filed audited accounts over a period of 3 years prior to the date of the listing 6-month lock-up period for managers		**Euro.NM Amsterdam** Created in 1997 in replacement of the Official Parallel Market (closed in 1994) – closed in 2005 High-growth companies Shareholders' equity > EUR 5 millions Filed audited accounts over a period of 3 years prior to the date of the listing (1 year only for new economy companies) Number of shares distributed to the public > 100,000 and > 20% Capital increase > 50% of offered shares Lock-up period for managers: 3 years applicable to 80% of the shares
Portugal ***until April 2005***	Euronext	CMVM	**Main Market** Market capitalisation > EUR 2.5 millions Total number of shares > 500,000 Number of shares distributed to the public > 25% Filed audited accounts over a period of 3 year prior to the date of the listing	**Second Market** Closed in 2005 Market capitalisation > EUR 625,000 Number of shares distributed to the public > 10% Filed audited accounts over a period of 2 year prior to the date of the listing	**Novo Mercado** Closed in 2005 High-growth companies Shareholders' equity > EUR 1.5 millions Market capitalisation > EUR 2.5 millions Number of shares distributed to the public > 100,000 and > 20% Capital increase > 50% of offered shares Lock up period

Belgium, France, Netherlands, Portugal ***Since 2005***	Euronext	CMF AMF CMCM	**Eurolist** Number of shares distributed to the public > 25% Filed audited accounts over a period of 3 year prior to the date of the listing		**Alternext** Unregulated market. No requirement on size, sector, growth. 2-year track record at least ***With public offer*** Float > EUR 2.5 millions Prospectus to be approved by the AMF ***Without public offer*** No float requirement Offering circular with no authority approval
Finland	Helsinki Stock Exchange (HSE)	HSE	**Main List** Capital ressources > EUR 2 millions Shareholders' equity > EUR 4 millions Filed audited accounts over a period of 3 years prior to the date of the listing Number of shares distributed to the public > 25% Voting rights in the general public > 10%	**I List** No size requirement Filed audited accounts over a period of 2 years prior to the date of the listing Number of shares distributed to the public > 15%	**NM List** Market capitalisation > EUR 2 millions Filed audited accounts over a period of 1 year prior to the date of the listing Number of shares distributed to the public > 15% Voting rights in the general public > 10% 3-year business plan lock-up period for main shareholders if existence length < 3 years

Table 4. Cont'd

Germany	Deutsche Börse	Frankfurt Stock Exchange	**Official Market** ***General Standard*** Market value > EUR 1.25 millions Free float > 25% Filed audited accounts over a period of 3 years prior to the date of the listing Financial reporting in accordance with German standards ***Prime Standard*** Same as General Standard Financial reporting in accordance with U.S. GAAP and IFRS	**Regulated Market – General Standard** Number of shares distributed to the public > 10,000 3 years of existence Filed audited accounts over a period of 1 year prior to the date of the listing Financial reporting in accordance with German standards	**Neuer Markt** Created in 1997 – closed in 2003 Shareholders' equity > EUR 1.5 millions At least 2 designated sponsors Issuance > 100,000 shares Issuance > EUR 250,000 in nominal value Expected market value > EUR 5 millions Free float > 20% Capital increase against cash > 50% of offered shares 6-month lock-up period for pre-IPO shareholders Financial reporting in accordance with U.S. GAAP and IFRS
Greece	Athens Stock Exchange (ASE)	ASE Capital Market Commission (CMC) for firms not complying age requirements	**Main Market** Shareholders' equity > GRD 4 billions (EUR 11.74 millions) 25% of the equity should be distributed to at least 2,000 shareholders owning less than 2% of the capital Filed audited accounts over a period of 3 years prior to the date of the listing	**Parallel Market** Shareholders' equity > GRD 1 billion (EUR 2.93 millions) 20% of the equity should be distributed to at least 1,000 shareholders Capital increase > 80% of offered shares Filed audited accounts over a period of 2 year prior to the date of the listing	**New Market (NEHA)** Created in 1999 New-technology firms Shareholders' equity > GRD 200 millions (EUR 587,000) Issuance > 100,000 shares Issuance > GRD 250 millions (EUR 734,000) At least 150 shareholders must own less than 2% of the capital. Capital increase > 80% of offered shares Filed audited accounts over a period of 2 year prior to the date of the listing Lock-up period for shareholders owning >5%: 80% of the shares during 1 year and 50% during 2 years At least 1 market maker

Table 4. Cont'd

Italy	Borsa Italiana	CONSOB and Borsa Italiana	**Borsa (MTA)** ***Blue Chips*** Market capitalisation > EUR 800 millions Number of shares distributed to the public > 25% 3 years of accounting records Filed audited accounts over a period of 1 year prior to the date of the listing ***Ordinary*** Market capitalisation > EUR 20 millions and < EUR 800 millions Number of shares distributed to the public > 25% 3 years of accounting records Filed audited accounts over a period of 1 year prior to the date of the listing ***Star*** Market capitalisation > EUR 20 millions and < EUR 800 millions Number of shares distributed to the public > 35% for newly listed companies (>20% for transferred companies) 3 years of accounting records Filed audited accounts over a period of 1 year prior to the date of the listing	**Mercato Expandi** Market capitalisation > EUR 1 million Number of shares distributed to the public > 10% 2 years of accounting records Filed audited accounts over a period of 1 year prior to the date of the listing Turnover > EUR 750,000 Last net earnings > EUR 100,000 Financial debt / consolidated gross operating margin > 4	**Nuovo Mercato** High-growth companies Market capitalisation > EUR 3 millions Issuance > 100,000 shares Issuance > EUR 5 millions Filed audited accounts over a period of 1 year prior to the date of the listing Number of shares distributed to the public > 30% Capital increase > 50% of offered shares Lock-up period for pre-IPO shareholders and managers: 1 year applicable to 80% of the shares (2 years for start-up companies)
Poland	Warsaw Stock Exchange (WSE)	WSE	**Main market** Total book value > PLN 65 millions Market capitalisation > PLN 40 millions Free float > PLN 32 millions Free float > 25% or > 500,000 shares of value > PLN 70 millions	**Parallel Market** Total book value > PLN 22 millions Market capitalisation > PLN 14 millions Free float > PLN 11 millions Free float > 10% or > 200,000 shares of value > PLN 35 millions	---

			Number of shareholders > 500 Filed audited accounts over a period of 3 year prior to the date of the listing	Number of shareholders > 300 Filed audited accounts over a period of 2 year prior to the date of the listing	
Spain	BME	CNMV	**Primer Mercado** Shareholders' equity > EUR 1.5 millions excluding stakes > 25% belonging to 2 shareholders At least 100 shareholders must own a stake < 25% of the capital Filed audited accounts over a period of 3 year prior to the date of the listing Distributed dividend > 6% of the capital	**Segundo Mercado** Shareholders' equity > EUR 250,000 Public float > 20%	**Nuevo Mercado** Operational since 2000 *Information not available*

Table 4. Cont'd

Sweden	Stockholms-börsen (OMX)	OMX	**A – List** Market capitalisation > SEK 300 millions 3 years of verifiable history and accounting records Documented profitability Number of shares distributed to the public > 25% Voting rights in the general public > 10% At least 2,000 shareholders Lowest share price on the first listing day: SEK 25	**O – List** No history requirement No requirement on market value Number of shares distributed to the public > 10% Voting rights in the general public > 10% At least 300 shareholders Lowest share price on the first listing day: SEK 25	---
Switzerland	Swiss Exchange (SWX)	SWX	**Main Market** Capital resources > CHF 25 millions No requirement on market capitalisation since 2001 Filed audited accounts over a period of 3 years prior to the date of the listing (possible exceptions) Number of shares distributed to the public > 25% and > CHF 25 millions	**Local Caps** Capital resources > CHF 2.5 millions No requirement on market value Filed audited accounts over a period of 2 years prior to the date of the listing Number of shares distributed to the public > 20% and > CHF 5 millions	**New Market** Created in 1999 – closed in 2004 High-growth companies Shareholders' equity > CHF 2.5 millions Market capitalisation > CHF 8 millions Operating and financial track record over a period of 1 year prior to the date of the listing Accounts in accordance with U.S. GAAP and IFRS Number of shares distributed to the public > 20% Capital increase > 50% of offered shares 6-month lock-up period
Turkey	Istanbul Stock Exchange (ISE)	ISE	**National Market / Second National Market / New Economy Market** Paid-in or issued capital > TRL 1.25 billions Free float > 15% if capital<TRL 750 billions, > 10% if capital within range of TRL 750-1,500 billions, > 5% if capital > TRL 1.5 trillions At least 3 calendar years of existence (2 years if free float > 25%) Filed audited accounts over a period of 1 year prior to the date of the listing Positive earned profits before tax in the last 2 years (previous year only if free float > 25%)		

United Kingdom	LSE	FSA (UKLA) LSE	**Main market** Market value > GBP 700,000 Number of shares distributed to the public > 25% Filed audited accounts over a period of 3 years ending no later than 6 months prior to the date of the listing Financial reporting in accordance with UK GAAP, U.S. GAAP and IFRS	**Alternative Investment Market (AIM)** Created in 1995. Unregulated market. No requirement on size, floating capitalisation, age, sector, growth. Admission is only subject to the approval of the *Nominated Adviser* in charge of the IPO.

Information provided in this table was gathered from regulators and exchanges' documentations and websites as well as from Schuster (2003) and Giudici and Roosenboom (2005). Lock-up periods are minimal requirements set by regulators, but interestingly, original shareholders often agree to lock-up periods and share percentages that exceed regulatory standards. See Goergen *et al.* (2006) for an empirical study of the cross-section and the determinants of lockup agreements on the French and German markets.

It is important to point out that the LSE and Euronext Amsterdam never had a Parallel Market, and that Euronext abandoned the Belgian, French, and Portuguese second markets in 2005 and moved all stocks to the Main Market, known as 'Eurolist'.

2.3. Listing requirements on New Markets

New markets usually cater to young high-growth companies, which implies that listing is not authorised solely on the basis of historical data but can be justified by growth prospects. For that reason, listing on a New Market never requires more than **one year of accounting records** but always involves raising funds, with a **capital increase representing at least 50%** of the shares offered to the public. Listing standards on New Markets often focus on disclosure and governance (Giudici and Roosenboom, 2002), and generally require periodic audited financial statements meeting international accounting standards. Concerning size, the requirements are not expressed in terms of market capitalisation but in terms of shareholders' equity with a **minimum requested book value of between one and five million euros**. At least **20% of the shares must be distributed to the public** (30% for the Nuovo Mercato in Italy and 15% for the NM list in Finland).

Another important characteristic of New Markets is the greater uncertainty about the future performance of their newly listed firms. To protect new shareholders against adverse selection games that pre-IPO shareholders may play, lock-up obligations are imposed on all New Markets. During **lock-up periods**, pre-IPO main shareholders and managers are not allowed to sell their shares. Lock-up or lock-in periods last from six months to two years depending on the exchange and apply to 80% or 100% of the shares held before the offering.

With the lack of candidate firms in the years 2000, some exchanges did away with their New Markets: Deutsche Börse in 2003, the Swiss Exchange in 2004 and Euronext in 2005.

2.4. Unregulated growth markets: AIM and Alternext

The rules described above apply to all New Markets in Europe except the Alternative Investment Market (AIM) of the LSE. AIM, created in 1994, has not experienced the slump in the market since 2000, unlike other New Markets. There were 258 firms introduced on AIM in 2004. One of the reasons for the substantial number of IPOs even in recent years is that AIM IPOs have not been limited to firms from the 'new economy'. AIM caters to all firms with sound business prospects but that do not meet the listing criteria, mainly in terms of size, of Main or Parallel Markets, or of well-established growth markets like NASDAQ. As a result, 36 industrial sectors are represented on AIM, and of the 950 listed companies, 105 are not UK domestic firms. Another explanation for the success of AIM is that, unlike the New Markets of continental Europe, which often suffer from the narrowness of the buy side, it benefits from a sustained demand coming from an active community of investors specialised in AIM firms.

But the main characteristic of AIM is that it is not regulated by a market authority. Being beyond FSA (Financial Services Authority) supervision, it is only governed by the LSE. With regard to European regulations, AIM is exempt from the Prospectus Directive and is considered as a Multi-Trading Facility (MTF). Listing on AIM does not require any industrial characteristic or any minimum equity size, floating capitalisation or age. Raising funds when going public is not compulsory. Lock-up periods are not imposed by the exchange. The admission authority is delegated to a special category of underwriters, called 'nominated advisors' and commonly known as 'Nomads', designated and controlled by the LSE according to stringent criteria. Nomads co-ordinate due diligence, produce and approve admission documents and implement floatation. A company is admitted three days after the nomad confirms to the exchange that the firm is suitable for listing on AIM.

Given the success of AIM and the decline of continental New Markets, Euronext closed its new economy market segments (Euro.NM on Euronext Amsterdam, Nouveau Marché on Euronext Paris, Novo Mercado on Euronext Lisbon, Nouveau Marché on Euronext Brussels) in 2005 and replaced them with a single organised but unregulated – in the sense of the Prospectus Directive – market segment tailored for small companies. In a similar way to AIM, Alternext is not *regulated* by AMF (Autorité des Marchés Financiers) but does come under the authority of the exchange. Listing and trading rules are defined by Euronext. The floatation process is simplified and any company, regardless of its industrial sector or country of origin, may request a listing provided it has a two-year track record of existence. Floatation can be achieved with or without a public offer and is managed by a specialised intermediary, the 'listing sponsor', whose role is comparable to that of a nominated advisor on AIM. In the case of a private placement without public offer, no minimum market size or float is required and information about the IPO is disclosed in an offering circular that does not need authority approval. If a public offering is launched, Euronext requires a minimum floating capitalisation of 2.5 million euros and a prospectus must be approved by the AMF. Post-IPO disclosure obligations are simplified: IFRS (International Financial Reporting Standards) financial reports, quarterly accounts and review of half-year accounts are not compulsory. Financial communication obligations are restricted to semi-annual accounts, audited annual accounts and crossing of shareholding thresholds (50% and 95% of the capital).

2.5. Other unregulated lists

Approximately half of the exchanges included in our survey have developed an OTC (over the counter) or unregulated market segment in parallel to regulated segments to allow firms that do not fulfil the regulated market criteria to obtain a first listing in preparation for a future admission on the regulated market. Table 5 lists these unregulated segments without any details about their requirements or level of activity as the present study focuses on regulated markets. We have deliberately left AIM out of this list as its level of activity and general workings are more comparable to those of regulated growth markets than to those of OTC markets.

Table 5. Unregulated lists

Country	Exchange	Unregulated market segment
Austria	VSE	Third Market
Belgium	Euronext Brussels	Public Auctions Market
Finland	HSE	Pre-list Brokers' List Market
France	Euronext Paris	Marché Libre
Poland	WSE	Free Market
Portugal	Euronext Lisbon	Mercado Sem Cotações
Sweden	OMX	OTC-list

Exchanges not mentioned in the table, except the LSE, have no unregulated list.

3. A review of IPO mechanisms on European stock markets and listing companies' practices

Initial pricing and allocation mechanisms can be divided into three categories: fixed-price offerings, auctions and book-building procedures. By definition, book-building procedures are handled solely by investment banks. Auction and fixed-price mechanisms can either be managed by underwriters or provided by exchanges. While the general rule is the delegation of

primary trading mechanisms to investment banks, Euronext Paris and the ISE offer initial public offering mechanisms.

3.1. Fixed-price offerings

In a fixed-price offering, shares are offered to all categories of investors, private and institutional, at a single and unchangeable price set in advance by the underwriter and filed in the introduction prospectus. Investors submit their applications for shares at the fixed price and rationing rules (possibly random but most often *pro rata*) are used to allocate shares. Fixed-price offerings exist in all countries except Austria, Greece, Finland and Spain. Specific terminology is used in the UK, where any IPO for which shares are offered to the public, either through a fixed-price offer or through an auction, is called an 'offer for subscription' if new funds are raised and 'offer for sale' if not. In the case of a fixed-price offering, the offer for sale or offer for subscription will be said "at fixed price".

3.2. Auctions

Auctions or tender offerings are IPO mechanisms in which the issuer sets the minimum price at which it is willing to sell its shares. All investors, either individual or institutional, are then invited to place subscription orders in the form of limit orders at prices above or equal to the minimum price. The auctioneer then sets the issue price as a function of the aggregate demand. Besides these basic features, different types of auctions exist across Europe. Some auctions allow market orders, others do not. In the so-called Dutch auctions, the issue price is set in order to perfectly equate supply and demand and clear the market. Orders are served in descending order of price limits until clearing the number of offered shares. The lowest price that clears the market is the equilibrium price. The auction is said to be discriminatory or multiunit if served orders are executed at the limit price they specify. In contrast, in a uniform-price auction, all compatible orders are executed at a unique price equal to the equilibrium price. In practice, most tender offerings use the uniform-price mechanism, with the exception of the ISE which runs discriminatory auctions. Besides, pure Dutch auctions are seldom. Initial offering auctions are generally 'up-bounded': a maximum price is set and orders at prices above that limit are not allowed, or the auctioneer has the discretion to eliminate orders with price limits that far exceed the minimum price. In this type of auctions, *pro rata* rationing can be used. In most countries, the auctioneer is the lead manager. On Euronext Paris and at the ISE, the auction mechanisms are provided by the exchange.

The use of auctions for selling IPOs has tended to decline in Europe. Auctions have disappeared in Germany and Switzerland. The few countries where auction IPO mechanisms still exist are France, the Netherlands, the UK, Poland and Portugal.

3.3. Book-building

Book-building, also called 'placing' in the UK, and *placement* in France, exists in all countries and has been used increasingly over the 1990s. In the book-building procedure, shares are exclusively offered to institutions but not to individual investors. The underwriter sets a price range for the shares to be placed. During the subscription period, usually one week, institutional investors are invited to place purchase commitments in an order book at prices inside the price range.

The subscription period is preceded by a road-show that can last two weeks. In preparation for the road-show, the underwriter's financial analysts value the company in research reports and

estimate an appropriate price for the company's shares. On the basis of these reports,[8] the syndicate members approach institutional investors, present the issuer and gauge the market acceptance of the new issue. Depending on the country, the book-building spread can be filed either prior to or at the end of the road-show. After the file price range is set, it can be revised if there is unusually weak or strong demand. In countries like Germany, the price range is filed after the road-show so that feedback from institutional investors provides an indication on how the book-building spread should be set.

At the end of the subscription period, the issue price is determined by monitoring the subscription orders received in the order book and, in case of over-subscription, the underwriter has complete discretion to allocate the shares.

In Belgium, Finland, France, Poland, Portugal, Spain, Sweden, Switzerland and the UK, some new issues are offered as a double stage issue whereby, in addition to the private book-building process, a separate mechanism offers shares to the public. The simplest and most common technique is to offer shares to the public at a fixed price which is equal to the equilibrium price set during the book-building process. An alternative method is to organise an auction in which individual investors can place limit orders. In this case, the issue price may differ for each category of subscribers. To the best of our knowledge, the only exchange that regulates this price differential is Euronext Paris, which requires that the issue price paid by institutions in the book-building process should not be lower than the definitive public offer price.

Whereas the majority of institutional placements are associated with public offers in Belgium, France, Portugal and Spain,[9] the practice is occasional in the UK and rare in other countries.

Table 6 gives an overview of the IPO mechanisms that are used in each country of our sample.

3.4. Procedures for initial trading on Euronext Paris

More than any other country in Europe, the French IPO market has been characterised by multiple mechanisms being used to carry out IPOs, and the specificity of Euronext Paris's primary market is to offer and handle a range of initial offering mechanisms comprising a fixed-price offering procedure as well as various auction mechanisms.

3.4.1. Fixed-price offer

A firm price and the number of shares to be offered at that price are indicated in the admission notice. Investors must place orders at a limit price equal to the proposed firm price but are allowed neither market orders nor orders with higher price limits. Bid and offer are then matched solely by reducing the quantity of shares allocated per order on a strictly linear basis. An identical reduction rate is usually applied to all orders. However, different allocation percentages are sometimes set for different categories of orders to favour small orders, or orders from individual investors, or a special group of investors.

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[8] In the United States, during road-shows and book-building, there is a 'black-out period' during which no more research reports may be published. In Europe, the black-out or quiet period does not exist.

[9] In Spain, since 1992, 100% of IPOs have been introduced through a hybrid book-building mechanism in which book-building is used to set the price and allocate shares to institutional investors. A public offer tranche is reserved for local retail investors who do not participate in the price-setting process. The distribution of the IPO between retail and institutional investors is stated in the preliminary prospectus. Allocation to institutional investors is discretionary; allocation to retail investors is *pro rata* as a function of order size only (Pons-Sanz (2005)).

3.4.2. Auction mechanisms

Direct admission

The number of shares to be offered, the minimum price asked by the sellers, the maximum variation accepted from this minimum (10% in general) and the maximum level of order reduction are pre-determined and specified in the notice of admission. Concerning the last point, the allocation proportion cannot be less than 4%.

Investors can place both market and limit orders. Supply and demand are matched through price adjustment within the pre-defined price range. If the equilibrium price is located outside this range, the match is achieved either by scaling back orders at the maximum price or by modifying the price range when the fill rate is less than 4%.

Minimum price offer

The admission note defines the number of shares to be made available to the public and the minimum price required by the sellers. Only limit orders are accepted and Euronext Paris reserves the right to reject orders with limits substantially higher than the minimum. Based on its analysis of orders by limit and of accumulated quantities by limit, Euronext Paris determines the median range of price limits, eliminates orders with limits out of this price range, sets a single offer price inside the range (the lowest limit that allows the offer to be filled) and serves all remaining orders with limits equal or superior to the offer price in an identical proportion that should exceed 4%.

Open-price offer

The introduction notice stipulates a price range. Investors must submit orders at a limit within this range, upper and lower bounds included. Orders without price limit or with price limits outside the range are rejected. Bid and offer are matched by price adjustments within the pre-defined range. The offer price is set at the lowest limit price inside the range that fills the number of offered shares. Orders at a limit equal or superior to this price are served. If necessary, a uniform reduction rate is applied to all orders. As for fixed-price offers, different allocation proportions may be applied to different groups of investors.

Direct admission and minimum price offer procedures cannot be used when the IPO involves a placement. Only fixed-price and open-price offerings can be associated with a placement.

Table 6. IPO mechanisms by country

Country	Exchange	Book-building institutional only	Book-building with public offer	Fixed-price offering	Auction
Austria	VSE	yes	no	no	no
Belgium	Euronext Brussels	yes	yes	no	no
Finland	HSE	yes	yes	no	no
France	Euronext Paris	yes (*placement*)	yes	yes	Various types organised by the exchange (*direct admission*, *minimum price offer*, *open price offer)*
Germany	Deutsche Börse	yes	no	yes	not any more
Greece	ASE	yes	no	no	no
Italy	Borsa Italiana	yes (*with fixed price** *and with open price***)	no	yes	no
Netherlands	Euronext Amsterdam	yes	no	yes	yes
Poland	WSE	yes	yes	yes	yes
Portugal	Euronext Lisbon	yes	yes	yes (*offer for sale*)	yes (*offer for sale*)
Spain	BME	no	yes***	no	no
Sweden	OMX	yes	yes	yes	no
Switzerland	SWX	yes	yes	yes	not any more
Turkey	ISE	yes	no	yes	yes (sale on the ISE)
United Kingdom	LSE	yes (*placing*)	yes	yes (*offer for sale at fixed price, offer for subscription at fixed price*)	yes (*offer for sale by tender offer, offer for subscription by tender offer, open offer*)

* Before 1999, in the Italian book-building procedures, a fixed price was offered to institutions at the end of the marketing period prior to actual order submission. In 1999, this practice was abandoned in favour of the book-building with open price.

** Since 1999, book-building with open price has been the general practice in Italy. The final price is determined after collecting orders from institutions, so that they do not know at which price they will effectively buy the shares.

*** Since 1992, when Royal Decree 291/1992 was published.

3.5. Relative advantages of IPO mechanisms

Table 7 lists, for each mechanism, its main characteristics in terms of pricing and allocation rules.

Table 7. Pricing and allocation rules by IPO mechanism

	Book-building	**Fixed-price offer**	**Auction**
Offering price	Price range	Fixed price	Minimum price or price range
Order types	Limit orders	Market orders	Limit orders Market orders in some cases
Organiser	Lead manager	Lead manager or the exchange	Lead manager or the exchange
Actual issue price	At the discretion of the lead manager	Offering price	Lowest limit filling the offer
Orders filled	Discretionary	All	At equilibrium price or higher
Allocation	Discretionary	Proportional	Price priority and/or Proportional

The two main advantages of fixed-price offerings are low costs and simplicity. Of a sample of 2,143 IPOs from 65 countries between 1992 and 1999, Ljungqvist et al. (2003) find them to be half as expensive as book-built offers. Fixed-price offerings are also easier to implement than other procedures. They allow investors to know, with certainty, before submitting orders, the actual price that they will have to pay in case they receive an allocation. Allocation is non discretionary and cannot favour particular investors.

The main drawback of fixed-price issues is the non-elasticity of the price. The offer price is set before any precise information about the actual share demand is known and it may differ substantially from its optimal value. Loughran et al (1994) show that this pricing mechanism tends to result in greater underpricing,[10] that is more money left on the table by issuers. According to Welch (1992), in fixed-price offers, issuers have no choice other than underpricing offered shares to guarantee their subscription by investors. Using a sample of 182 Italian IPOs undertaken in the years 1985-2001, Cassia et al (2004) find that fixed-price offerings are effectively more underpriced than book-built offers.

As a result, many authors, along with investment banks, defend book-building as an optimal floatation mechanism where the road-show and the pre-marketing period serve as an information-extraction process for the underwriter, as modelled by Benveniste and Spindt (1989). As underlined by Derrien (2005), the flexibility offered by book-building in terms of allocation, allows the lead manager to elicit private information from potential institutional investors on their estimate of the share value, as a counterpart to allocation guarantees, so that the issue price incorporates, at least partially, this information. Benveniste and Wilhelm (1990) develop a theoretical model that shows that, in the context of asymmetric information, listing firms maximise the proceeds of their IPOs when the lead manager is free to determine the IPO price and the allocation rules. Similarly, a theoretical model by Benveniste and Busaba (1997) demonstrates that the book-building process allows issuers to raise more funds than other

[10] For a definition of underpricing and its measures, refer to part II section 1.

methods. Moreover, although there is uncertainty about the final issue price at the start of a book-building procedure, the risk at the final price is small, as definitive price changes away from the preliminary range seldom occur (Jenkinson and Jones, 2004; Ljungqvist et al., 2003). For these reasons and because the underwriters' firm commitment generally characterises book-building procedures, book-building is defended by its supporters as a process that minimises the risk of IPO failure.

Another pro book-building argument put forward by underwriters is that they use discretion to allocate a defined number of shares to institutions that are likely to be buy-and-hold investors (Cornelli and Goldreich, 2001; Jenkinson and Jones, 2004). This type of allocation improves post-IPO liquidity and market-making on the secondary market (Boehmer and Fishe, 2004; Aggarwal, 2000; Zhang, 2004). According to Chemmanur and Liu (2003), this also helps young and growth firms to optimise their price quotation in the long run. Chemannur and Liu (2003) and Loughran and Ritter (2002) present the book-building procedure as a way of developing the reputation of young and growth companies. The media and analysts tend to follow them closely at the time of their introduction when book-building is used, which is not the case for fixed-price offerings. At a minimum, the role of the bank, in a book-building procedure, facilitates the valuation of young and risky candidates. In fact, the bank offers these firms a standby contract at the time of their IPOs by adjusting the offer to the demand and reducing uncertainty on equity valuation (see Benveniste and Spindt, 1989, Benveniste and Wilhelm, 1990). Kutsuma and Smith (2004) use a sample of 484 IPOs on JASDAQ over 1995-1999 to investigate issuing firms' motivations for choosing book-building more frequently, since its introduction in 1997, even though it is more costly than auctions. They state that companies going public through book-building are younger and smaller than those opting for an auction process and conclude that book-building allows riskier firms to go public even if the total cost is higher. They estimate that between 102 and 145 firms could not have achieved floatation before the introduction of book-building.

Finally, through a book-building procedure, the issuer may choose a given type of shareholding structure by advising the underwriter to favour either small orders or large shareholders (Brennan and Franks, 1997; Stoughton and Zechner, 1998).

However, the discretionary allocation power of underwriters is a matter of controversy as investment banks are given the liberty to favour some clients according to criteria other than best bid. Several cases of abusive allocations in book-built IPOs recently have made headlines in the financial press. As mentioned in Degeorge et al (2005), unlawful underwriters' practices include 'spinning', which means giving underpriced IPO shares to executives of prospective investment banking clients in the hope of winning future underwriting business from them, and 'laddering', that is the practice of giving generous IPO allocations to clients who commit to buy more shares in the after-market (Hao, 2004). Another practice mentioned by Loughran and Ritter (2002, 2004) is that underwriters allocate hot IPOs to investors in return for commission business and they receive greater profits from commission business when there is greater underpricing. Boehmer and Fishe (2004), with a sample of 265 U.S. book-built IPOs, show that underwriters do not necessarily disadvantage small investors but favour regular IPO investors. Several quid pro quo practices of the sort are denounced by other authors. Degeorge et al. (2005) provide empirical evidence about the hypothesis that underwriters favour, in the allocation process, banks that will provide positive analysts' coverage of their recent IPOs.

Another criticism is that book-building excludes, in most cases, individual investors, who are left only with the possibility of buying newly listed shares in the secondary market at inflated prices. Some book-built IPOs make an exception to that rule and offer shares to the public through a double-stage procedure where a fixed- or open-price offering is launched with an initial placement reserved for institutional investors. The rate of small investors' participation

then depends on the underwriter's and the issuer's motivations that could be increased post-IPO liquidity (Boehmer and Fishe, 2000) or maintained control (Brennan and Franks, 1997; Cornelli and Goldreich, 2001). In practice, allocating IPOs to only large shareholders, such as pension funds, insurance companies etc., may lower post-IPO liquidity.

As a result, auctions, and in particular the Dutch auction technique, are often claimed, as in Bartlett and Shulman (2003), to be the most efficient mechanisms because they provide both price adjustment and non-arbitrary allocation. Many academics support auctions as an optimal mechanism that results in fair prices and fair allocations. Biais et al (2002) analyse the optimal IPO mechanism in a model where there is both asymmetric information and an agency problem between issuers and underwriters. They conclude that the discretion that underwriters have with book-building results in sub-optimal outcomes for issuers relative to using auction mechanisms.

Derrien and Womack (2003) find that auctioned IPOs exhibit lower initial returns than their book-built counterparts because auctions incorporate more information about market conditions into the issue price. They interpret this result as proof of the higher price efficiency of auctions. Other empirical works that demonstrate that auctions are less costly than book-building in terms of direct costs, i.e. placement fees, as well as indirect costs with regard to initial returns, include Kaneko and Pettway (2003), Kutsuma and Smith (2004), Degeorge et al. (2005). Pettway and Kaneko (1996) and Chemmanur and Liu (2003) show that the auction procedure would be optimal for well-established and well-known companies whose objective is to maximise proceeds.

Nevertheless, a downside of the auction mechanism is that it may lead to overpricing in bullish markets, with negative effects on welfare. To avoid overpricing, some auction mechanisms stipulate a maximum price for the offer, which also limits the uncertainty about the final price for subscribers. Further, auctions are usually associated with 'best effort'[11] contracts and not firm commitments, as opposed to book-built offerings. Lastly, for reasons discussed above, auctions are probably unable to promote the initial listing of small, young, unknown companies.

3.6. Listing companies' practices

A sample of 2,104 European IPOs, described in Appendix 1, was obtained for the period 1995-2004. This sample represents 40.38% of the total number of IPOs reported by the WFE during the same period (see Table 1). A breakdown of these new listings per country and per year is found in Table B of Appendix 1. These data confirm the cold and hot issue periods already identified from the WFE statistics.

For each IPO of the sample, we collected the issue date, price and initial offering mechanism. The data on the IPO allocation mechanism was provided by the national exchanges except for Belgium, Finland, the Netherlands, Poland, Sweden and Switzerland. An attempt was made to fill this gap in the database by surveying the 400 companies which listed on these exchanges and 103 responses were received. Consequently, a complete database of information exists for 1,807 issuers out of the 2,104 IPOs. Statistics about the breakdown of IPOs by initial allocation mechanism are provided in Table 8 for each country. Consistent with the recent literature (Biais and Faugeron-Crouzet, 2002; Sherman, 2003; and Ljungqvist et al, 2003), a bias toward the book-building procedure and away from the fixed-price and auction mechanisms is clearly evident. Auctions have disappeared on most exchanges except Euronext Brussels, Euronext Paris and the ISE. Fixed-price offers are used significantly in only 4 countries (Belgium, France, Germany and Turkey). Over the whole sample, more than 4 IPOs out of 5 involve book-

[11] A best effort contract does not commit the underwriter to buy the shares that are left unsold.

building. In 3 countries, that is Austria, Greece and Spain, book-building is the only initial offering procedure used. Finally, when book-building is chosen for the IPO, the offering is generally restricted to institutions, except on the Belgian, French, Portuguese and Spanish[12] primary markets, where book-building procedures are most commonly associated with a public offer at a fixed or open price.

Table 8. IPO mechanisms per country in a sample of 2,104 IPOs from 1995 to 2004

Country	Fixed-price offerings		Auctions		Book-building		Unclassified		Total
	in number	in %	in number	in %	in number	in %	in number	in %	
Austria	0	0.0%	0	0.0%	23	100.0%	0	0.0%	23
Belgium	4	6.9%	11	19.0%	23	39.7%	20	34.5%	58
Finland	6	13.6%	0	0.0%	6	13.6%	32	72.7%	44
France	32	8.8%	71	19.6%	260	71.6%	0	0.0%	363
Germany	12	2.9%	1	0.2%	402	96.9%	0	0.0%	415
Greece	0	0.0%	0	0.0%	183	100.0%	0	0.0%	183
Italy	1	0.7%	0	0.0%	134	99.3%	0	0.0%	135
Netherlands	3	6.4%	0	0.0%	0	0.0%	44	93.6%	47
Poland**	0	0.0%	0	0.0%	7	7.4%	88	92.6%	95
Portugal	4	25.0%	0	0.0%	12	75.0%	0	0.0%	16
Spain	0	0.0%	0	0.0%	36	100.0%	0	0.0%	36
Sweden*	9	9.5%	0	0.0%	9	9.5%	77	81.1%	95
Switzerland	6	9.8%	0	0.0%	19	31.1%	36	59.0%	61
Turkey	66	83.5%	9	11.4%	4	5.1%	0	0.0%	79
UK	3	0.7%	0	0.0%	451	99.3%	0	0.0%	454
Total	146	6.9%	92	4.4%	1,569	74.6%	297	14.1%	2,104

* Most unclassified IPOs in Sweden should be considered as book-built according to Swedish specialists.

** Although the classification is lacking for most Polish issues, auctions are said to be widely used in Poland.

4. The cost of going public

Apart from up-front costs, the direct cost of a new listing corresponds to the underwriter's compensation, the so-called gross spread, generally expressed as a percentage of the IPO proceeds. As claimed by Bartlett and Shulman (2003), this cost can be prohibitive and deter some firms from going public, in particular in the United States, where spreads are greater than in Europe according to international comparative studies (Chen and Ritter, 2000; Tortsila, 2001, 2003; Ljungqvist et al., 2003). Medium-sized issuing firms in the US generally support a spread of 7%, while the spreads are of 4%, 3%, and 2.5% respectively in Germany, France and Belgium, as reported by Torstila (2003).[13] Moreover, Ljungqvist et al. (2003) find that the fees increase when the underwriter is American or when there is a U.S. tranche.

Whether the high level of underwriting fees is caused by a lack of competition between investment banks is a matter of debate. Chen and Ritter (2000) report that, since 1994, gross

[12] In Spain, all IPOs are book-built and associated with a fixed-price public offer.

[13] Torstila (2003) uses a large sample of 11,000 IPOs from 27 countries between 1986 and 1999.

spreads have been equal to 7% for almost all medium-sized IPOs, regardless of the proceeds and risk of the offering. The clustering of gross spreads could result from collusive behaviour by underwriters and thus explain their relatively high level. In Europe, where gross spreads are lower, Torstila (2003) find them to be less clustered.

However, clustering and collusion may not be the only factors. Torstila (2003) proves that gross spread clustering is inversely related to spread level and that gross spreads in Germany, France and Belgium, are clustered as much as in the United States despite their lower level. Other authors, in particular Degeorge et al. (2005) assign the high level of spreads to the intensive use of book-building, for which investment banks charge higher fees.

II. A comparison of IPO underpricing and long-run performance across European markets

Despite the large body of literature on IPOs, two enigmas remain as yet unresolved. First, there is evidence of high initial returns to equity IPOs in the United States, in Europe and in Asia. Second, patterns of long-term underperformance have been observed following IPOs.

Underpricing has been considered a market anomaly to the principle of efficiency, because the size of underpricing is much higher than the premium offered for equivalent stocks in terms of risk. However, recent theories that consider IPO underpricing as an informational event or a tool for risk management, have attempted to reconcile the IPO underpricing puzzle with market efficiency.

This part of our work is devoted to providing an overview of IPO performance in Europe. The first subsection documents initial returns while long-run performance is addressed in the second sub-section.

1. A comparison of IPO initial underpricing across European markets

The initial return of an IPO corresponds to the difference between the equilibrium price following the issue and the IPO price. The post-IPO equilibrium price is the first trade price following the IPO, or the first closing price, or a closing price observed a few days after the IPO date. The IPO price, by definition, is the price at which the new shareholders buy the shares at issue. It is jointly determined by the listing firm and its underwriter at the end of the IPO procedure according to financial analysts' valuations and the demand expressed for the shares. The definitive offer price is generally lower than the first equilibrium price, which is well-known under the term of IPO underpricing.

1.1. Measures of IPO underpricing

Measures of underpricing differ according to which price is taken as the post-IPO equilibrium price and which return is chosen as a benchmark.

1.1.1. Raw initial returns

Initial performance can be measured by the difference between the post-listing equilibrium price (*EP*) and the final offering price (*OP*) divided by the offering price:

$$U = \frac{EP - OP}{OP} = \frac{EP}{OP} - 1 \text{ or } U = \ln\left(\frac{EP}{OP}\right) \qquad \text{(II.1).}$$

A main problem is the choice of the equilibrium price *EP*, i.e. the trading price matching the offer and the demand for the shares after the IPO. When the market is sufficiently liquid, *EP* generally corresponds to the first-day closing price. In other cases, the equilibrium may be obtained a couple of days after the IPO. For that reasons, some authors measure initial returns over a five day or one week horizon (Table 9).

The raw initial return *U* can be considered a measure of underpricing, assuming that the normal return under efficiency would be 0 and that the equity risk is equivalent to the market risk. Other methods relax these assumptions and adjust raw returns.

1.1.2. Adjusted initial returns

Three adjustment methods are used in the literature:

- the initial return adjusted for a market index return,

$$U_m = \frac{EP - OP}{OP} - \frac{I_1 - I_0}{I_0} = \frac{EP}{OP} - \frac{I_1}{I_0} \text{ or } U_m = ln\left(\frac{EP}{OP}\right) - ln\left(\frac{I_1}{I_0}\right) \quad \text{(II.2)},$$

where I_1 designates the market index closing price on the first trading day and I_0, the index closing value the day before,

- the initial return adjusted for systematic risk,

$$U_s = \frac{EP - OP}{OP} - \beta \frac{I_1 - I_0}{I_0} \quad \text{(II.3)},$$

where β is the systematic risk,

- and the raw initial return adjusted for the return of a control portfolio (Ritter (1991) and Affleck-Graves et al. (1993)),

$$U_p = \frac{EP - OP}{OP} - R_p \quad \text{(II.4)},$$

where R_p is the return of a reference portfolio.

Moreover, some papers (Keloharju, 1993; Husson and Jacquillat, 1990) calculate the return that would be obtained by an uninformed investor participating in all the IPOs.

Considering that the market movements are too small to affect the initial returns significantly, most studies measure IPO underpricing with raw returns and select the closing price at the end of the first day of quotation as the equilibrium price. Adjusted returns are preferred when the delay between the IPO date and the determination of the first equilibrium price is too long (Périer, 1996).

The most widely utilised adjusted measure is U_m, which implicitly standardises systematic risk to 1. As pointed out by Kooli (2000), the limits of the second model (U_s) lie in the difficult and biased estimation of beta.

1.2. Empirical results on IPO underpricing in Europe: previous literature

A well-accepted result is that IPOs are underpriced. Underpricing has been observed around the world in various periods (Ritter and Welch, 2002), even though the level of underpricing has changed over time (Loughran and Ritter, 2002). In the 1980s, average IPO underpricing was 7%. It increased to 15% during the period 1990-1998, before jumping to 65% during the short 1999-2000 period corresponding to the Internet bubble. Table 1 summarises the main articles that report empirical evidence about IPO initial performance in the 15 European markets of our sample. Although the magnitude of initial returns depends on the selected measure and is probably influenced by taxation and specific national regulation, as in the US, IPO underpricing is uniformly observed in Europe and also varies over time.

Table 9. Empirical evidence of IPO underpricing in Europe

Country	Authors	Period	Sample size	Methodology	Horizon	Mean underpricing
Austria	Aussenegg (2006)	1984-1996	62	$P_1/OP - I_1/I_0$	1st day	6.46%
				$P_1/OP - 1$	1st day	5.75%
Belgium	Deloof *et al.* (2002)	1993-2000	33	$MP_{30}/OP - 1$	1st month	18.9%
	Goergen *et al.* (2003)	1996-2000	13 (Euro.NM)	$P_1/OP - 1$	1st day	10.36%
				$P_8/OP - 1$	1st week	5.38%
	Manigart and de Maeseneire (2003)	1996-October 1999	12 (Euro.NM)	$P_1/OP - I_1/I_0$	1st day	-0.10%
Finland	Keloharju (1993)	1984-1989	80	$P_1/OP - I_1/I_0$	1st day	8.7%
	Westerholm (2000)	1994-1997	14	$ln(P_1/OP) - 1$	1st day	11.4%
France	Chahine (2004b)	1996-2000	172	$P_1/OP - 1$	1st day	22.76%
	Degeorge and Derrien (2001b)	1991-1998	243	$P_{10}/OP - 1$	10th day	17.5%
	Derrien and Womack (2003)	1992-1998	264	$P_1/OP - 1$	1st day	13.23%
	Faugeron-Crouzet and Ginglinger (2002)	1983-1994	292	$EP/OP - 1$	equilibrium	18.67%
	Goergen *et al.* (2003)	1996-2000	144 (Euro.NM)	$P_1/OP - 1$	1st day	4.19%
				$P_8/OP - 1$	1st week	25.10%
	Ljungqvist and Wilhelm (2002)	1990 - May 2000	516	$P_5/OP - 1$	5th day	16.5%
	Schuster (2003)	1988-1998	323	$P_1/OP - 1$	1st day	12.37%
	Sentis (2001)	1991-1995	61	$P_1/OP - 1$	1st day	9.24%
				$P_1/OP - I_1/I_0$		9.01%
Germany	Goergen, *et al.* (2003)	1996-2000	319 (Euro.NM)	$P_1/OP - 1$	1st day	43.32%
				$P_8/OP - 1$	1st week	54.27%
	Ljungqvist (1997)	1970-1993	189	$ln(P_1/OP) - ln(I_1/I_0)$	1st day	9.2%
	Ljungqvist and Wilhelm (2002)	1990-May 2000	470	$P_5/OP - 1$	5th day	40.2%
	Schuster (2003)	1988-1998	219	$P_1/OP - 1$	1st day	25.66%
	Stehle *et al.* (2000)	1960-1995	187	$P_1/OP - 1$	1st day	15.79%
	Steib and Mohan (1997)	1988-1994	103	$P_1/OP - I_1/I_0$	1st day	6.81%

Table 9. Cont'd

Country	Authors	Period	Sample size	Methodology	Horizon	Mean underpricing
Greece	Gounopoulos (2003)	1990-2001	225	$P_1/OP-1$	1st day	46.13%
				$P_1/OP-I_1/I_0$	1st day	45.41%
	Nounis (2003)	1994-2002	254	$P_1/OP-1$	1st day	41.09%
				$P_1/OP-I_1/I_0$	1st day	42.1%
Italy	Arosio *et al.* (2000)	1985- August 2000	164	$P_1/OP-1$	1st day	23.94%
				$P_1/OP-I_1/I_0$	1st day	21.06%
	Cassia *et al.* (2004)	1985-2001	182	$P_1/OP-1$	1st day	21.87%
				$P_1/OP-I_1/I_0$	1st day	19.25%
	Fabrizio (2000)	1988-1998	77	$ln(P_1/OP)-ln(I_1/I_0)$	1st day	11.1%
	Goergen *et al.* (2003)	1996-2000	26 (Euro.NM)	$P_1/OP-1$	1st day	18.84%
				$P_8/OP-1$	1st week	36.88%
	Schuster (2003)	1988-1998	77	$P_1/OP-1$	1st day	13.03%
Netherlands	Doeswijk *et al.* (2005)	1977-2001	154	$P_1/OP-I_1/I_0$	1st day	14.9%
	van Frederikslust and van der Geest (2001)	1985-1998	106	$P_1/OP-1$	1st day	16%
				$P_1/OP-I_1/I_0$	1st day	16%
	Goergen *et al.* (2003)	1996-2000	11	$P_1/OP-1$	1st day	86.07%
				$P_8/OP-1$	1st week	64.47%
	van der Goot (2003)	1983-1997	92	$P_1/OP-I_1/I_0$	1st day	15.23%
	Roosenboom and van der Goot (2005)	1984-2001	118	$P_1/OP-1$	1st day	11.03%
	Roosenboom *et al.* (2003)	1984-1994	64	$P_1/OP-1$	1st day	3.82%
	Schuster (2003)	1988-1998	75	$P_1/OP-1$	1st day	13.46%
Poland	Aussenegg (2000)	1991-1998	98	$P_1/OP-1$	1st day	27.51%
				$P_1/OP-I_1/I_0$	1st day	21.78%
	Jelic and Briston (2003)	1991-1999	92	$P_1/OP-I_1/I_0$	1st day	28.83%
Portugal	Duque and Almeida (2000)	1992-1998	10	$P_1/OP-1$	1st day	16.95%

Table 9. Cont'd

Country	Authors	Period	Sample size	Methodology	Horizon	Mean underpricing
Spain	Alvarez and Gonzalez (2005)	1987-1997	56	$P_1/OP-1$	1st day	12.29%
				$P_1/OP-I_1/I_0$		11.77%
	Ansotegui and Fabregat (1999)	1986-1998	99	$P_1/OP-1$	1st day	10.68%
	Arcas and Ruiz (1999)	1992-1997	44	$P_1/OP-1$	1st day	17.17%
	Schuster (2003)	1988-1998	88	$P_1/OP-1$	1st day	14.75%
Sweden	Bodnaruk *et al.* (2004)	July 94-June 2001	124	$P_1/OP-1$	1st day	14.2%
	Rydqvist (1997)	1980-July 1994	251	$P_1/OP-I_1/I_0$	1st day	40.7% before 90 – 8% after 90
	Schuster (2003)	1988-1998	148	$P_1/OP-1$	1st day	18.46%
Switzerland	Drobetz *et al.* (2005)	1983-2000	120	$P_1/OP-1$	1st day	34.94%
				$P_1/OP-I_1/I_0$		34.97%
	Kunz and Aggarwal (1994)	1983-1989	42	$P_1/OP-1$	1st day	35.8%
	Schuster (2003)	1988-1998	43	$P_1/OP-1$	1st day	9.71%
Turkey	Kiymaz (2000)	1990-1996	163	$P_1/OP-I_1/I_0$	1st day	13.1%
United Kingdom	Brennan and Franks (1997)	1986-1989	64	$P_5/OP-I_1/I_0$	5th day	9.52%
	Brown (1999)	1990-1995	232	$P_1/OP-1$	1st day	8.70%
	Levis (1993)	1980-1988	712	$P_1/OP-I_1/I_0$	1st day	14.53%
	Levis (2004)	2000	240	$P_1/OP-1$	1st day	60.1%
	Ljungqvist and Wilhelm (2002)	1990- May 2000	876	$P_5/OP-1$	5th day	39.6%

The post-IPO equilibrium price can be the first trade price following the IPO, or the first closing price, or a closing price observed a few days after the IPO date. *OP*, P_1, P_5, P_8 respectively designate the offering price, the closing price on the first day of trading, the closing price on the 5th working day following the IPO and the closing price on the 8th post-IPO calendar day. MP_{30} is the mean closing price over the 30 calendar days following the IPO. *EP* denotes the first equilibrium price following the IPO. I_0 (I_1) is the market index closing value on the day immediately preceding the IPO (on the first trading day).

1.3. IPO underpricing in Europe in the recent years (1995-2004)

We compare the initial returns measured for the European IPO sample presented in Appendix 1 to those reported for prior periods. Consistent with previous studies, the mean raw return for the 2,104 European IPOs composing our sample on their first day of trading is very positive and equals 22.06%. We calculate raw returns in logarithmic terms according to equation (II.1) with 4 different post-issue prices: the first closing price following the IPO, the closing price on the 5th trading day following the IPO, the closing price on the 10th trading day following the IPO and the closing price one month after the issue. We also adjust these returns for market index returns as in equation (II.2). Daily closing prices and index values are obtained from Thomson Financial Datastream. Statistics on these initial returns comprising the mean, the median and the standard deviation, are reported in Table 10 for each country and each index. Substantial underpricing is found for all countries within a time horizon between one day and one month and for any benchmark, with no discrepancy between adjusted and raw returns. As an illustration, the average 1st trading day adjusted return rises to 22.01%, a value that is not significantly different from the average raw return of 22.06% mentioned above. These abnormal returns do not disappear in the short run and even grow slightly until the end of the first month of listing in most cases. When alternative indices are utilised to adjust returns, the results are not benchmark-dependent.

In spite of the convergence of mean values, standard deviations are large, proving that IPO initial returns are heterogeneous. Further, the median raw 1st-day return is far below the mean, at 6.41%. In fact, the distribution of initial returns is highly skewed, with median returns being inferior to mean returns in all cases.

Although the underpricing phenomenon is observed in every country of the sample, the level of underpricing varies notably from one national market to another. Countries where underpricing is close to the mean are Poland, Portugal, the Netherlands, Switzerland and the United Kingdom. Underpricing is relatively limited in Austria, Belgium, France, Italy, Spain, Sweden and Turkey, with the lowest average initial returns in France and Turkey, while initial returns exceed the sample mean in Germany where the mean 1st-day raw return equals 38.93%, in Greece with an average 1st-day return of 46.68% and to a lesser extent in Finland (27.76%). In order to understand the national cross-section of initial returns, the sample is broken down according to macroeconomic factors such as economic sector (Table 12) and business cycle (Table 11) as well as introduction mechanisms (Table 13).

Our sample is equally balanced between New Markets' and traditional market segments' issues. As expected, New Markets' issues exhibit larger initial returns (Table 11 Panel A), the excess initial returns of growth markets relative to Main and Parallel Markets being even greater in hot primary markets. The number of IPOs per annum reported in Appendix 1 Table B indicate that our ten-year observation period is characterised by three successive sub-periods: a low period from 1995 to 1997, a hot market in 1998-2000 and an extremely cold market from the end of 2000. The only exceptions are the London and the Athens stock exchanges where primary markets remain rather active in the years 2001-2004. Consistent with the findings of Loughran and Ritter (2002, 2004), underpricing varies across these market cycles: it increases substantially during the hot market period (Table 11 Panel B) and then falls in the cold market to levels observed in the eighties and the early nineties. In addition, the average difference in initial returns between traditional and growth segments nearly doubles during the hot issue period.

Table 10. Initial returns of IPOs in Europe by country from 1995 to 2004

Country	Sample size		Raw initial returns (in %)				Index		Adjusted initial returns (in %)			
			1st trading day	first 5 open days	first 10 open days	1st month of trading			1st trading day	first 5 open days	first 10 open days	1st month of trading
All	2104	***Mean***	22.06	28.09	29.29	31.32	**Largest**	***Mean***	22.01	27.80	28.73	30.40
		Median	6.41	9.36	9.65	10.17	**Largest**	***Median***	6.49	8.87	9.34	9.72
		Std-dev	46.45	66.22	70.75	77.09	**Largest**	***Std-dev***	46.47	66.02	70.50	76.41
Austria	23	***Mean***	6.96	15.19	11.63	12.23	**ATI**	***Mean***	7.11	15.59	11.81	11.23
		Median	2.54	1.36	2.66	3.27		***Median***	2.65	1.56	3.18	2.38
		Std-dev	16.38	40.51	31.04	36.34		***Std-dev***	16.45	40.33	31.23	35.54
Belgium	58	***Mean***	12.21	14.32	14.42	17.12	**BEL20**	***Mean***	11.98	13.31	12.82	15.13
		Median	4.73	4.65	7.36	6.28		***Median***	5.10	2.74	4.37	4.78
		Std-dev	20.05	28.02	28.07	38.00		***Std-dev***	19.95	27.23	26.72	36.49
Finland	44	***Mean***	27.76	25.89	27.46	26.43	**HEX General**	***Mean***	27.38	23.93	22.97	20.93
		Median	1.99	3.59	4.69	0.84		***Median***	3.65	5.30	0.55	2.64
		Std-dev	65.54	60.44	66.28	63.99		***Std-dev***	65.34	59.28	64.49	61.03
France	363	***Mean***	5.36	18.23	20.19	23.98	**CAC40**	***Mean***	5.23	17.54	19.00	22.15
		Median	0.00	8.53	8.52	9.26		***Median***	0.46	7.50	7.46	7.84
		Std-dev	14.17	31.94	38.66	52.39		***Std-dev***	14.13	31.65	37.96	51.40
							SBF 250	***Mean***	5.25	17.65	19.14	22.28
								Median	0.36	7.73	8.05	7.49
								Std-dev	14.12	31.66	37.99	51.40
Germany	415	***Mean***	38.93	39.75	41.20	44.42	**DAX 200**	***Mean***	38.86	39.39	40.49	42.80
		Median	12.49	12.00	13.38	13.78		***Median***	12.44	11.45	13.08	11.34
		Std-dev	62.35	72.37	76.41	85.83		***Std-dev***	62.33	72.28	76.23	85.49
							DAX 30	***Mean***	38.97	39.61	41.00	43.77
								Median	11.74	13.18	13.40	13.52
								Std-dev	62.37	72.15	75.85	84.76
							FAZ General	***Mean***	38.96	39.64	40.98	43.92
								Median	12.21	12.84	13.23	13.77
								Std-dev	62.27	72.03	75.72	84.67

Table 10. Cont'd

Country	Sample size		Raw initial returns (in %)					Adjusted initial returns (in %)				
			1st trading day	first 5 open days	first 10 open days	1st month of trading	Index		1st trading day	first 5 open days	first 10 open days	1st month of trading
Greece	183	***Mean***	46.68	69.94	74.21	79.32	**Athens SE General**	***Mean***	46.52	69.39	73.49	78.59
		Median	23.91	25.97	28.31	34.66		***Median***	23.94	27.00	27.84	33.92
		Std-dev	64.54	125.39	135.70	148.16		***Std-dev***	64.77	125.30	135.83	147.36
Italy	135	***Mean***	10.26	12.97	15.06	15.88	**MIB 30**	***Mean***	10.41	12.95	14.85	15.00
		Median	0.63	0.01	0.00	-0.30		***Median***	1.31	1.06	1.15	0.40
		Std-dev	26.13	42.83	48.00	49.24		***Std-dev***	25.94	42.35	47.93	47.97
							Milan Comit Global	***Mean***	10.25	12.85	14.92	15.02
								Median	1.27	0.39	1.14	0.43
								Std-dev	26.06	42.36	48.03	48.19
Netherlands	47	***Mean***	22.92	26.08	23.81	19.87	**AEX**	***Mean***	22.74	25.85	22.96	17.53
		Median	7.06	7.12	5.13	2.16		***Median***	6.79	5.55	1.59	0.92
		Std-dev	53.96	60.81	49.69	58.94		***Std-dev***	53.93	60.59	50.08	58.73
							Amsterdam SE All Shares	***Mean***	22.71	25.67	22.84	17.65
								Median	7.00	5.44	2.16	1.09
								Std-dev	53.91	60.50	49.85	58.69
Poland	95	***Mean***	19.55	17.68	16.66	16.56	**WGI 20**	***Mean***	19.81	18.38	16.50	14.93
		Median	7.14	6.55	5.71	1.79		***Median***	7.03	6.28	7.26	1.86
		Std-dev	53.15	61.05	62.10	64.08		***Std-dev***	53.86	61.65	63.18	65.33
							WGI	***Mean***	19.78	18.19	16.48	14.78
								Median	7.18	6.29	5.64	3.93
								Std-dev	53.77	61.71	63.20	65.21
Portugal	16	***Mean***	21.30	24.22	24.57	27.94	**PSI 20**	***Mean***	20.83	23.49	23.06	25.31
		Median	12.87	14.76	16.84	16.03		***Median***	11.57	12.49	16.07	17.27
		Std-dev	26.19	33.29	27.59	31.72		***Std-dev***	26.20	31.56	25.53	27.31
Spain	36	***Mean***	10.73	16.99	16.77	17.13	**Madrid SE Index**	***Mean***	10.27	16.33	15.57	17.38
		Median	0.06	9.42	10.65	11.13		***Median***	2.22	8.80	6.38	14.52
		Std-dev	23.39	32.78	33.97	38.00		***Std-dev***	23.49	31.37	32.76	36.70

Table 10. Cont'd

Country	Sample size		Raw initial returns (in %)				Index		Initial adjusted returns (in %)			
			1st trading day	first 5 open days	first 10 open days	1st month of trading			1st trading day	first 5 open days	first 10 open days	1st month of trading
Sweden	95	***Mean***	15.93	15.74	19.20	18.64	**OMX 30**	***Mean***	15.81	15.27	19.05	16.91
		Median	6.25	4.41	7.73	8.70		***Median***	7.22	4.44	7.73	8.09
		Std-dev	33.62	36.67	44.05	38.61		***Std-dev***	33.47	35.94	42.93	37.68
Switzerland	61	***Mean***	18.08	18.68	16.21	17.14	**SPI**	***Mean***	18.04	18.15	15.04	14.73
		Median	3.33	5.00	5.90	6.55		***Median***	3.50	5.46	5.50	4.13
		Std-dev	42.30	34.39	33.49	34.26		***Std-dev***	42.12	34.32	33.39	34.03
							Vontobel Small Companies	***Mean***	18.16	18.67	16.24	16.08
								Median	3.18	5.62	5.21	3.70
								Std-dev	42.16	34.24	33.09	33.59
							SMI	***Mean***	18.03	18.05	14.90	14.73
								Median	3.47	5.37	4.81	4.83
								Std-dev	42.12	34.35	33.39	34.13
Turkey	79	***Mean***	4.62	8.02	7.39	19.00	**ISE National 100**	***Mean***	4.72	7.84	5.94	18.55
		Median	0.00	0.00	0.00	0.00		***Median***	-0.67	4.08	3.37	0.92
		Std-dev	23.21	34.35	36.85	68.61		***Std-dev***	22.80	33.96	36.00	66.51
UK	454	***Mean***	21.27	26.33	26.84	25.94	**FTSE All Shares**	***Mean***	21.23	26.30	26.96	26.30
		Median	10.60	12.50	12.50	12.63		***Median***	10.57	12.55	12.87	12.53
		Std-dev	39.68	65.60	69.37	66.51		***Std-dev***	39.70	65.50	69.30	66.29
							FTSE 100	***Mean***	21.24	26.29	26.97	26.37
								Median	10.67	12.50	12.92	12.82
								Std-dev	39.70	65.52	69.33	66.32
							FTSE 350	***Mean***	21.23	26.30	26.95	26.30
								Median	10.59	12.53	12.88	12.52
								Std-dev	39.70	65.50	69.31	66.31

Initial returns are calculated for 4 different time intervals following the IPO: over the first day of trading, the first five trading days, the first ten trading days and the first month of listing. For a given interval of t trading days after the initial offer, the raw initial return is computed as the logarithm of the closing price on date t divided by the issue price and the adjusted return equals the raw return minus the index return measured as the logarithm of the index closing value on date t divided by the index closing value on the day preceding the IPO. Means and standard-deviations are equally weighted. All means are significantly positive at the 1% level. Exceptions are mean underpricing for Austria at the 5-day horizon (significant at 10%), 10-day horizon (significant at the 10% level) and 1˙month horizon (not significant), and Turkey at the 1-day horizon (significant at the 10% level) and the 10-day horizon (not significant).

Table 11. Initial returns of IPOs in Europe by market segment and sub-period from 1995 to 2004

Panel A: by market segment

Segment	Sample size		Raw initial returns (in %)				Initial adjusted returns (in %)			
			1st trading day	first 5 open days	first 10 open days	1st month of trading	1st trading day	first 5 open days	first 10 open days	1st month of trading
Traditional markets	821	***Mean***	11.58	14.77	14.99	15.62	11.54	14.57	14.33	14.29
		Median	3.06	5.71	5.13	4.37	3.42	5.61	4.75	3.89
		Std-dev	28.83	36.08	38.80	43.47	28.95	36.02	38.59	42.93
New markets	947	***Mean***	28.46	34.14	35.83	37.62	28.42	33.85	35.53	37.05
		Median	9.09	12.61	12.50	13.95	8.98	13.01	12.90	14.41
		Std-dev	53.96	69.70	73.77	78.32	53.91	69.41	73.32	77.47

Panel B: by period

Period	Sample size		Raw initial returns (in %)				Initial adjusted returns (in %)			
			1st trading day	first 5 open days	first 10 open days	1st month of trading	1st trading day	first 5 open days	first 10 open days	1st month of trading
1995-1997	389	***Mean***	15.86	17.69	18.77	20.42	15.89	17.48	18.09	18.29
		Median	8.61	9.08	9.42	8.53	8.33	8.60	8.17	7.35
		Std-dev	31.03	35.68	38.13	42.56	31.17	36.01	38.55	42.64
1998-2000	1290	***Mean***	27.18	36.28	37.89	40.61	27.06	35.78	37.05	39.42
		Median	6.00	11.47	12.02	13.35	6.23	11.27	11.47	12.67
		Std-dev	53.98	78.79	84.02	90.76	54.01	78.54	83.71	89.92
2001-2004	425	***Mean***	12.19	12.76	12.82	13.11	12.26	13.01	13.19	14.08
		Median	5.74	5.60	6.33	5.69	5.76	5.65	6.44	7.02
		Std-dev	27.41	34.29	37.85	45.51	27.37	34.16	37.91	45.46

Table 11. Cont'd

Panel C: by period and segment

Period	Segment	Sample size		Raw initial returns (in %)				Initial adjusted returns (in %)			
				1st trading day	first 5 open days	first 10 open days	1st month of trading	1st trading day	first 5 open days	first 10 open days	1st month of trading
1995-1997	**Traditional**	237	***Mean***	17.40	19.22	19.93	20.47	17.64	19.32	19.65	19.11
			Median	8.95	9.35	9.98	8.58	9.21	9.22	8.65	7.90
			Std-dev	34.49	39.42	40.49	42.66	34.67	39.69	40.77	42.99
	New	64	***Mean***	16.30	18.68	19.88	25.54	16.13	18.15	18.49	22.09
			Median	5.93	9.86	9.62	11.53	7.08	8.91	7.97	8.21
			Std-dev	27.01	28.99	33.95	46.64	26.71	28.62	33.46	46.27
1998-2000	**Traditional**	458	***Mean***	10.42	15.63	15.74	16.82	10.23	15.17	14.68	15.00
			Median	1.00	6.22	4.18	3.30	1.73	5.35	3.64	2.61
			Std-dev	28.28	37.71	41.57	47.86	28.37	37.52	41.11	46.98
	New	651	***Mean***	34.87	42.26	44.50	46.74	34.79	41.84	43.98	45.77
			Median	10.00	16.42	17.46	21.20	9.81	16.29	17.38	18.87
			Std-dev	61.90	80.14	84.30	88.41	61.88	79.83	83.85	87.56
2001-2004	**Traditional**	126	***Mean***	4.86	3.28	2.98	2.13	4.84	3.47	3.03	2.66
			Median	1.37	1.04	0.84	-0.42	1.80	2.50	2.01	2.03
			Std-dev	12.92	15.37	16.43	18.70	12.81	14.87	16.52	18.59
	New	232	***Mean***	13.81	15.59	15.88	15.34	13.92	15.77	16.51	16.72
			Median	8.00	9.30	9.78	7.81	8.18	8.54	10.06	9.63
			Std-dev	23.88	31.61	36.03	41.92	23.80	31.56	35.85	41.61

Initial returns are calculated for 4 different time intervals following the IPO: over the first day of trading, the first five trading days, the first ten trading days and the first month of listing. For a given interval of t trading days after the initial offer, the raw initial return is computed as the logarithm of the closing price on date t divided by the issue price and the adjusted return equals the raw return minus the index return measured as the logarithm of the index closing value on date t divided by the index closing value on the day preceding the IPO. Means and standard-deviations are equally weighted. Indices are those of Table 10. For countries with several indices, the largest index is chosen.

Table 12. Initial returns of IPOs in Europe by economic sector from 1995 to 2004

Sector	Sample size		Raw initial returns (in %)				Initial adjusted returns (in %)			
			1st trading day	first 5 open days	first 10 open days	1st month of trading	1st trading day	first 5 open days	first 10 open days	1st month of trading
Industry	655	***Mean***	17.15	20.95	20.02	21.69	16.93	20.74	19.48	20.70
		Median	4.69	6.45	6.33	6.67	4.72	6.33	6.33	5.49
		Std-dev	38.90	54.99	55.27	60.92	39.07	55.17	55.65	60.78
Bank-Insurance	85	***Mean***	17.20	21.25	22.00	18.31	17.42	20.74	21.13	17.53
		Median	5.08	7.69	5.93	3.27	5.32	6.44	5.76	3.01
		Std-dev	46.71	56.78	57.46	55.31	46.74	56.66	57.91	55.97
NTIC	679	***Mean***	28.81	37.42	39.82	43.51	28.90	37.13	39.30	42.61
		Median	8.82	14.29	14.29	16.82	8.51	14.53	14.33	16.84
		Std-dev	54.27	77.26	83.70	90.83	54.14	76.82	83.26	89.77
Other services	681	***Mean***	20.75	26.48	28.58	30.01	20.67	26.11	27.98	29.10
		Median	6.66	8.16	9.71	9.13	6.83	8.46	9.83	10.07
		Std-dev	44.00	64.45	70.29	77.04	44.03	64.18	69.73	76.23

Table 13. Initial returns of IPOs in Europe by floatation mechanism from 1995 to 2004

Mechanism	Sample size		Raw initial returns (in %)				Initial adjusted returns (in %)			
			1st trading day	first 5 open days	first 10 open days	1st month of trading	1st trading day	first 5 open days	first 10 open days	1st month of trading
Book-building	1569	***Mean***	24.53	31.91	33.51	35.82	24.44	31.64	33.12	35.22
		Median	6.67	10.00	10.89	11.60	6.96	9.85	10.59	11.46
		Std-dev	48.48	71.89	77.08	83.67	48.52	71.68	76.80	82.88
Fixed price	146	***Mean***	5.53	8.92	10.18	13.25	5.98	8.81	9.23	12.84
		Median	0.00	1.41	0.55	1.75	1.15	3.80	3.05	1.05
		Std-dev	24.56	32.97	38.48	53.00	24.37	32.23	38.09	52.40
Auction	92	***Mean***	13.39	20.89	19.78	23.18	13.07	20.42	18.60	21.67
		Median	8.38	15.15	12.88	14.19	8.47	14.13	10.56	10.88
		Std-dev	17.31	27.41	29.09	38.29	16.80	27.63	28.89	38.18

Raw returns are computed in logarithm on the basis of the market closing price and by reference to the issue price. Adjusted returns equals raw returns minus a market index return over the same period. Indices are those of Table 10. For countries with several indices, the largest index is chosen. Means and standard-deviations are equally weighted.

The high level of underpricing on New Markets is likely to be driven by IPOs in new technologies. On the basis of the sector classification available in Thomson Financial Datastream, we split the sample into four economic categories: industry, bank and insurance,[14] new technologies (referred to as 'NTIC') and other services. Industrial firms and banks and insurance companies have equivalent initial returns, the latter being less underpriced than other services. Among all categories, new technology companies are the most underpriced.

The breakdown of our sample according to IPO mechanisms shows that issuers leave more money on the table with book-building than with other procedures. The average raw return on the first trading day equals 24.53%. Contradicting the theory, fixed-price offerings are the least underpriced, with an average initial return of 5.53% and a null median return. This is probably due to the fact that companies going public with a fixed-price offering are more established and information asymmetry about their fundamental value is weaker. The underpricing of auctioned IPOs is in the middle with an average of 13.39%. The initial returns of book-built IPOs are more variable across firms than those of auctioned or fixed-price IPOs, which indicates that there is more uncertainty about the actual market value of companies going public with this method. It is also noticeable that the greater mean underpricing of these companies is attributable to extreme values since the median initial returns of book-buildings are lower than those of auctions.

The high level of underpricing observed on the German market can be attributed to the high concentration of German IPOs in the hot issue period, in the Neuer Markt and in the new technology sector (Tables B, C, D of Appendix 1). In comparison, less money is left on the table by French and Turkish issuers as they use fixed-price and tender offers more frequently. France and Turkey are also characterised by a large proportion of IPOs in the traditional economy.

1.4. Economic factors explaining IPO underpricing

Although several arguments have been put forward to explain IPO underpricing, the main explanatory factor is information asymmetry.

1.4.1. The information-related explanations for IPO underpricing

Models of asymmetric information interpret IPO underpricing as either a consequence of or a solution to information asymmetry between different parts of the firm or different categories of investors.

Underpricing: an output of information asymmetries

In Rock's (1986) and Welch's (1992) adverse selection models, IPO underpricing results from information asymmetries between investors. According to Rock (1986), the firm agrees to go public at a discounted price in order to retain less informed investors in the market. Rock assumes that some investors are perfectly informed whereas others are uninformed. The former bid only for attractively priced IPOs, while the uninformed bid indiscriminately. This imposes a 'winner's curse' on the uninformed: in 'bad' offerings, they would receive full allocation, but in 'good' IPOs, they would compete with the informed and receive partial or null allocations. Consequently, their average return across IPOs would be negative. Provided uninformed investors expected such an outcome, they would withdraw from the market and listing firms would be left with an IPO market occupied only by perfectly informed investors. With this feature, only attractive IPOs would succeed and others would lack buyers and fail. Therefore, by voluntarily underpricing their shares, issuers help uninformed investors to at

[14] Any other financial activity such as asset management, investment funds etc. are excluded.

least break even and thus retain them in the market. Further, according to Welch (1992), the uninformed mimic the informed investors' behaviour. By underpricing its shares, the firm induces both the informed and the uninformed to submit buy orders in a domino effect. In support of this hypothesis, Amihud et al. (2003) observe that such domino effects lead to either large or weak subscriptions.

The empirical literature has provided a wide international range of evidence of the 'winner's curse' hypothesis. Rock's model leads to several empirical predictions. Underpricing of a candidate firm increases because the IPO attracts the less informed. IPO underpricing increases the more investing in a given firm is considered to be risky (Miller and Reilly, 1987). The more underpriced a firm is, the more costly the search for information (Booth and Chua, 1996). In the case of over-subscription and high underpricing, the rationing of shares is in favour of the less informed, which has been observed in the case of Finland (Keloharju, 1993), the UK (Levis, 1990) and France (Sentis, 2001).

Other information asymmetries lead to underpricing, especially those between the firm and the lead manager. In Baron's (1982) model, underpricing results from a moral hazard problem between the candidate firm and underwriting banks. When the firm is less informed than its underwriter about investor intentions to buy, managers have an incentive to allow the bank to fix the offering price. When the firm cannot observe the banks' selling efforts, it has a great incentive to offer the bank a contract that underprices the shares and thus induces the bank to make the best effort. Baron's hypothesis is not confirmed by Muscarella and Vetsuypens (1989), who document underpricing even in the absence of agency costs between the underwriter and the issuing firm.

Underpricing: a means of solving information asymmetries

Signalling models

Signalling models proposed by Allen and Faulhaber (1989), Welch (1989), Grinblatt and Hwang (1989), suggest that firms underprice initially to allow investors to realise larger proceeds from secondary operations. In doing so, firms raise less money, so that only high-quality firms are able to underprice, and underpricing lets investors distinguish the good candidates from the bad ones.

The signalling theory generates a rich set of empirical predictions. If firms underprice as a condition for subsequent offerings, re-issuing companies should experience greater initial underpricing. However, the evidence on this proposition is not clear. In general, researchers have tested the signalling theory by examining the relationship between underpricing and the probability, size, speed and the announcement effect of subsequent equity sales. Michaely and Shaw's (1994) evidence does not support the signalling models with a sample of 947 IPOs between 1984 and 1988 on the US market. They find that the less underpriced firms at the date of IPO, generate better earnings and dividends in the after-market and tend to re-issue more frequently after the IPO. Two years after the IPO, the firm value is not directly linked to initial underpricing and capital retained by the owner. On the other hand, from a sample of 1,985 IPOs on the U.S. stock market between 1980 and 1986, Jegadeesh et al. (1993b) report a positive relationship between underpricing and the probability as well as the amount of seasoned equity offering or open-market insider sales. These results confirm Welch's (1992) model. However, Jegadeesh et al. (1993a) offer another explanation. Initial positive returns may convey the information that investors are confident about the firm's growth. Upon this market feedback, the firms may finance more investment opportunities by successive capital increases. Tests made by Jegadeesh et al. (1993a) and van Bommel and Vermaelen (2003) confirm this 'market feedback hypothesis'.

The signalling hypothesis has been more strongly validated on the French market than on other markets. Faugeron-Crouzet and Ginglinger (2002) find that firms going public on the second market have higher underpricing when re-issuing shares within four years of the IPO.

Underpricing as an incentive to reveal information during the pre-offer phase

Some models based on information revelation during the pre-offer period (Benveniste and Spindt, 1989; Benveniste and Wilhem, 1990; Spatt and Srivastava, 1991; Sherman and Titman, 2002) stipulate that the institutional investors may know more than the issuer about the prospects of the company's competitors and sector or the economy as a whole. Also, because they participate in the IPO market regularly, institutional investors may know more about the prospects of the IPO market. Finally, they know something the issuer does not know, that is their demand for stocks. Thus, the task for the underwriter is to acquire as many pieces of information as possible from them, during the pre-selling period, before setting the issue price. This structure challenges the underwriter to choose a mechanism that encourages truthful information disclosure instead of downplaying it to benefit from selling shares at the full information price in the after-market. The road-show or the book-building process can be seen as such a mechanism. Price discovery takes place in the pre-market and is then followed by the distribution of securities to investors. To make sure that investors truly reveal their private estimate of the share value, the underwriter can use stick and carrot strategies such as its power of allocation or underpricing.

The book-building literature has grown remarkably in the past few years, generating a rich set of empirical predictions. The challenge with testing information-disclosure models is to collect data on investors' bids and allocations and to identify whether these investors are informed or uninformed, regular or occasional clients, the type of information that is usually kept confidential. Cornelli and Goldreich (2001) have access to the books of one European investment bank participating in 23 international IPOs. They find that the empirical pattern in the underwriter's allocation and pricing decisions are very consistent with the Benveniste and Spindt model. The underwriter favours both investors who submit limit orders and regular investors with a better probability of allocation. With public data and data from market makers in the grey market for German IPOs over 1999 and 2000, Aussenegg et al. (2005) show that underwriters gather information from potential investors before posting a price range, and investors may be rewarded for providing information prior to the onset of when-issued trading.[15]

Sherman and Titman (2002) also support the thesis of information disclosure. They observe that the youngest and riskiest firms are the most underpriced as the institutional investors need more private information to reduce uncertainty about the firm's value.

Other predictions of the Benveniste and Spindt model can be tested. Underpricing should be concentrated among the offerings with the highest level of pre-market interest, because, in those cases, the underwriter adjusts the price upwards within the price range but only partially in order to leave enough money on the table to compensate informed investors for their truthful disclosure. From a sample of 1,430 IPOs on the US market between 1983 and 1987, Hanley (1993) provides empirical support for this partial adjustment phenomenon.

In the models of information disclosure, institutional investors are supposed to be informed and to subscribe to underpriced IPOs only. However, some empirical results do not confirm this conjecture and show that institutional investors subscribe to underpriced and overpriced IPOs in identical or approximately identical proportions (Hanley and Wilhelm, 1995; Krigman et al.,

[15] A 'when-issued market' is an unofficial market where new issues of shares are bought and sold before they become officially available for trading on the stock exchange

1999; Aggarwal et al., 2002). In fact, the level of underpricing does not appear to be the sole factor in deciding whether or not to participate in an IPO: other factors such as size, length of the relationship with the candidate company, or the company's reputation also play a role (Binay and Pirinsky, 2003).

Underpricing as an incentive for financial analysts to produce information after the IPO

In Chemmanur (1993) and more recently Aggarwal et al. (2002), the manager underprices shares to induce financial analysts to produce information about the firm. Underpricing the issue entails high initial returns, which attract the attention of potential analysts and media. Financial analysts' reports then increase investors' interest and demand in the firm's shares, which presents two advantages.

First, for Chemmanur (1993), the information role played by financial analysts favours future re-issuing operations. In this case, the owners hope to sell their remaining stake at a higher price than in the absence of underpricing. The results obtained by Spiess and Pettway (1997) on the US stock market do not support the predictions derived from the Chemmanur (1993) model. Working on a sample of 172 industrial firms introduced between 1987 and 1991 that issued again within the three subsequent years, they find that initial underpricing is significantly lower with the present value of initial and subsequent offerings and does not significantly determine the net profit from any of the issues for the existing shareholders.

Second, Aggarwal et al. (2002) argue that initial underpricing followed by financial analysts' activity is favourable to the insiders when a lock-up period is imposed, as it allows them to sell their shares at a higher price once the lock-up period expires. Tests using a sample of 621 IPOs on the US stock market between 1993 and 1999 confirm these predictions. Greater underpricing receives more attention from financial analysts, especially analysts unaffiliated with the underwriter, during the lock-up period. Moreover, research coverage is found to be correlated with stock price performance during the lock-up period and with the percentage of capital sold by the owner-manager at the end of the lock-up period.

Underpricing also has an effect on research by analysts affiliated to the underwriting bank (Cliff and Denis, 2004). This could be a compensation for the coverage efforts made by the analysts.

1.4.2. Underpricing as a tool for managing litigation risk

In some countries, especially the US, and particularly since the implosion of the internet bubble, investors disappointed by their investments sometimes sue issuers to recover financial losses resulting from incorrect, distorted or omitted information. In this context, underpricing can be a way of diminishing lawsuit risk. For instance, Tinic (1988) observes that IPO underpricing in the United States has significantly increased following the Securities Act of 1933, which mandates full and fair disclosure of the characters of securities in prospectuses. Recently, Lowry and Shu (2002) have confirmed the litigation-risk hypothesis. They show that firms with a higher risk of litigation underprice their IPOs by a greater amount as a form of insurance and that higher underpricing lowers lawsuit probability and expected costs. For that reason, investment bank underwriters would have strongly underpriced internet IPOs (Booth and Booth, 2003).

However, the threat of legal suits cannot be an important motivation for underpricing in European countries, where lawsuits are extremely rare.

1.4.3. Underpricing as a strategic behaviour of pre-IPO shareholders

Retaining control

Although IPO underpricing is costly for the existing shareholders, it can also favour ownership dispersion and thus limit the dilution of main shareholders' control. When the shares on offer are underpriced, the prospect of high initial returns attracts numerous investors and makes the issue oversubscribed. The over-subscription gives discretion to the underwriter and the managers to prioritise the allocation of shares to retail investors who are not interested in controlling the firm. This allows the owner-manager to retain control of the firm. Consistent with this hypothesis, Brennan and Franks (1997) find a negative link between order size and initial returns over a sample of 69 IPOs at the LSE between 1986 and 1989. They show that sellers in the after-market are not insiders and that issued shares are first offered to retail investors.

Maximising the sale price

In some situations, the money left on the table by pre-IPO owners may be deliberate in order to maximise post-IPO prices. Some original owners probably prefer to put up a relatively small percentage of the total number of shares, so that the lack of sufficient tradeable shares results in a rapidly increasing price because of a relatively thin market. If lock-up rules allow it, they can then sell their shares at a much higher price than if they had priced them correctly at the initial offering.

1.4.4. Underpricing as a means of making the secondary market more liquid

Underpricing as a result of the underwriter's price support

By using a sample of 463 US IPOs from 1982 to 1983, Ruud (1993) argues that underwriters do not underprice deliberately, but price IPOs at the expected market value and support offerings whose prices fall below the offer price in the after-market. According to Ruud (1993), it is not the unconditional expectation of the true initial return that is observed, which might be around 0, but the expectation conditional on the underwriter's intervention. Empirical tests of Ruud's (1993) hypothesis produce contradictory results. Degeorge (1995) rejects the hypothesis. Asquith et al. (1998) divide a sample of 560 US IPOs during 1982 and 1983 into two sub-groups: IPOs with price support and IPOs without price support. While the distribution of initial returns without price support should have a mean of 0, they find that firms without price support are underpriced by about 18%, and that supported ones are not underpriced once the effects of price support are taken into account. According to Westerholm (2000), active support by underwriters in Finland accounts for one third of observed underpricing.

Underpricing as a means of improving the secondary market's liquidity

A valuable finding in the Hanley (1993) model is to view price support as an insurance aimed at market makers rather than IPO investors. With a large sample of 1,523 US IPOs from 1982 to 1987, they confirm that price support lowers market makers' liquidity risk and accordingly leads them to charge lower bid-ask spreads. Thus, it helps the underwriter to be more competitive compared to its rivals.

For other researchers, underpricing strengthens the secondary stock market. Because underpriced operations are often over-subscribed, satisfied investors get the opportunity to sell their shares to rationed investors at a higher price than the IPO price. These buys and sells on

the IPO day, known as 'flipping activity', generate brokerage revenues for intermediaries that recoup the loss from underpricing (Boehmer and Fishe, 2000).

1.5. Conclusion

Since the 1970s, theoretical research has attempted to find rational factors for IPO underpricing. These explanations are more or less confirmed by data. Up to now, no general and unified approach exists, while the anomaly persists over time and is robust different institutional environments. As IPO underpricing cannot be integrated in a single interpretation, an analysis by strata could divide underpricing into components, one of which compensating the uninformed investors for their participation, another one compensating the institutional investors for their intentions to buy or another compensating the financial analysts for their research.

Loughran and Ritter (2004) suggest that the relevant explanation for underpricing changes over time: possibly 'the winner's curse' in the eighties and information disclosure models in the nineties.

2. A comparison of IPO long-run performance across European markets

The study of the long-run performance of firms after their IPO is of interest for issuers as well as for investors. Issuers may fairly wonder whether they are entering the stock market at a time that maximises their capitalisation, whereas, for investors, the relevant question is whether IPOs are attractive investments.

By definition, the long-run performance of firms going public is measured by stock price performance over a long time, generally from one year to five years after the IPO. The general assertion is that; although IPO firms are more risky with regard to delisting rates and price volatility (Peristiani, 2003), they perform poorly in the long-run; yet findings are not homogenous and very much depend on measurement methods.

2.1. Empirical measures of long-term performance

The measurement of long-term performance is a complex and controversial matter. Three categories of measures are commonly implemented in the literature: buy-and-hold abnormal returns, cumulated abnormal returns and constant terms from multi-factor models.

2.1.1. Buy-and-hold abnormal returns

The buy-and-hold abnormal return measure (BHAR) is probably the most frequently used methodology (see Tables 11 and 12). It represents the abnormal return of a portfolio passively invested in each IPO of the sample over *T* periods. Analytically, it equals the rate of return of a portfolio strategy consisting in buying stocks on their first trading day and holding them over *T* periods minus the rate of return of an appropriate benchmark over the same period of time.

For stock *i*:

$$BHAR_i = \prod_{t=1}^{T}(1 + r_{it}) - \prod_{t=1}^{T}(1 + I_t) \qquad \text{(II.5)},$$

where r_{it} is the rate of return of stock *i* on day, week, or month t, and I_t is the rate of return of the selected market index in period *t*. *T* is the total number of days, weeks, or months over which the performance is measured.[16] *t* is a relative-time index starting on the issue day and the first return is generally calculated upon the closing price of the first day of listing. Thus, $BHAR_i$ measures the long-term performance obtained by an investor who would buy stock *i* at the closure of the IPO's first day of trading.

The sample's average abnormal return is then computed as the arithmetic equally-weighted mean of individual abnormal returns:

$$BHAR = \frac{1}{n}\sum_{i=1}^{n} BHAR_i \qquad \text{(II.6)},$$

n being the number of IPOs in the sample.

2.1.2. Wealth relatives

The wealth-relative measure (WR) has the same logic as BHAR, in that it also measures the abnormal performance of a portfolio passively invested in IPOs at the initial trading day, but instead of calculating a difference between compounded rates of return, the security-to-market relative wealth compares final wealth values through the following ratio:

$$WR_i = \frac{1 + r_{iT}}{1 + I_T} \qquad \text{(II.7)}.$$

A wealth ratio greater than one indicates overperformance while one less than one indicates underperformance. The WR ratio of equation (II.7) is used by Levis (1993). Relative wealth can also be calculated by compounding the returns in sub-periods (Ritter, 1991; Loughran and Ritter, 1995; Drobetz et al., 2005):

$$WR_i = \frac{\prod_{t=1}^{T}(1 + r_{it})}{\prod_{t=1}^{T}(1 + I_t)} \qquad \text{(II.8)}.$$

For the sample,

$$WR = \frac{1}{n}\sum_{i=1}^{n} WR_i \qquad \text{(II.9)}.$$

The null hypothesis of BHAR or WR is preferably tested with a bootstrapped and skewness-adjusted t-statistic. The distribution of long-term performances has been shown to be skewed to the right, which biases negatively the usual t-statistic (Kothari and Warner, 1997; Lyon et al., 1999).

[16] 756 days, 156 weeks or 36 months, in most studies

2.1.3. Cumulative abnormal returns

For a robustness check, most researchers also use cumulative abnormal returns (CAR). The market-adjusted return[17] of IPO *i* on month *t* is defined as:

$$AR_{it} = r_{it} - I_t \qquad \text{(II.10)},$$

and the cumulative abnormal return of IPO *i* is obtained by adding together the monthly abnormal returns from month *1* to *T* :

$$CAR_i = \sum_{t=1}^{T} AR_{it} \qquad \text{(II.11)}.$$

The average benchmark-adjusted cumulative return of IPOs following introduction is the arithmetic equally-weighted mean of individual cumulative abnormal returns:

$$CAR = \frac{1}{n}\sum_{i=1}^{n} CAR_i \qquad \text{(II.12)},$$

The statistical significance of *CAR* is tested by:

$$t(CAR) = \frac{CAR\sqrt{n}}{\sqrt{T\sigma^2 + 2(T-1)cov}} \qquad \text{(II.13)},$$

where σ^2 is the average monthly cross-sectional variance of AR_{it} over *T* months and *cov* the first–order auto-covariance of the AR_t series, with $AR_t = \frac{1}{n}\sum_{i=1}^{n} AR_{it}$.

2.1.4. Multi-factor models

Several authors have shown empirically that when controlling for effects such as size or book-to-market, the long-term underperformance of IPOs decreases, or even disappears. This finding justifies the use of multi-factor models, in which stock or portfolio returns are regressed on a fixed number of common factors, the first factor being invariably the market return and the intercept representing the mean abnormal performance.

The Fama and French (1992) three-factor model

The Fama-French model represents the stock returns in function of three common factors: the market return, the size effect and the *book-to-market* effect, as follows:

$$r_{pt} - r_{ft} = \alpha_p + \beta_p(I_t - r_{ft}) + s_p SMB_t + h_p HML_t + e_{pt} \qquad t = 1,2,...T \qquad \text{(II.14)},$$

where r_{pt} is the return on a portfolio *p* of IPOs for month *t*, r_{ft} is a monthly short-term risk-free rate, I_t is the monthly return of a market proxy, β_p is the beta of portfolio *p*, SMB_t is the

[17] Monthly abnormal returns are not adjusted for systematic risk. Ibbotson (1975), Ritter (1991) and Clarkson and Thompson (1990), among others, demonstrated that the average IPOs' betas declined with the length of time after the issue and that the mean difference in betas between IPOs and other firms was too small to have a significant effect on the results. Ritter (1991) underlined that, in the case betas of IPOs were systematically stronger than those of other firms, measured underperformance would be thus underestimated.

difference in the returns of a value-weighted portfolio of small stocks and large stocks on month *t*, s_p is the sensitivity of portfolio *p* to the factor *SMB*, HML_t is the difference in the returns of a value-weighted portfolio of high book-to-market stocks and low book-to-markets on month *t*, *T* is the length in months of the period of observations, e_{pt} is an error term. The estimate of the intercept α_p provides a test of the null hypothesis that the mean abnormal return on the calendar portfolio is zero.

The estimation of the parameters of equation (II.14) entails several methodological problems: the definition of the different months *t*, the choice of the index *I*, the choice of the regression methodology, the formation of portfolios *p*, *SMB* and *HML*.

Lyon et al. (1999) support use of calendar-time portfolios. The monthly returns are calculated from closing prices at the end of each month. The calendar-time regressions capture excess returns starting on the first day of the month following the month of the IPO. Returns between the offering date and the end of the first month are not incorporated in the analysis. This approach controls for the non-independence of returns over time.

The number of IPOs is not constant from month to month, thus weighted least-squares should be used to account for the time-varying number of observations used to create the calendar portfolios (Krigman et al.,1999).

Calendar portfolios (*p*, *SMB*, *HML*) are value-weighted. Fama and French (1993, 1996) document that three-factor models have systematic problems in explaining the average returns on categories of small stocks. Loughran and Ritter (2000) confirm that multi-factor regressions fail in detecting abnormal returns that are present especially when the target population comprises small stocks like typical IPOs. Value-weighting is used to avoid giving more weight to small stocks.

The Carhart 's (1997) model

Jegadeesh et al. (1993a) and Carhart (1997), among others, have shown momentum in stock returns to be a significant factor in explaining performance. Carhart (1997) adds a fourth factor to the Fama-French model, *MOM*, which is defined as the equally-weighted average return of firms with the highest 30% returns minus the equally-weighted average of firms with the lowest 30% returns on the preceding month. Regression (II.14) is transformed as follows:

$$r_{pt} - r_{ft} = \alpha_p + \beta_p \left(I_t - r_{ft}\right) + s_p SMB_t + h_p HML_t + m_p MOM_t + e_{pt} \qquad t = 1,2,...T \quad \text{(II.15)},$$

where MOM_t is the difference in the returns of the highest 30% and the 30% lowest on month *t-1*.

The Eckbo et al. (2000) model

Eckbo et al. (2000) propose a six-factor model including the market excess return and five other mainly macroeconomic factors:

$$\begin{aligned} r_{pt} - r_{ft} = \alpha_p + \beta_p \left(I_t - r_{ft}\right) + a_p \Delta RPC_t + b_p \left(BBB - AAA\right)_t + c_p UI_t \\ + d_p \left(30y - 1y\right)_t + e_p Tbill_t + e_{pt} \qquad t = 1,2,...T \end{aligned} \quad \text{(II.16)}.$$

ΔRPC_t is the change of consumption level in non-durable goods per habitant on month *t* ; $\left(BBB - AAA\right)_t$ is the change of yield difference between bonds rated AAA and bonds rated

BBB during month t ; UI_t is the unanticipated inflation on month t ; $(30y-1y)_t$ is the yield difference between 30-year government bonds and 1 year government bonds on month t ; $Tbill_t$ is the yield difference between 90 days treasury notes and 30 days treasury notes.

Of these three models, the most popular in the literature is Fama-French, followed by Carhart.

2.1.5. Benchmark selection

Several studies (Brav and Gompers, 1997; Stehle et al., 2000; Schuster, 2002; Drobetz et al., 2005; etc.) show that long-term performance is sensitive to benchmarks. According to Loughran and Ritter (2000), using an official market index may lead to underestimation of underperformance, because it includes some issuing firms. Several authors, especially Brav and Gompers (1997), Stehle et al. (2000), Brav et al. (2000), argue that benchmarks built upon size and book-to-market give more reliable results.

2.2. Empirical results on long-term performance: previous literature

The major result, broadly accepted but recently challenged, is that IPOs perform badly over one to five years following their introduction on the stock market. This result has also been established in a large number of countries. Table 14 sums up the findings of the main articles that provide empirical evidence of IPOs' long-run underperformance in Europe.

The underperformance measured in European countries is generally lower than that observed on US stock markets[18]. On some European stock markets, this long-term underperformance has been challenged (Table 15), especially in France and in Switzerland, and more surprisingly, a positive abnormal performance has been observed on the Swedish and Greek markets.

Finally, some authors (Brav et al., 2000; Drobetz et al., 2005; Álvarez and González, 2005) show that measured performance strongly depends on the selected methodology. According to Brav et al., 2000, the underperformance measured with traditional indexes on the US markets disappears with an index formed with firms similar in terms of size and book-to-market.

2.3. IPO long-run performance in Europe in recent years (1995-2004)

In this sub-section, we report the long-term performance measured on our sample (Appendix 1) over two time horizons: the first year and the first three years following the initial issue. Given that price data are not necessarily available for each IPO up to one year and three years after the first listing, the size of our sample[19], initially 2,104, decreases to 2,026 when measuring one-year performance, and to 1,846 when measuring 3-year performance. Long-term performance is estimated as follows. In a first stage, daily returns are calculated in logarithmic terms using closing prices for stocks and market indices. In a second stage, three measures of long-term performance are computed on the basis of daily returns: buy-and-hold returns (BHAR) according to equations (II.5) and (II.6), wealth relative ratios (WR) as in equations (II.7) and (II.9), and cumulated abnormal returns (CAR) as in equations (II.10), (II.11) and (II.12). Means, medians and standard deviations of these measures are reported in Table 16 for each country and each index. As for the analysis of initial underpricing, we disaggregate the sample by sector

[18] See Ritter (1991), Loughran (1993) and Loughran and Ritter (1995) for evidence of the IPO long-term underperformance on the US markets.

[19] This sample represents 40.38% of the total number of IPOs reported by the WFE during the same period (see Table 1).

categories, market segments, sub-periods and floatation mechanisms. Comparative results are provided in Tables 18, 19 and 20.

Consistent with most studies, and notably those cited in Table 14, the long-term abnormal returns of our sample are frequently negative, but vary over time and across countries. More importantly, levels of underperformance across countries and market indices show that results are not benchmark-dependent but differ across methodologies. Whereas evidence of underperformance at the one-year term is unclear (the average first-year CAR equals –21.59% but the average first-year BHAR of –1.52 % is not significantly different from zero and the WR measure exceeds 1), we find a significant three-year underperformance with each measure: -32.61% for BHAR, 0.87 for WR, and –87.19% for CAR). Similar to initial returns, the standard deviations show a great variability of performance across IPO stocks. Further, median long-run returns are inferior to mean returns in all cases and the distribution of performance is skewed to the left.

Table 14. Empirical evidence of IPOs' long-term underperformance in Europe

Country	Authors	Period	Sample size	Methodology	Horizon	Mean abnormal performance
Austria	Aussenegg (2006)	1984-1993	57	BHAR	3 years	-47.42%
				WR		0.73
	Aussenegg (2006)	1984-1991	51	BHAR	5 years	-73.95%
				WR		0.64
Finland	Keloharju (1993)	1984-1989	79	BHAR	3 years	–21%
France	Brounen and Eichholtz (2002)	1984-1999	17	CAR	1 year	–12.62%
	Chahine (2004a)	1996-1998	168	BHAR	2 years	–9.94%
	Leleux and Muzyka (1997)	Nov.87-Mar.91	56	CAR	3 years	–29.2%
Germany	Jaskiewicz *et al*. (2005)	1990-2000	-	BHAR	3 years	-32.8%
	Ljungqvist (1997)	1970-1993	180	BHAR	3 years	–12.11%
	Sapusek (1998)	1983-1993	142	CAR	3 years	–20%
	Stehle *et al*. (2000)	1960-1992	187	BHAR	3 years	–6%
Poland	Jelic and Briston	1991-1999	19	CAR	3 years	-66.80%
				BHAR		-50.93%
Portugal	Duque and Almeida (2000)	1992-1998	21	CAR	1 year	–2.80%
Spain	Álvarez and González (2005)	1987-1997	56	BHAR	3 years	From –14.16% to –31.11% according to the benchmark
	Jaskiewicz *et al*. (2005)	1990-2000	-	BHAR	3 years	-36.7%
Switzerland	Kunz and Aggarwal (1994)	1983-1989	42	AR	3 years	-6.1%
United-Kingdom	Brounen and Eichholtz (2002)	1984-1999	24	CAR	1 year	–4.53%
				BHAR		–5.83%
	Khurshed *et al.* (1999)	1991-1995	240	BHAR	3 years	-17.81%
	Leleux and Muzyka (1997)	Nov.87-Mar.91	220	CAR	3 years	–21.8%
	Levis (1993)	1980-1988	483	CAR	3 years	From –8.31% to -22.96% according to the benchmark

Table 15. Empirical evidence refuting IPOs' long-term underperformance in Europe

Country	Authors	Period	Sample size	Methodology	Horizon	Mean abnormal performance
Belgium	Leleux and Muzyka (1997)	Nov.87-Mar.91	8	CAR	3 years	n.s.
France	Degeorge and Derrien (2001b)	1991-1998	243	CAR / BHAR	3 years	n.s.
Germany	Leleux and Muzyka (1997)	Nov.87-Mar.91	18	CAR	3 years	n.s.
Greece	Nounis (2003)	1994-2002	254	AR	1 year	+14.68%
Netherlands	Doeswijk *et al.* (2005)	1977-2001	154	BHAR	1 and 3 years	n.s.
	Leleux and Muzyka (1997)	Nov.87-Mar.91	5	CAR	3 years	n.s.
Poland	Aussenegg (2000)	1991-1997	45	BHAR WR	1 years	36.53% 1.263
	Aussenegg (2000)	1991-1997	45	BHAR WR	2 and 3 years	n.s. 1.028 and 0.924
Spain	Álvarez and González (2005)	1987-1997	56	Fama-French	3 years	n.s.
Sweden	Brounen and Eichholtz (2002)	1984-1999	13	CAR BHAR	1 year	+18.89% +22.16%
	Loughran *et al.* (1994)	1980-1990	162	BHAR	3 years	+1.2%
Switzerland	Drobetz *et al.* (2005)	1983-2000	120	BHAR CAR	3 years	-1.69% (n.s) or +5.12% in function of the index –7.45%% or –1.02% (n.s.) in function of the index
	Kunz and Aggarwal (1994)	1983-1989	42	AR	3 years	-6.1%
United-Kingdom	Brown (1999)	1990-1995	232	BHAR	3 years	n.s.
	Levis (2004)	2000	23 for Main Market	AR	<= 1 year	Over-performance from +15.6% to +36.9% in function of the index
France, Germany Italy, Netherlands, Spain, Sweden, Switzerland	Schuster (2003)	1988-1998	972	BHAR	3 years	+8.44%

Table 16. Long-term performance of IPOs in Europe by country from 1995 to 2004

Country	Index		Buy-and-hold abnormal returns (in%)		Wealth relative ratios (in %)		Cumulated abnormal returns (in %)	
			1st year	first 3 years	1st year	first 3 years	1st year	first 3 years
All	**Largest**	*Mean*	-1.52	-32.61***	1.09***	0.87***	-21.59***	-87.19***
		Number	2,026	1,846	2,026	1,846	2,026	1,846
		Median	-25.06	-43.35	0.82	0.51	-16.96	-67.27
		Std-dev	115.51	159.53	1.26	1.84	81.41	140.57
Austria	**ATI**	*Mean*	4.74	-31.98	1.10	0.86	-5.35	-100.06**
		Number	22	21	22	21	22	21
		Median	-2.66	-25.02	0.99	0.84	-0.98	-18.73
		Std-dev	71.70	91.28	0.71	0.79	57.31	184.24
Belgium	**BEL20**	*Mean*	19.88	14.98	1.30**	1.37	2.11	-44.02***
		Number	57	51	57	51	57	51
		Median	-4.68	-48.62	1.07	0.56	6.18	-59.59
		Std-dev	103.80	180.30	1.00	2.54	72.73	112.19
Finland	**HEX General**	*Mean*	-14.00	-61.47***	1.05	0.70***	-25.32**	-70.07***
		Number	44	43	44	43	44	43
		Median	-17.55	-33.81	0.94	0.53	-15.01	-66.25
		Std-dev	96.82	120.76	0.86	0.63	84.95	89.68
France	**CAC40**	*Mean*	11.44*	-36.33***	1.21***	1.00	-8.72**	-56.86***
		Number	362	355	362	355	362	355
		Median	-20.46	-43.87	0.87	0.58	-11.32	-51.93
		Std-dev	128.33	124.85	1.38	1.28	77.15	115.40
	SBF250	*Mean*	11.63*	-36.96***	1.22***	0.99	-8.22**	-57.61***
		Number	362	355	362	355	362	355
		Median	-20.02	-47.10	0.88	0.58	-11.06	-52.10
		Std-dev	128.30	123.65	1.38	1.27	77.28	115.10
Germany	**DAX200**	*Mean*	-19.57**	-53.69***	1.09	0.59***	-47.37***	-187.85***
		Number	410	408	410	408	410	408
		Median	-53.27	-64.66	0.68	0.20	-41.35	-161.21
		Std-dev	153.98	211.40	1.75	2.77	104.74	170.83
	DAX30	*Mean*	-8.75	-30.28***	1.13	0.66**	-38.47***	-167.60***
		Number	410	408	410	408	410	408
		Median	-43.38	-40.78	0.70	0.24	-37.41	-140.73
		Std-dev	151.48	210.89	1.76	2.94	97.67	164.94
	FAZ General	*Mean*	-7.60	-31.06***	1.14	0.67**	-37.94***	-171.13***
		Number	410	408	410	408	410	408
		Median	-43.73	-43.65	0.70	0.23	-36.71	-146.50
		Std-dev	151.90	211.55	1.83	3.18	98.70	166.35
Greece	**Athens SE General**	*Mean*	36.29***	38.10*	1.29***	1.30**	11.87**	-4.63
		Number	174	148	174	148	174	148
		Median	-8.54	-17.24	0.99	0.85	3.60	-3.65
		Std-dev	147.60	250.91	0.95	1.66	64.22	85.17
Italy	**MIB30**	*Mean*	-7.01	-30.47***	1.02	0.84***	-11.82**	-45.00***
		Number	135	127	135	127	135	127
		Median	-17.86	-33.77	0.84	0.69	-15.65	-37.54

		Std-dev	63.14	61.73	0.67	0.67	53.78	80.48
	Milan Comit Global	*Mean*	-8.63*	-37.24***	1.02	0.84***	-12.95***	-50.23***
		Number	135	127	135	127	135	127
		Median	-20.40	-38.82	0.84	0.69	-15.93	-45.11
		Std-dev	63.46	62.43	0.67	0.67	53.94	80.62

Table 16. Cont'd

Country	**Index**		**Buy-and-hold abnormal returns (in%)**		**Wealth relative ratios (in %)**		**Cumulated abnormal returns (in %)**	
			1st year	**first 3 years**	**1st year**	**first 3 years**	**1st year**	**first 3 years**
Netherlands	**AEX**	*Mean*	5.36	-18.81	0.99	0.67	-12.77	-66.96***
		Number	46	44	46	44	46	44
		Median	-17.67	-36.07	0.89	0.60	-8.56	-44.79
		Std-dev	129.71	117.64	1.10	0.94	71.96	119.60
	Amsterdam SE All Shares	*Mean*	5.99	-17.50	1.14	0.91	-11.83	-66.16***
		Number	46	44	46	44	46	44
		Median	-16.05	-37.91	0.91	0.60	-6.18	-46.47
		Std-dev	130.17	118.63	1.14	0.99	71.89	120.69
Poland	**WGI 20**	*Mean*	-25.57***	-30.71**	0.82***	0.86***	-38.52***	-71.10***
		Number	81	76	81	76	81	76
		Median	-32.52	-48.85	0.66	0.53	-37.29	-64.17
		Std-dev	48.09	113.83	0.49	1.30	65.26	115.12
	WGI	*Mean*	-28.84***	-42.18***	0.80***	0.77***	-41.83***	-80.83***
		Number	81	76	81	76	81	76
		Median	-38.88	-58.46	0.68	0.48	-37.31	-76.50
		Std-dev	46.51	111.78	0.47	1.08	65.84	115.59
Portugal	**PSI20**	*Mean*	11.48	-19.24	1.16	0.86	0.17	-29.58*
		Number	16	15	16	15	16	15
		Median	3.14	-17.25	1.06	0.91	4.19	-6.21
		Std-dev	58.38	50.03	0.69	0.41	54.36	60.56
Spain	**Madrid SE Index**	*Mean*	-6.48	-29.30***	0.96	0.85*	-6.79	-27.00***
		Number	35	33	35	33	35	33
		Median	-14.76	-37.51	0.87	0.71	-8.47	-25.99
		Std-dev	49.23	58.15	0.43	0.52	45.49	56.70
Sweden	**OMX 30**	*Mean*	8.69	-47.61***	1.17	0.97	-12.45	-63.31***
		Number	94	89	94	89	94	89
		Median	-20.30	-42.60	0.87	0.77	-13.06	-26.09
		Std-dev	120.61	79.86	1.09	1.23	77.41	135.87
Switzerland	**SPI**	*Mean*	-19.84***	-27.10***	0.85**	0.84	-37.03***	-74.44***
		Number	60	59	59	59	60	59
		Median	-22.87	-47.30	0.83	0.64	-18.67	-45.93
		Std-dev	49.60	75.57	0.50	0.86	89.53	133.97
	Vontobel Small Companies	*Mean*	-17.21***	-32.81***	0.89*	0.82*	-32.76***	-75.16***
		Number	60	59	60	59	60	59
		Median	-17.16	-48.10	0.89	0.56	-9.63	-58.68
		Std-dev	48.14	79.66	0.47	0.81	90.15	130.42

	SMI	*Mean*	-18.17***	-20.54**	0.88*	0.90	-35.76***	-68.85***
		Number	60	59	60	59	60	59
		Median	-20.63	-39.84	0.84	0.68	-17.06	-41.20
		Std-dev	50.28	75.33	0.53	0.93	89.48	134.53
Turkey	**ISE National 100**	*Mean*	-39.97***	-191.51***	0.86**	0.69***	-28.20***	-66.33***
		Number	76	71	76	71	76	71
		Median	-40.19	-108.46	0.70	0.51	-31.86	-63.07
		Std-dev	54.15	256.22	0.60	0.64	55.01	84.75

Table 16. Cont'd

Country	**Index**		**Buy-and-hold abnormal returns (in%)**		**Wealth relative ratios (in %)**		**Cumulated abnormal returns (in %)**	
			1st year	**first 3 years**	**1st year**	**first 3 years**	**1st year**	**first 3 years**
UK	**FTSE All Shares**	*Mean*	-10.96***	-27.74***	0.97	0.78***	-35.71***	-102.85***
		Number	414	306	414	306	414	306
		Median	-26.24	-50.14	0.76	0.48	-25.22	-73.18
		Std-dev	82.54	64.18	1.15	1.07	84.87	153.30
	FTSE 100	*Mean*	-9.92**	-24.88***	0.98	0.80***	-35.03***	-100.16***
		Number	414	306	414	306	414	306
		Median	-25.47	-47.48	0.77	0.50	-24.22	-70.22
		Std-dev	82.87	64.32	1.18	1.10	85.13	153.54
	FTSE 350	*Mean*	-10.87***	-27.37***	0.97	0.78***	-35.72***	-102.68***
		Number	414	306	414	306	414	306
		Median	-26.22	-49.70	0.76	0.48	-25.32	-72.84
		Std-dev	82.70	64.24	1.16	1.07	85.01	153.41

Long-term abnormal returns are measured by buy and hold returns and cumulated abnormal returns over 1 year and 3 years following the IPO. Means and standard-deviations are equally weighted. ***,**,* indicates statistical significance respectively at the 1%, 5%, 10% level.

Table 17. Long-term performances of IPOs in Europe by market segment and period from 1995 to 2004

Panel A: by market segment

Segment		**Buy and hold returns (in %)**		**Wealth relative ratios (in %)**		**Cumulated abnormal returns (in %)**	
		1st year	**first 3 years**	**1st year**	**First 3 years**	**1st year**	**first 3 years**
Traditional markets	*Mean*	-7.20***	-31.72***	1.01***	0.93***	-17.27***	-56.86***
	Number	796	752	796	752	796	752
	Median	-20.02	-42.67	0.86	0.65	-13.31	-44.22
	Std-dev	69.60	101.66	0.69	1.02	66.09	114.62
New markets	*Mean*	-2.16	-35.68***	1.14***	0.73***	-33.11***	-136.12***
	Number	907	809	907	809	907	809
	Median	-35.42	-45.53	0.74	0.30	-30.57	-117.27
	Std-dev	141.37	161.30	1.68	2.41	95.68	159.40

Table 17. Cont'd

Panel B: by period

Period		Buy and hold returns (in %)		Wealth relative ratios (in %)		Cumulated abnormal returns (in %)	
		1st year	first 3 years	1st year	first 3 years	1st year	first 3 years
1995-1997	*Mean*	4.98	-41.42**	1.18***	1.27***	-5.80*	-45.37***
	Number	389	389	389	389	389	389
	Median	-19.17	-92.01	0.90	0.61	-10.37	-49.23
	Std-dev	142.65	323.01	1.62	3.49	59.18	107.88
1998-2000	*Mean*	-1.15	-31.44***	1.10***	0.74***	-26.25***	-104.25***
	Number	1,289	1,289	1,289	1,289	1,289	1,289
	Median	-30.59	-40.65	0.76	0.46	-24.66	-76.35
	Std-dev	118.96	63.63	1.26	1.02	90.18	149.00
2000-2004	*Mean*	-10.17***	-21.15***	0.97***	0.95***	-21.97***	-53.20***
	Number	348	168	348	168	348	168
	Median	-13.24	-38.35	0.89	0.77	-10.70	-27.78
	Std-dev	49.58	84.89	0.58	0.90	64.94	112.07

Panel C: by period and segment

Period	Segment		Buy and hold returns (in %)		Wealth relative ratios (in %)		Cumulated abnormal returns (in %)	
			1st year	first 3 years	1st year	first 3 years	1st year	first 3 years
1995-1997	**Traditional**	*Mean*	-4.92	-61.09***	1.02***	0.83***	-9.98***	-52.37***
		Number	237	237	237	237	237	237
		Median	-18.25	-86.88	0.90	0.60	-11.17	-53.52
		Std-dev	65.48	128.89	0.57	0.80	49.35	82.71
	New	*Mean*	51.29	18.04	1.75***	2.38***	2.00	-63.13***
		Number	64	64	64	64	64	64
		Median	-20.30	-121.30	0.93	0.46	-7.84	-77.73
		Std-dev	302.18	550.92	3.66	7.88	87.39	162.40
1998-2000	**Traditional**	*Mean*	-9.35***	-19.34***	1.00***	0.96***	-22.59***	-60.60***
		Number	458	458	458	458	458	458
		Median	-26.58	-37.50	0.79	0.66	-20.09	-42.15
		Std-dev	76.07	76.07	0.78	1.10	74.78	127.11
	New	*Mean*	-3.01	-41.69***	1.15***	0.55***	-36.69***	-154.18***
		Number	650	650	650	650	650	650
		Median	-42.19	-44.64	0.69	0.25	-37.65	-138.10
		Std-dev	134.36	47.79	1.57	0.89	102.62	160.33

2000-2004	**Traditional**	*Mean*	-2.74	-9.09	1.03***	1.09***	-10.28*	-45.51***
		Number	101	57	101	57	101	57
		Median	-3.92	-27.58	1.02	0.89	0.47	-24.95
		Std-dev	43.53	126.27	0.48	1.11	55.79	123.19
	New	*Mean*	-17.01***	-30.71***	0.88***	0.85***	-32.73***	-61.71***
		Number	193	95	193	95	193	95
		Median	-22.70	-44.87	0.82	0.75	-17.26	-28.81
		Std-dev	46.27	47.05	0.58	0.73	68.15	108.40

Long-term abnormal returns are measured by buy and hold returns, wealth returns and cumulated abnormal returns over 1 year and 3 years following the IPO. Means and standard-deviations are equally weighted. Indices are those of Table 16. For countries with several indices, the largest index is selected. ***, **, * indicates statistical significance respectively at the 1%, 5%, 10% level.

Table 18. Long-term performances of IPOs in Europe by economic sector from 1995 to 2004

Sector		**Buy-and-hold abnormal returns (in %)**		**Wealth relative ratios (in %)**		**Cumulated abnormal returns (in %)**	
		1st year	**first 3 years**	**1st year**	**first 3 years**	**1st year**	**first 3 years**
Industry	*Mean*	-6.57	-42.07***	1.02***	0.91***	-17.06***	-56.45***
	Number	623	563	623	563	623	563
	Median	-24.51	-44.88	0.82	0.63	-17.92	-48.14
	Std-dev	98.33	153.10	0.81	1.09	62.57	107.51
Bank-Insurance	*Mean*	-3.40	-27.62**	1.01***	1.03***	-12.01*	-30.78**
	Number	82	74	82	74	82	74
	Median	-14.23	-19.43	0.90	0.99	-8.40	0.19
	Std-dev	78.44	115.37	0.63	0.72	56.91	108.51
NTIC	*Mean*	-1.72	-31.68***	1.12***	0.74***	-29.60***	-129.23***
	Number	718	675	653	617	718	675
	Median	-31.68	-46.53	0.75	0.27	-21.60	-115.30
	Std-dev	118.28	124.81	1.40	1.66	98.80	156.10
Other services	*Mean*	4.40	-26.37***	1.14***	0.95***	-16.04***	-76.18***
	Number	664	589	664	589	664	589
	Median	-21.41	-40.65	0.87	0.61	-12.51	-49.60
	Std-dev	128.39	194.89	1.48	2.56	77.90	142.41

Long-term abnormal returns are measured by buy and hold returns, wealth returns and cumulated abnormal returns over 1 year and 3 years following the IPO. Means and standard-deviations are equally weighted. Indices are those of Table 16. For countries with several indices, the largest index is selected. ***,**,* indicates statistical significance respectively at the 1%, 5%, 10% level.

Table 19. Long-term performances of IPOs in Europe by floatation mechanism from 1995 to 2004

Mechanism		Buy and hold returns (in %)		Wealth relative ratios (in %)		Cumulated abnormal returns (in %)	
		1st year	first 3 years	1st year	first 3 years	1st year	first 3 years
Book-building	*Mean*	1.05	-24.18***	1.12***	0.86***	-21.68***	-94.84***
	Number	1,510	1,351	1,510	1,351	1,510	1,351
	Median	-24.74	-41.65	0.83	0.49	-16.73	-69.13
	Std-dev	122.19	157.43	1.37	2.01	84.35	147.89
Fixed price	*Mean*	-14.15***	-104.29***	1.01***	0.84***	-16.16***	-60.29***
	Number	141	138	141	138	141	138
	Median	-23.55	-65.38	0.84	0.57	-15.59	-51.30
	Std-dev	77.30	209.34	0.72	0.91	59.13	101.47
Auction	*Mean*	-1.64	-31.81	1.06***	1.11***	-14.40**	-47.94***
	Number	91	88	91	88	91	88
	Median	-29.29	-65.37	0.78	0.56	-19.27	-55.78
	Std-dev	92.72	186.93	0.85	1.77	68.93	107.02

Long-term abnormal returns are measured by buy and hold returns, wealth returns and cumulated abnormal returns over 1 year and 3 years following the IPO. Means and standard-deviations are equally weighted. Indices are those of Table 16. For countries with several indices, the largest index is selected. ***,**,* indicates statistical significance respectively at the 1%, 5%, 10% level.

Regarding national differences, at the three-year horizon, substantial underperformance is found for all European countries, except Belgium and Portugal. For Portugal, the statistical significance of underperformance is weak, which confirms the low level of underperformance found by Duque and Almeida (2000). As for the Greek market, abnormal returns are positive for any time horizon. This finding is consistent with Nounis (2003) who measures an average over-performance of 14.68% during the first year of listing on a sample of Greeks IPOs.

As for the comparison of market segments, sub-periods, sectors and pricing mechanisms, our performance measures do not yield identical results with one-year returns but converge with three-year returns. Over a three-year interval, New markets perform less well than traditional market segments according to all measures. Three-year CARs for growth markets are 2.4 times as negative as those observed for traditional markets. Further, the cold periods of 1995-1997 and 2001-2004 exhibit lower underperformances than the intermediary hot period. It is noteworthy that post-2000 IPO performance rises to the pre 1998 level.

During the hot period, the underperformance spread between new and traditional markets widens considerably: the performance of a portfolio invested in New Market IPOs during the years 1998-2000 is one third of the performance of an equivalent portfolio invested on traditional segments. The poor performance of growth market IPOs is mainly due to the weak returns of new technology IPOs. On the basis of sector classification available in Thomson Financial Datastream, industry and services other than bank and insurance have equivalent levels of underperformance. Among all categories, new technology companies underperform the most, with banks and insurance companies having the lowest level of underperformance.

Lastly, with regard to IPO mechanisms, we find that, over the three years following the initial offering, book-built IPOs perform poorly in comparison to fixed-price and auctioned IPOs. The performance of stocks issued at a fixed price is comparable to those of auction-issued stocks, yet the latter have the least underperformance.

2.4. Theoretical explanations for IPO long-run underperformance

Many factors, like window-dressing, IPO timing, market optimism etc., are claimed to explain long-term underperformance of firms going public. These explanations are not exclusive and can occur simultaneously, which makes it more difficult to test them individually. Thus, the same test can confirm or reject several hypotheses at the same time. Furthermore, some of these hypotheses, like IPO timing, may explain both IPO initial underpricing and long-run underperformance.

2.4.1. The window-dressing hypothesis

When a firm goes public, so as to reduce the risk of failure of the IPO, the managers have an incentive to present the most favourable financial situation. According to Teoh et al. (1998), managers are ready to manipulate reported earnings around initial public offerings, for instance by altering discretionary accounting accruals, in order to give the stock market a false signal on the future profitability of the candidate firm and thus reduce the cost of capital. The authors observe that the more earnings management there is, the more stock performance decreases after three years. This hypothesis assumes the lack of investors' ability to correctly estimate the firm's value at the time of the offering. After a mean three-year delay, investors would be able to identify the accounting adjustments and would reallocate their portfolios. Consistent with this hypothesis, Pastor-Llorca and Poveda-Fuentes (2006) notice that Spanish IPO firms make use of discretionary accruals to report higher earnings in the IPO year and show that firms with a higher level of discretionary accruals underperform more in the long-run. Roosenboom et al. (2003) obtain a similar negative relation between discretionary accruals and long-run stock price performance over a sample of 64 Dutch IPOs; yet, they find that earnings are managed in the first year as a public company but not in the years before the IPO.

Earnings management is likely to be observed at start-up firms whose managers are induced to manipulate results in the short-term in order to diversify the sources of funds and to increase the amount of funds raised. Traditional methods of valuation would not be well-adapted for those companies, which leaves important margins when estimating their values.

2.4.2. The timing hypothesis

According to the timing hypothesis, managers choose a window of opportunity to launch an IPO, this window being identified as a function of the firm's performance or market conditions. First, managers prefer to take their firms public when they have performed well earlier, and probably the IPO date is conditional on the firm's cycle of activity and operational performance.

Second, the window of opportunity for an IPO may be determined by market conditions. In a bullish market, the number of IPOs tends to increase because the placement of stocks is easier, the risk of failure of an IPO is lower and securities are priced higher, which softens the cost of initial underpricing. Loughran and Ritter (1995) as well as Helwege and Liang (2001) show that firms going public during 'hot markets' have more severe long-term underperformance than other firms.

Because of the existence of 'hot markets' and 'cold markets', IPOs cluster by periods of time, and this cyclicality increases initial underpricing of IPO firms and long-term underperformance.

Schultz (2003) calls this hypothesis 'pseudo market-timing' and demonstrates that long-term underperformance is an artefact linked to IPO clustering.

Lewis et al. (2000) show, from a sample of 1,955 IPOs on the US stock market between 1988 and 1995, that firms that go bankrupt have weaker long-term returns. They suppose that periods of 'hot markets' attract 'good' firms as well as 'bad' firms, the latter being offered to the market by less scrupulous intermediaries. In this context, investors would not be able to estimate the bad firms' actual probability of bankruptcy at the time of their IPOs but, in the long run, the poor performance of bad IPOs would pull down the average performance of all IPOs. In Europe, no study has formally tested the market timing hypothesis. The recent article by Derrien and Kecskés (2006) partly fills this gap by providing empirical evidence of market timing for AIM IPOs in the UK.

2.4.3. The delisting hypothesis

Benninga et al. (2005) explain IPO long-term underperformance by the firms' ability to delist voluntarily (eg via mergers, market transfers). Sentis's (2002) game theory model takes account of the possibility of voluntary delisting in the case of takeovers by external firms. His model predicts that IPO firms performing well are taken over and consequently delisted, so that only the least performing issuing firms remain on the market and in IPO samples.

2.4.4. Behavioural explanations

Financial analysts' optimism

Post-IPO underperformance has an inverse relation to optimistic forecasts or recommendations by analysts during the offer period (Chahine, 2004a; Degeorge and Derrien, 2001a; Dechow et al., 1999; Michaely and Womack, 1999). From a sample of IPOs on the *Second Marché* and the *Nouveau Marché*, Chahine (2004a) finds that long-term performance is significantly correlated with unanticipated earnings and analysts' earnings-forecast revisions. From there, he explains underperformance by analysts' excessive optimism at the time of IPO. In the offering period, analysts' favourable forecasts and recommendations encourage subscription yet, over time, prices converge towards fundamental values.

Investors' optimism

According to Krigman et al. (1999), active buy and sell trades in the aftermarket during the first day of trading, the so-called 'flipping activity', is a good indication of future stock price performance. They suggest that there are periods when investors are particularly confident about firms' future projects and profits, and that managers are induced to make offerings in these periods. Therefore, long-term underperformance is a correction for this excess of optimism. Consistently, for a sample of 486 European IPOs, Cornelli et al. (2006) find long-run post-IPO price reversal only when prices in the grey market, the 'when-issued' market that precedes IPOs, are high, indicating excessive optimism.

For a sample of 2,288 IPOs, Purnanandam and Swaminathan (2004) show that firms that go public at an overestimated price exhibit weak returns in the long term. They explain this result by the excess of confidence of some investors who react on the basis of private information. In the short term, the behaviour of these investors leads to overreaction on the market, but in the long term, the continuous flow of public information makes stock prices fall back to fundamental values.

Other authors consider that only a small portion of investors are overoptimistic. They marginally influence the price in the IPO period but in the long run, the continuous flow of

public information reduces the heterogeneity of opinions between optimistic investors and others, and prices decrease. Jenkinson and Ljungqvist (2001) show that long-term underperformance is negatively correlated to opinion heterogeneity and positively correlated to the speed of reduction of the divergence of opinions upon the arrival of new public information.

Houge et al. (2001) use three proxies for opinion heterogeneity: the delay between the open and the first trade, the buy-sell ratio and the bid-ask spread. In their sample of 2,025 IPOs between 1993 and 1996 on the US stock market, long-term abnormal returns are negatively correlated with the three proxies. Consistently, in Gao et al. (2002) long-term performance is negatively linked to stock volatility on the first 20 days of trading, over a sample of 2,327 IPOs between 1986 and 1996.

2.4.5. Underwriting banks' behaviour

The underwriter's reputation hypothesis

According to Carter et al. (1998), based on three measures of underwriter bank prestige, mean long-term underperformance of firms introduced by more prestigious underwriters is weaker. This result acts in favour of the hypothesis of underwriter reputation, according to which the selection of a highly ranked underwriter would be a good signal for the market with regard to the risk borne in the post-IPO period.

The price support hypothesis

According to Ruud (1993), underwriters stabilise stock prices during a short period of time after the IPO so as to avoid a failure of the issue. Prices are artificially supported at a high level in the short run, but at the end of the stabilisation period, performance decreases.

2.4.6. Measurement errors

Some authors claim that abnormal performance is the outcome of measurement biases. Thus, empirical studies can observe negative abnormal performance when underperformance does actually not exist or is weak. Over a sample of 3,661 IPOs on the US market between 1935 and 1972, Gompers and Lerner (2003) find that long-term underperformance disappears when considering CARs instead of BHARs.

Market-adjusted performance is also significantly sensitive to benchmarks. Over a sample of 120 IPOs on the Swiss market between 1983 and 2000, Drobetz et al. (2005) show that results are very dependant on market indices. On the basis of the BHAR methodology, the mean performance they observe changes from 5.12% to -1.69% when using a different benchmark. Cumulative abnormal returns also vary from –7.45% to –1.02% depending on the selected index.

Finally, some articles show that, when risk factors other than market risk are taken into account, abnormal performance decreases in absolute value and converges towards zero in some cases. Brav and Gompers (1997) and Brav et al. (2000) demonstrate that when size and book-to-market factors are considered, abnormal performance vanishes. According to Eckbo and Norli (2002), this finding is reinforced when financial leverage and liquidity factors are added.

III. Initial underpricing, long-run performance and post-IPO liquidity

This last section is devoted to the interaction between initial returns, post-IPO liquidity and long-term performance. The first sub-section reviews the literature and the second sub-section reports the empirical findings we obtained on a sample of IPOs carried out on Euronext Paris between 1995 and 2004 (Sample presented in Appendix 2).

1. Previous research relating IPO performance and after-market liquidity

Most of the research that analyses the relationship between the performance of newly-listed firms and their liquidity addresses the link between initial returns and after-market liquidity. On this issue, there are two opposing theories. A theory first defended by Booth and Chua (1996) stipulates that underpricing is a means to ensure a diverse ownership structure and therefore enhance post-IPO liquidity. According to this hypothesis, post-listing spreads and adverse selection measures should be negatively related to underpricing. Conversely, a more recent theory developed by Ellul and Pagano (2006) posits that post-IPO spreads and asymmetric information measures increase with underpricing because underpricing is a compensation for illiquidity costs expected in the after-market.

1.1. Underpricing as a means of promoting after-market liquidity: the liquidity-promotion hypothesis

The process of a firm's initial public offering is characterised by the expansion of its ownership structure, previously concentrated in the hands of a few parties, to include a much larger number of outside investors. In terms of post-IPO ownership structure, an issuer may fulfil two alternative objectives.

On the one hand, a firm may carry out an IPO to broaden its ownership structure in order to obtain more secondary-market liquidity for its shares, a factor often considered as an important measure of the success of an IPO. In the worst case scenario, insufficient secondary-market liquidity can result in the failure or cancellation of an IPO (Corwin et al., 2004). In general, higher after-market liquidity helps increase the firm's value and reduce its cost of capital in several ways. It encourages analysts to write and talk about the IPO and improves the issuing firm's future access to capital markets by attracting investors. It reduces transaction costs in future equity raisings (Ibbotson and Ritter, 1995) and lowers gross fees requested by investment banks in subsequent equity offerings (Butler et al., 2004). It also reduces the illiquidity premium and thus the returns required by investors to hold the firm's shares, as shown in Amihud and Mendelson (1986) and Brennan and Subrahmanyam (1996). In addition, promoting trading liquidity through ownership dispersion may be an effective mechanism to impede future hostile takeovers (Shleifer and Vishny, 1986).

On the other hand, a firm carrying out an IPO may prefer to maintain a concentrated ownership at the expense of liquidity. A concentrated ownership structure may confer more value than a dispersed one as the former corporate governance arrangement gives shareholders more of an incentive to monitor the company's activities to minimise agency costs. This is especially important for companies with a less pronounced degree of information, as large shareholders are more likely to intervene because the consequence of their actions can be observed by the market (Kahn and Winton, 1998). Therefore, some companies may deliberately forfeit liquidity in order to adopt a concentrated ownership structure.

IPOs seeking secondary-market liquidity will underprice their shares because they need to attract a large number of small shareholders to create a broader ownership structure. However,

being at a disadvantage in terms of the information they have at their disposal, small investors participate in an IPO if they are compensated for the adverse selection costs they incur, that is if the IPO is sufficiently underpriced.

Alternatively, firms carrying out an IPO and seeking concentrated ownership will not underprice their shares when issuing them as large shareholders possess superior information about the company's true value and do not bear information costs. They could even be overpriced as large shareholders may be prepared to pay a premium for control.

Booth and Chua (1996) develop an explanation for IPO underpricing in which the issuer's wish for ownership dispersion creates an incentive to underprice. Uninformed investors incur additional costs in collecting information and therefore will not be induced to participate unless a higher degree of underpricing is offered. Their model illustrates that an optimal level of underpricing is reached when the issuer maximises proceeds. The ownership dispersion at equilibrium is partly determined by the value of secondary market liquidity. Maximising proceeds means promoting secondary-market liquidity through initial ownership dispersion and oversubscription, to the point that the rate of increase in total market value equals the rate of increase in total information costs. Consistent with this theory, Michaely and Shaw (1994) find that there is higher underpricing for IPOs that have a more diverse shareholder base.

Higher underpricing induces broader investor participation and creates a broader ownership structure. These two factors are in turn positively associated with the level of post-listing trading, and therefore offer an explanation of how underpricing can influence liquidity.

Miller and Reilly (1987), Hanley (1993), and Schultz and Zaman (1994) have all produced evidence showing that underpriced IPOs, on average, exhibit higher after-market trading turnover than overpriced IPOs, without clearly explaining why this is so. Reese (1998) also showed that there is a positive relationship between underpricing and post-listing trading turnover for up to three years after listing and suggested financial media coverage as a possible explanation. Pham et al. (2003) and Li et al. (2005b) provide evidence that a higher level of underpricing leads not only to increased trading turnover but also lower bid-ask spreads. Pham et al. (2003) argue that this relationship is established through the mediation of the ownership structure formed after the allocation process. They also find that overpriced IPOs are likely to have less debt and higher book-to-market ratios. Firms with these features are often associated with higher agency costs (Jensen and Meckling, 1976; Gompers, 1995), and hence receive greater marginal benefits from future monitoring by large shareholders. Therefore, these firms are less interested in underpricing their shares.

Hahn and Ligon's (2004) results are supportive of the notion that initial public offering underpricing boosts the subsequent secondary market liquidity of the stock. They find that for three different volume-based measures of liquidity, the turnover ratio, Amihud's illiquidity measures and the average number of trades, there is a consistent significantly positive relationship between underpricing and liquidity. Underpricing and analyst coverage may be part of an overall strategy to establish liquidity for the issue.

This last view, according to which underpricing attracts analysts' coverage and thereby reduces asymmetric information in the after-market, is also defended by Li et al. (2005a). They measure the adverse selection spread component for a sample of 1,726 firms that went public on the NASDAQ between 1995 and 2000, and find that the level of asymmetric information immediately after the IPO decreases with underpricing, meaning that underpricing induces information production in the post-listing period and thus favours liquidity. Their results also show that the adverse selection component of the spread is smaller in the early periods of the after-market, and increases to a relatively stable level approximately 40 days after the initial offering.

1.2. Underpricing as a compensation for post-IPO expected illiquidity: the illiquidity-compensation hypothesis

Contrary to Booth and Chua's theory, Ellul and Pagano (2006) demonstrate that the IPO underpricing is an increasing function of the expected post-listing illiquidity due to asymmetric information. They propose a model in which investors worry about the after-market illiquidity that may result from asymmetric information after the IPO. The less liquid the after-market is expected to be, and the less predictable its liquidity, the larger the IPO underpricing, because IPO underpricing compensates uninformed investors who participate in the issue not only for adverse selection costs borne at the IPO stage but also for the expected trading costs that they will bear by liquidating their shares in the after-market.

In addition, Ellul and Pagano (2006) provide empirical evidence in support of their theory using a sample of 337 IPOs carried out between 1998 and 2000 at the LSE, either on the Main Market or on AIM. Using effective spreads and two measures of asymmetric information, the probability of information-based trading (PIN) proposed by Easley et al. (1996) and the adverse selection component of the spread, they find a positive relationship between underpricing and post-IPO trading cost level and variability.

1.3. Post-IPO liquidity and long-run performance

The advantage of a liquid post-IPO market for the issuer should be a reduction in the firm's cost of capital due to a lower liquidity risk premium required by investors. If such is the case, long-run IPO performance should decrease with the liquidity of the after-market. Eckbo and Norli (2002) test this hypothesis on a sample of 6,379 NASDAQ IPOs between 1972 and 1988. They measure post-listing liquidity with monthly turnover computed as trading volume divided by the number of shares outstanding. With this measure, they observe that IPO stocks are significantly more liquid than non-IPO stocks similar in size and book-to-market value in the five years following the IPO, and that IPO stock liquidity is the greatest in the year of the initial issue. Therefore, they examine the risk-reducing effect of greater liquidity with a factor model that comprises Fama-French factors, a momentum factor and a liquidity factor. They show that the magnitude and the significance of the liquidity factor loadings are comparable to those of the momentum factor. When applied to IPO portfolios, the liquidity factor reduces expected portfolio returns, as predicted.

2. An empirical test of the relationship between IPO performance and after-market liquidity

We use a sample of IPOs carried out on Euronext Paris between 1995 and 2004 (sample presented in Appendix 2) to analyse how IPO underpricing relates to post-IPO liquidity and whether secondary market liquidity has an impact on long-term performance. In particular, we investigate the following questions:

1. Does the choice of book-building as the allocation mechanism have a significant impact on post-IPO liquidity and performance?
2. Does initial underpricing boost post-IPO liquidity, or conversely, is it a compensation for after-market illiquidity and asymmetric information?
3. Provided that underpricing enhances after-market liquidity, is this effect temporary or permanent? A permanent effect would indicate that higher liquidity results from the broader ownership that underpricing helps to achieve (Booth and Chua's theory), while a temporary

effect would only reflect that underpricing induces more interest from investors in the immediate post-IPO period.

4. Does underpricing result in lower post-listing asymmetric information because it attracts analysts' coverage or, on the contrary, is it an increasing function of expected post-IPO adverse selection costs?
5. Finally, how does after-market liquidity impact long-run performance?

Box A summarises the main conclusions of our empirical tests.

Box A. Main findings on IPO performance and after-market liquidity

1. No difference in liquidity is found between book-built IPOs and other types of IPOs, with the exception that book-built IPOs' after-market is narrower.
2. Our findings do not corroborate the theory according to which underpricing is a cost paid by the issuer to reduce post-IPO adverse selection and to 'purchase' after-market liquidity.
3. Our findings validate the hypothesis that underpricing is a premium offered to primary market investors as a compensation for expected post-IPO information risk.
4. Initial underpricing produces higher turnover in the immediate after-market but has no effect on trading volumes after the first year of trading.
5. More traded IPO stocks have higher abnormal returns within the first year following primary listing but lower abnormal returns at the 3-year term, which indicates that investors assign more value to and require lower risk premia on stocks with higher trading volumes.

These findings are based on a sample of 211 IPOs carried out on Euronext Paris between 1995 and 2004.

2.1. Performance and liquidity measures

Measures of performance and liquidity used in our empirical work are presented hereafter. Liquidity measures are estimated on observation periods that start five days after the IPO date in order to eliminate the effect of abnormal volumes and liquidity generally observed in the first days following primary listing.

Underpricing

For each stock of the sample, underpricing is measured as the raw return observed over the first trading day:

$$U = \frac{P_1}{P_0} - 1 \qquad \text{(III.1)},$$

where P_1 is the closing price in the after-market and P_0 is the IPO price. The IPO is underpriced (overpriced) when $U > 0$ ($U < 0$).

Long-term performance

We measure long-term performance over the first year and the first three years following the initial offering with cumulated abnormal returns (CAR) and wealth relative ratios (WR).

For each stock of the sample,

$$CAR_{1Y} = \sum_{t=1}^{T_{1Y}} (r_t - I_t) \quad \text{(III.2)},$$

$$CAR_{3Y} = \sum_{t=1}^{T_{3Y}} (r_t - I_t) \quad \text{(III.3)},$$

$$WR_{1Y} = \frac{1 + r_{1Y}}{1 + I_{1Y}} = \frac{P_{1Y}/P_1}{I_{1Y}/I_1} \quad \text{(III.4)},$$

$$WR_{3Y} = \frac{1 + r_{3Y}}{1 + I_{3Y}} = \frac{P_{3Y}/P_1}{I_{3Y}/I_1} \quad \text{(III.5)},$$

where r_t is the stock return on day *t*, I_t is the SBF250 index return on day *t*, the first return r_1 is computed by taking the first closing price as the starting point, T_{1Y} (T_{3Y}) is the last trading day of the first year (first three years) of trading, T_{3Y} is the last trading day of the first three years of trading, r_{1Y} (r_{3Y}) is the stock return over the first year (first three years) following the IPO, P_{1Y} (P_{3Y}) denotes the stock closing price one year (three years) after the IPO date.

Liquidity and asymmetric information

For the whole sample, post-IPO liquidity is measured with the average daily turnover, that is the average daily volume in percentage of the number of shares sold in the IPO, over the first six months of trading ($TURN_{6M}$) and over the first three years of trading ($TURN_{3Y}$).

For IPO stocks that start continuous trading at the latest six months after the initial listing (93 out of 211 securities), we compute duration-weighted average quoted spreads over the first six months of continuous trading,

$$S_{6M} = \frac{1}{\sum_{k=1}^{K_{6M}} d_k} \left(\sum_{k=1}^{K_{6M}} d_k \times \frac{ask_k - bid_k}{mid_k} \right) \quad \text{(III.6)},$$

and from the first day of continuous trading up until three years after the IPO,

$$S_{3Y} = \frac{1}{\sum_{k=1}^{K_{3Y}} d_k} \left(\sum_{k=1}^{K_{3Y}} d_k \times \frac{ask_k - bid_k}{mid_k} \right) \quad \text{(III.7)},$$

bid_k, ask_k, mid_k and d_k being respectively the best bid quote, the best ask quote, the mid quote and the duration of the best quotes observed at time *k*. We also calculate duration-weighted average depth by reporting best bid and ask quantities to the number of shares sold in the IPO:

$$D_{6M} = \frac{1}{\sum_{k=1}^{K_{6M}} d_k} \left(\sum_{k=1}^{K_{6M}} d_k \times \frac{Qbid_k + Qask_k}{sold\_shares} \right) \times 100 \quad \text{(III.8)},$$

$$D_{3Y} = \frac{1}{\sum_{k=1}^{K_{3Y}} d_k} \left(\sum_{k=1}^{K_{3Y}} d_k \times \frac{Qbid_k + Qask_k}{sold\_shares} \right) \times 100 \quad \text{(III.9)}.$$

Finally, we estimate Kyle's (1985) liquidity-cost coefficient by reporting quoted spreads to their associated quantities in thousand euros:

$$K_{6M} = \frac{1}{\sum_{k=1}^{K_{6M}} d_k} \left(\sum_{k=1}^{K_{6M}} d_k \times \frac{ask_k - bid_k}{(Qbid_k + Qask_k) \times mid_k / 1000} \right) \times 100 \quad \text{(III.10)},$$

$$K_{3Y} = \frac{1}{\sum_{k=1}^{K_{3Y}} d_k} \left(\sum_{k=1}^{K_{3Y}} d_k \times \frac{ask_k - bid_k}{(Qbid_k + Qask_k) \times mid_k / 1000} \right) \times 100 \quad \text{(III.11)}.$$

This variable measures the marginal relative spread to pay to trade 1,000 euros in the stock immediately.

Further, we estimate the magnitude of asymmetric information during the first six months of continuous trading with different methodologies. First, we implement Huang and Stoll's (1997) 'two-way spread-decomposition methodology' and divide the effective spread *S* in two components: λ, the proportion of the spread representing order-processing costs, and $(1-\lambda)$, the proportion of *S* corresponding to adverse selection and inventory-holding costs. $S(1-\lambda)$ is then used to proxy asymmetric information costs.

Second, we estimate Hasbrouck's (1991) α coefficients, which measure the permanent impact of trades on quotes. It consists in estimating the asymmetric information cost by the permanent impact of trades on prices. If private information is contained in a trade, it must be inferred from the trade component which is unanticipated by the market. However, the immediate impact on prices of this trade innovation can contain not only information effects but also transient effects. To remove the transient effects from the impact, information asymmetry can be measured by the persistent impact of a trade innovation on prices. To estimate the permanent price impact of a one-unit unexpected volume, we use a bivariate model of mid-quote variations and signed volumes, in which quote revisions are a function of past quote revisions, past signed trading volumes, and public information. For each stock, we estimate the α price impact coefficient for an unexpected traded quantity of 1,000 shares.

2.2. IPO allocation mechanism, underpricing and after-market liquidity

As a preliminary test, we compare the average underpricing and liquidity of book-built and non book-built IPOs. Table 20 reports the results. They show that book-built IPOs are less underpriced than fixed-price and auctioned IPOs but less liquid. The difference in liquidity is not significant in turnover for the whole sample but it is significant at the 1% threshold with regard to spread and depth measures for continuously traded IPO stocks.

Table 20. Underpricing and liquidity: book-built vs. non book-built IPOs

		Book-built IPOs	Non book-built IPOs	Difference
Underpricing: *U*	Mean	3.39%	9.64%	6.25%**
	t-statistic	---	---	2.073
	Std-dev	14.07%	22.64%	---
	Number	166	65	---
Turnover: $TURN_{6M}$	Mean	0.05996%	0.06388%	0.00392%
	t-statistic	---	---	0.614
	Std-dev	0.0411%	0.0396%	---
	Number	159	52	---
Spread: S_{6M}	Mean	2.41%	1.56%	-0.85%***
	t-statistic	---	---	-5.717
	Std-dev	1.17%	0.25%	---
	Number	81	12	---
Depth: D_{6M}	Mean	0.04%	0.08%	0.04%***
	t-statistic	---	---	6.379
	Std-dev	0.03%	0.02%	---
	Number	81	12	---
Kyle's coefficient: K_{6M}	Mean	0.61%	0.04%	-0.57%***
	t-statistic	---	---	-7.642
	Std-dev	0.68%	0.01%	---
	Number	81	12	---

In order to investigate whether these differences result from the book-building allocation process or other characteristics of the firm and to analyse the link between underpricing and liquidity, we run a three stage multivariate analysis that combines logistic and OLS regressions in the Heckman style to avoid endogeneity biases.

In a first stage, the probability that the firm chooses a book-building procedure to go public, denoted $P(BB)$, is modelled as a function of the issue size, the earnings-to-price ratio, the activity of the IPO market (hot or cold market) and the market segment (traditional or New Market):

$$P(BB) = a_0 + a_1 SIZE + a_2 E/P + a_3 HM + a_4 NM + \tilde{\varepsilon}_1 \qquad \text{(III.12)},$$

where *SIZE* is the logarithm of the issue size calculated as the number of shares on sale in the IPO multiplied by the subscription price, E/P denotes the earnings per share as a percentage of the IPO price, *HM* is a dummy that equals 1 for the years 1997-2000, 0 otherwise, and *NM* is a dummy equal to 1 for New Market IPOs.

In a second stage, the probability for the issue to be underpriced, $P(U > 0)$, is modelled as a function of the IPO size, expected growth measured by the book-to-market ratio, the activity of the primary market, the industrial sector (new technologies vs traditional industries and services), the percentage of shares held by the managers after the IPO and the allocation mechanism (book-building vs others):

$$P(U>0) = b_0 + b_1 SIZE + b_2 BTM + b_3 HM + b_4 NTIC + b_5 MAN\% + b_6 \hat{P}(BB) + \tilde{\varepsilon}_2 \quad \text{(III.13)},$$

where *BTM* is the book-to-market ratio, *NTIC* is a dummy equal to 1 for new technologies firms, *MAN%* is the percentage of shares retained by the managers, and $\hat{P}(BB)$ is the book-building probability predicted by the model III.13.

Last, in a third stage, turnovers are regressed on control variables comprising volatility, market value, and price level, as well as the book-building probability and the underpricing level:

$$TURN_{6M} = c_0 + c_1 \sigma_{6M} + c_2 MV + c_3 1/P_0 + c_4 \hat{P}(BB) + d_4 \hat{P}(U>0) \times U + \tilde{\varepsilon}_3 \quad \text{(III.14)},$$

$$TURN_{3Y} = d_0 + d_1 \sigma_{3Y} + d_2 MV + d_3 1/\overline{P}_{3Y} + d_4 \hat{P}(BB) + d_5 \hat{P}(U>0) \times U + \tilde{\varepsilon}_4 \quad \text{(III.15)},$$

where σ_{6M} (σ_{3Y}) is the closing price volatility over the first six months (three years) of trading, *MV* is the logarithm of the firm's market value at the IPO date, $\overline{P}_{3Y}$ is the average closing price over the first three years following the IPO, $\hat{P}(U>0) \times U$ is the predicted value of the initial underpricing measured as the predicted probability from model (III.13) multiplied by the actual underpricing percentage.

For IPO stocks that start continuous trading within six months of the initial listing, the relationship between liquidity and initial underpricing is also tested with spread and depth measures:

$$D_{6M} = e_0 + e_1 \sigma_{6M} + e_2 MV + e_3 1/P_0 + e_4 \hat{P}(BB) + e_5 \hat{P}(U>0) \times U + \tilde{\varepsilon}_5 \quad \text{(III.16)},$$

$$S_{6M} = g_0 + g_1 \sigma_{6M} + g_2 TURN_{6M} + g_3 1/P_0 + g_4 \hat{P}(BB) + g_4 \hat{P}(U>0) \times U + \tilde{\varepsilon}_7 \quad \text{(III.17)},$$

$$K_{6M} = i_0 + i_1 \sigma_{6M} + i_2 TURN_{6M} + i_3 1/P_0 + i_4 \hat{P}(BB) + i_5 \hat{P}(U>0) \times U + \tilde{\varepsilon}_9 \quad \text{(III.18)}.$$

The results are displayed in Table 21.

First stage: Factors explaining the choice of book-building

According to our estimates of regression (III.12), the firms of our sample that choose book-building for their IPOs are bigger than others and less profitable with respect to their earnings-to-price ratios. Book-building is found to be more popular in hot markets and on the New Market. All these findings are consistent with previous literature and expectations except the former, that is the positive link between IPO size and the book-building probability. This specific feature of our sample is probably the reason why we find book-built IPOs less underpriced, contrary to other studies.

Second stage: Factors explaining underpricing

The results for the Logit regression (III.13) indicate that the likelihood of underpricing decreases with respect to IPO size, expected growth and post-IPO managers' shareholdings. Moreover, it is surprisingly lower in hot markets and for new technologies firms. Finally, the $\hat{P}(BB)$ coefficient is negative but not statistically different from zero, which means that, after controlling for size, growth opportunities, managers' shareholdings, period and sector, we have found that book-built IPOs are no less frequently underpriced than other IPOs. This finding contrasts with previous studies and could result from the boom in the book-building method on the French market since the end of the 90s.

Table 21. Book-building, underpricing and after-market liquidity: regression results

	$P(BB)$	$P(U>0)$	$TURN_{6M}$	$TURN_{3Y}$	D_{6M}	S_{6M}	K_{6M}
Number of observations	231	227	211	207	93	93	93
Regression type	Logit	Logit	OLS	OLS	OLS	OLS	OLS
intercept	-33.756*** (0.000)	11.861*** (0.004)	-0.646 (0.180)	-5.266 (0.108)	0.319*** (0.000)	2.557*** (0.000)	0.136 (0.644)
SIZE	2.075*** (0.000)	-0.567** (0.028)					
E/P	-15.306** (0.050)						
BTM		-1.808* (0.063)					
MAN%		-0.833* (0.078)					
HM	1.845*** (0.003)	-2.161*** (0.000)					
NM	4.133*** (0.000)						
NTIC		-0.696* 0.067)					
MV			0.054* (0.054)	0.311 (0.107)	-0.011*** (0.000)		
σ_{6M}			0.142*** (0.000)		-0.002* (0.066)	0.185** (0.019)	0.032 (0.472)
$TURN_{6M}$						1.231*** (0.000)	-0.375** (0.011)
$1/P_0$			-2.507*** (0.001)		0.038 (0.595)	11.243*** (0.003)	10.960*** (0.000)
σ_{3Y}				0.281*** (0.002)			
$1/\overline{P}_{3Y}$				-4.508*** (0.009)			
$\hat{P}(BB)$		-0.625 (0.362)	-0.121 (0.172)	0.038 (0.948)	-0.079*** (0.000)	-0.808 (0.139)	-0.105 (0.737)
$\hat{P}(U>0)\times U$			0.014*** (0.000)	0.003 (0.874)	0.000 (0.627)	0.000 (0.982)	-0.002 0.783
Cox-Snell R^2	47.3%	21.2%					
Adjusted R^2			35.1%	4.8%	63.1%	32.6%	33.2%

***, **, * indicate that the coefficient is significantly positive or negative respectively at the 1%, 5%, 10% level. P-values are reported in brackets.

Third stage: IPO mechanism, underpricing and after-market liquidity

IPO mechanism and after-market liquidity

The estimation of regressions (III.14), (III.15), (III.16), (III.17), and (III.18) show that, within six months of the initial issue:

- book-built IPOs are slightly less traded than non book-built IPOs but this effect disappears in the long run;
- book-built IPOs have slightly smaller spreads than non book-built IPOs;
- the after-market for book-built IPOs is not as deep as that for non book-built IPOs;
- Kyle's coefficients, which report spreads to depth, are not different for book-built IPOs.

The first two findings are worth mentioning because the P-values associated with the corresponding coefficients are relatively low; yet they exceed the non-rejection level of 10%. In contrast, the finding about depth is very significant and holds at the 1% level. Therefore, we conclude that, although the immediate after-market for book-built IPOs is not less liquid than that for fixed-price and auctioned IPOs, it is significantly tighter. Further, the initial offering mechanism is not a good indication of future turnover in the long run.

Underpricing and after-market liquidity

On our sample of continuously-traded IPO stocks, underpricing does not affect post-IPO spreads, depths or Kyle's coefficients. Nevertheless, on our whole sample, turnover in the six months after the IPO is markedly higher for underpriced issues. This effect disappears in the long run: initial underpricing has no impact on average turnover over the three years following the issue. In the absence of a long-term relationship between underpricing and trading volumes, the higher turnover of underpriced IPOs immediately after the issue cannot be viewed as the consequence of a more diffuse ownership obtained by underpricing but as a reflection of higher post-IPO demand:

- underpriced stocks generate interest from investors and are consequently more traded than others;
- order-rationing is greater in underpriced issues and induces a larger demand for shares in the secondary market.

2.3. Underpricing and post-IPO information asymmetry

We then use Huang and Stoll's two-way decomposition method and Hasbrouck's asymmetric information coefficients to examine how initial underpricing is related to post-IPO information asymmetry. To that end, we regress both proxies for adverse selection onto predicted underpricing after controlling for IPO size, and managers' shareholding variation which we consider as a factor of information asymmetry between insiders and other shareholders.

Table 22 displays the results and shows that, according to both measures, information asymmetry after the IPO is positively related to underpricing. This finding leads us to reject, for the French IPO market, the theory according to which underpricing is a means of reducing post-IPO information asymmetry and to validate the hypothesis that underpricing is a reflection of not only information asymmetry at the time of the IPO but also expected post-IPO adverse selection costs.

2.4. After-market liquidity and long-run performance

Our analysis of the link between post-IPO liquidity and long-term performance is based on the correlation matrix provided in Table 23. With regard to these correlations, we state that:

- as shown in sub-section 2.2, immediate post-IPO trading volume increases with underpricing but no significant relationship is found at the three-year term;
- no direct relationship is found between underpricing and long-term performance;
- IPO stocks that are highly traded in the six months following the initial offering perform better during the first year of trading but exhibit lower three -year returns;
- three-year average turnover is positively related 1st year performance.

A share price performing beyond expectations induces greater interest from investors and thus higher turnover. Investors require smaller illiquidity premia on stocks with high turnover, so that their prices rise in response to higher trading volumes, and in subsequent periods, these stocks exhibit lower abnormal returns, which reflects a lower cost of equity capital for their issuers in the long run.

Table 22. Underpricing and post-IPO information asymmetry: regression results

	$S(1-\lambda)$	α
Methodology	Huang and Stoll (1997)	Hasbrouck (1991)
intercept	6.558** (0.016)	1.696** (0.027)
SIZE	-0.331** (0.032)	-0.091** (0.038)
MAN%	-0.198 (0.520)	-0.067 (0.448)
$\hat{P}(U>0)\times U$	0.023** (0.016)	0.004 (0.198)
Adjusted R^2	14.1%	7.2%
Number of observations	93	89

***, **, * indicate that the coefficient is significantly positive or negative respectively at the 1%, 5%, 10% level. P-values are reported in brackets. The difference in sample sizes results from the fact that negative coefficients have been excluded from the regression of the Hasbrouck's measure.

Table 23. Underpricing, trading volumes and long-run performance: correlations

	$TURN_{6M}$	$TURN_{3Y}$	CAR_{1Y}	WR_{1Y}	CAR_{3Y}	WR_{3Y}
U	0.248*** (0.000) [211]	-0.027 (0.697) [207]	-0.097 (0.143) [231]	-0.060 (0.363) [231]	-0.066 (0.320) [227]	-0.040 (0.550) [227]
$TURN_{6M}$	1	---	0.198*** (0.004) [211]	0.132* (0.056) [211]	-0.201*** (0.004) [207]	-0.131* (0.060) [207]
$TURN_{3Y}$	---	1	0.329*** (0.000) [207]	0.703*** (0.000) [207]	0.050 (0.473) [207]	0.136** (0.050) [207]

***, **, * indicate that the correlation is significantly different from 0 respectively at the 1%, 5%, 10% threshold. P-values are reported in brackets. The number of observations is given in square brackets.

2.5. Conclusion

No difference in liquidity is found between book-built IPOs and other types of IPOs, with the exception that book-built IPOs' after-market is narrower. Our findings do not corroborate the theory according to which underpricing is a cost paid by the issuer to reduce post-IPO adverse selection and to 'purchase' after-market liquidity, but validates the hypothesis that it is a premium offered to primary market investors as a compensation for expected post-IPO information risk. Initial underpricing produces higher turnover in the immediate after-market but has no effect on trading volumes after the first year of trading. More traded IPO stocks have higher abnormal returns within the first year following primary listing but lower abnormal returns at the three-year term, which indicates that investors assign more value to and require lower risk premia on stocks with higher trading volumes. However, among these conclusions, the latter one undoubtedly requires further investigation.

General conclusion

Based on a sample of 15 European countries, our survey analyses various features of the European IPO market over the past decade from 1995 to 2004: listing requirements, IPO-mechanism choices, performance and secondary market liquidity.

First, the comparison of national primary market regulations, in spite of the commonly observed segmentation between Main, Parallel and New Markets, shows a great diversity in listing requirements, and with the few exchanges that have stringent size requirements (such as Euronext Paris and Brussels until 2005, and the Milan Stock Exchange) at one end of the scale and the majority of exchanges for which the minimum-market-value requirement does not exceed five million euros at the other. Given the prospect of integrated European stock markets, it would be beneficial to go further than the enforcement of the Prospectus Directive and also harmonise basic primary listing requirements. In this respect, the consensus that we observed at a threshold between one and five million euros of minimal market size for a listing on a Main Market seems reasonable. Hence, the recent reform, undertaken by Euronext in 2005, that led to the merging of all Euronext regulated segments into a single list, called 'Eurolist', and removed the very high size requirements prevailing on the French and Belgian *Premiers Marchés*, has improved international integration. Besides, being able to compare growth markets sheds light on the opposition between the organised but unregulated segment of the LSE, AIM, and the continental regulated New Markets with sector restrictions, capital increase requirements and lock-up obligations. The decline, and the closure in some cases, of continental New Markets, and the success of AIM, where the number of candidate firms remained substantial after 2000, call for changes in the listing criteria and the reorganisation of growth markets. Euronext recently followed this path by closing its New Markets and opening Alternext, an organised and unregulated segment that will better address the specific needs of small- and mid-cap firms.

Second, the survey of IPO mechanisms across Europe reveals that primary market organisation is almost always delegated to investment banks, which then control the initial pricing and allocation of new issues. Exceptions are Euronext Paris and the Istanbul Stock Exchange, which provide exchange-run fixed-price and tender offering mechanisms. The outsourcing of primary-listing procedures to banks has resulted in a wide range of national terminologies which make cross-country comparison difficult. Examination of issuers' practices in terms of IPO mechanisms highlights the equity boom of the late nineties and the current prominence of book-building. With the disappearance of auctions on most exchanges book-building is often the only way for new issues to make their way into portfolios. The popularity of book-building can be explained by the many advantages that it provides issuers with:

- it permits the listing of small and risky firms that could probably not list otherwise;
- it is usually associated with firm commitment from the lead underwriter;
- the discretionary allocation power of the underwriter is a means of controlling post-listing ownership distribution.

Nonetheless, book-building has been proved to be more costly in terms of placement fees and initial underpricing, and the discretionary allocation process is a controversial issue. For these reasons and because candidate firms have diverse profiles, primary markets should offer various procedures. More precisely, we believe that the provision of alternative mechanisms by exchanges, such as uniform-price 'up-bounded' auctions, would improve the competitiveness of primary markets and be complementary to the listing services offered by investment banks by diversifying the choices proposed to issuers and investors.

Third, our empirical analysis of IPO short-term and long-term performance confirms, with a few exceptions, widely recognised patterns, but also show discrepancies between countries, periods, sector and primary listing mechanisms. In the short run, underpricing is observed in all countries

at all times but varies in level. Countries where underpricing is close to the mean are Poland, Portugal, the Netherlands, Switzerland, and the United Kingdom. Underpricing is relatively limited in Austria, Belgium, France, Italy, Spain, Sweden and Turkey, with the lowest average initial returns in France and Turkey, while initial returns exceed the sample mean in Germany, Greece, and to a lesser extent Finland. New markets' issues exhibit larger initial returns than those of Main and Parallel Markets. Underpricing varies across market cycles: it increases substantially during the hot market period 1998-2000 and then falls in the following cold market to levels observed in the eighties and the early nineties. In addition, the average difference in initial returns between traditional and growth segments nearly doubles during the hot issue period. The high level of underpricing on New Markets is likely driven by IPOs in new technologies. Among all sectors, new technology companies are the most underpriced. With regard to IPO mechanisms, issuers leave more money on the table with book-building than with other procedures. Converse to the theory, fixed-price offerings are the least underpriced. The high level of underpricing observed on the German market can be attributed to the high concentration of German IPOs in the hot issue period, in the Neuer Markt and in the new technology sector. In comparison, less money is left on the table by French and Turkish issuers as they use fixed-price and tender offers more frequently. France and Turkey are also characterised by a large proportion of IPOs in the traditional economy.

Empirical evidence on long-term performance is less clear. Results are not benchmark-dependent but sometimes differ between measurement methods. However, consistently with previous studies, significant underperformance is found at the 3-year horizon with all methodologies and in all countries, except Greece and Portugal. On average, New Markets underperform more in the long run than traditional markets, but this changes over time. New Markets IPOs prior to 1998 overperformed, with abnormal returns far above those of other IPOs, while, in contrast, New Markets' IPOs undertaken after 1998 performed very poorly in comparison with traditional markets' IPOs. This poor performance can be put down to the greater underperformance of NTIC firms. Finally, auctioned IPOs underperform less than others.

Finally, our study on post-IPO liquidity shows that, on a sample of French IPOs between 1995 and 2004, there is no difference in liquidity between book-built IPOs and other types of IPOs when controlling for volatility and other factors, with the exception that the book-built IPOs' after-market is not as deep. Initial underpricing is related to higher turnover in the immediate after-market but has no effect on trading volumes after the first year of trading. Higher trade volumes in the six months following the issue are associated with higher abnormal returns within the first year following primary listing but lower abnormal returns at the three-year term, which indicates that investors probably require lower risk premia on stocks with higher trading volumes. Converse to American studies, we do not find any significant relationship between underpricing and spreads and measure a positive link between initial underpricing and after-market asymmetric information. This finding, in accordance with those of Ellul and Pagano (2006) on the British market, contrasts with the patterns observed in the US.

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Appendix 1. European IPO sample used in Part II

We collected IPO dates and prices for 15 European countries from 1995 to 2004. Data were downloaded from the exchanges' websites for Turkey and the UK. Data were available free of charge from Deutsche Börse for Germany, OMX for Sweden, Euronext Lisbon for Portugal, Bolsa de Madrid for Spain, Euronext Brussels for Belgium, Euronext Amsterdam for the Netherlands, the Warsaw Stock Exchange for Poland, the Helsinki Stock Exchange for Finland and the Vienna Stock Exchange for Austria. The Greek data was purchased from the Athens Stock Exchange. The Italian data was kindly provided by Professor Giancarlo Giudici. The Swiss data was built by matching several sources of information: data from Professor Dusan Isakov, data sent by the Swiss Exchange and information posted on the Swiss exchange's website.

Our sample selection resulted in an original sample of 3,406 issues, from which we excluded market segment transfers, double listings of companies on two or more exchanges, initial listings of foreign companies, and new listings of investment companies such as investment funds, real estate funds and financial holdings. We also excluded offerings corresponding to 'carve-outs' and 'spin-offs'.

To calculate IPO market performance, daily closing prices were obtained from Thomson Financial Datastream. Some IPOs were deleted from the sample according to the following criteria:

- no data was available in Datastream for the firm;
- the Datastream price series started later than 1 month after the IPO date;
- the Datastream price series started more than 2 months prior to the IPO date;
- the ratio of the IPO price and the first Datastream closing price exceeded 5.

The last filter was to avoid incorrect identifications of securities or currency in Thomson Financial Datastream but eliminated no more than 15 IPOs.

These selection criteria produced a sample of 2,307 IPOs. Table A reports the distribution of these new listings between OTC and regulated markets. Since going public on an unregulated market segment, with the exception of AIM at the LSE, is not comparable to a regulated listing, all OTC segments but AIM were excluded from the analysis. Consequently, the definitive sample comprises 2,104 IPOs. The annual breakdown by country is reported in Table B. The distribution by market segment (Main and Parallel Markets vs growth markets) and economic sector is reported in Tables C and D respectively.

Table A. Distribution of IPOs between regulated and OTC markets

Country	Regulated segments	OTC	cna	Total
Austria	23	0	---	23
Belgium	---	---	58	58
Finland	44	4	---	48
France	363	183	---	546
Germany	415	0	---	415
Greece	183	0	---	183
Italy	135	0	---	135
Netherlands	47	3	---	50
Poland	---	---	95	95
Portugal	---	---	16	16
Spain	36	0	---	36
Sweden	95	13	---	108
Switzerland	61	0	---	61
Turkey	79	0	---	79
UK	123	331	---	454
Total	1,604	534	169	2,307

cna: classification not available

Table B. Final sample distribution by country per annum

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Austria	4	1	4	2	3	2	5	0	1	1	23
Belgium	0	2	11	13	17	7	1	2	4	1	58
Finland	3	1	8	3	16	12	0	1	0	0	44
France	14	43	52	104	59	66	17	7	0	1	363
Germany	16	7	20	54	150	144	18	2	0	4	415
Greece	12	14	10	21	30	46	15	15	11	9	183
Italy	11	11	9	14	25	41	16	4	4	dna	135
Netherlands	5	2	8	12	11	5	1	1	1	1	47
Poland	3	4	14	32	11	7	5	1	5	13	95
Portugal	3	1	3	3	2	3	0	0	1	0	16
Spain	0	4	6	8	9	4	2	1	1	1	36
Sweden	8	8	17	10	23	16	7	4	1	1	95
Switzerland	3	6	9	12	9	14	6	1	0	1	61
Turkey	16	4	12	13	1	25	0	3	2	3	79
UK	dna	dna	dna	42	44	145	75	59	50	39	454
Total	98	108	183	343	410	537	168	101	81	75	2,104

dna: data not available

Table C. Final sample distribution by market segment

Country	Traditional markets	Growth Markets	cna	Total
Austria	23	0	---	23
Belgium	---	---	58	58
Finland	29	15	---	44
France	218	145	---	363
Germany	107	308	---	415
Greece	---	---	183	183
Italy	97	38	---	135
Netherlands	35	12	---	47
Poland	95	0	---	95
Portugal	0	0	16	16
Spain	36	0	---	36
Sweden	9	86	---	95
Switzerland	49	12	---	61
Turkey	---	---	79	79
UK	123	331	---	454
Total	821	947	336	2,104

cna: classification not available

Table D. Final sample distribution by economic sector

Country	Industry	Bank-Insurance	NTIC	Other services	Unclassified	Total
Austria	10	2	4	6	1	23
Belgium	21	3	20	14	0	58
Finland	10	0	24	10	0	44
France	93	11	127	130	2	363
Germany	71	6	211	127	0	415
Greece	93	7	33	50	0	183
Italy	50	10	26	49	0	135
Netherlands	12	1	20	14	0	47
Poland	56	8	8	23	0	95
Portugal	4	1	4	7	0	16
Spain	18	0	2	16	0	36
Sweden	24	2	43	26	0	95
Switzerland	26	3	19	13	0	61
Turkey	47	5	5	22	0	79
UK	120	26	133	174	1	454
Total	655	85	679	681	4	2,104

Appendix 2. Euronext Paris IPO sample used in Part III

We gathered and analysed the prospectuses available in the AMF database for the period 1995-2004, that is 231 French IPO prospectuses. The following information was retrieved from the prospectuses:

- the IPO date and subscription price,
- the number of shares on sale in the IPO and the number of shares outstanding after the IPO,
- the IPO allocation mechanism,
- the firm's earnings,
- the percentage of shares held by the managers before and after the IPO.

In a second stage, we retrieved from Datastream post-IPO closing prices and book-to-market ratios. They were found for 227 stocks out of the initial sample. Last, we extracted high-frequency data from Euronext CD-Roms for these stocks. The tick-by-tick data was available for 211 stocks, among which 93 started to be traded continuously within the six months following their initial listing. The remaining 118 stocks were traded in batch auctions only (two per day).

List of abbreviations

AMF	Autorité des Marchés Financiers
AIM	Alternative Investment Market
AR	Abnormal Return
ASE	Athens Stock Exchange
BHAR	Buy-and-Hold Abnormal Return
BME	Bolsas y Mercados Espaňoles
CAR	Cumulative Abnormal Return
CBF	Commission Bancaire et Financière
CMVM	Comissão do Mercado de Valores Mobiliários
CNMV	Comisión Nacional del Mercado de Valores
CONSOB	Commissione Nazionale per le Società e la Borsa
EMU	European Monetary Union
EU	European Union
FESE	Federation of European Stock Exchanges
FSA	Financial Services Authority
GAAP	Generally Agreed Accounting Principles
HSE	Helsinki Stock Exchange
IFRS	International Financial Reporting Standards
IPO	Initial Public Offering
ISE	Istanbul Stock Exchange
JASDAQ	Japan Association of Securities Dealers Automated Quotation
LSE	London Stock Exchange
NASDAQ	National Association of Securities Dealers Automated Quotation
Nomad	Nominated Adviser
OMX	Stockholmsbörsen
OTC	Over The Counter
Std-dev	Standard deviation
SWX	Swiss exchange
UKLA	United Kingdom Listing Authority
VSE	Vienna Stock Exchange
WFE	World Federation of Exchanges
WSE	Warsaw Stock Exchange

About ECMI

The European Capital Markets Institute (ECMI) was established as an independent non-profit organisation in October 1993, in a collaborative effort by the European Federation of Financial Analysts Societies (EFFAS), the Federation of European Securities Exchanges (FESE) and the International Securities Market Association (ISMA), now the International Capital Market Association (ICMA). ECMI is managed and staffed by the Centre for European Policy Studies (CEPS) in Brussels. Its membership is composed of private firms, regulatory authorities and university institutes.

European capital markets have experienced rapid growth in recent years, corresponding to the gradual shift away from relationship banking as a source of funding and at the same time, have had to absorb and implement the massive output of EU-level regulation required to create a single market for financial services. These developments, combined with the immense challenges presented European financial institutions by the globalisation of financial markets, highlight the importance of an independent entity to undertake and disseminate research on European capital markets.

The principal objective of ECMI is therefore to provide a forum in which market participants, policy-makers and academics alike can exchange ideas and opinions concerning the efficiency, stability, liquidity, integrity, fairness and competitiveness of European capital markets and discuss the latest market trends. These exchanges are fuelled by the publications ECMI regularly produces for its members: quarterly newsletters, annual reports, a statistical package, regular commentary and research papers, as well as occasional workshops and conferences. ECMI also advises European regulators on policy-related matters, acts as a focal point for interaction between academic research, market sentiment and the policy-making process, and promotes a multidisciplinary and multidimensional approach to the subject.

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