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POST-LISTING STOCK RETURNS AND INDUSTRY EFFECT
Empirical Evidence from Finnish IPOs during 1987–2002

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ABSTRACT

This study, with an evidence of 79 Finnish IPOs during 1987–2002, investigates whether the industry has impact on the behavior of stock returns after initial public offerings. In particular, it is studied whether the underpricing and the underperformance associated with IPOs exist in the Finnish stock market and whether the industry affects these phenomena. The performance is analyzed with abnormal returns which are determined by using four benchmarks.

The results clearly show that Finnish IPOs are underpriced on average. Despite the method, the t-test being utilized verifies that the initial average abnormal return is statistically significant. Moreover, the results suggest that the IPOs underperform all the benchmarks in the long-run. However, the deepness of the underperformance is dependent on the underlying benchmark.

The analysis indicates that the industry has a clear impact on both these anomalous phenomena. The measure of underpricing (i.e. initial abnormal return) varies from industry to another. Industrial firms are the best initial performers whereas materials sector produces the poorest initial returns. Instead, consumer discretionary & staples industry generates the best long-run returns whereas high-tech sectors are the poorest performers in the 36-month period following IPO.

In addition, the Fama-French model being utilized exhibits that the whole underperformance in Finnish stock market may probably be explained with blow-outs of bubbles and different figures in market capitalizations and book-to-market values. When using the FF model, only the high-tech sectors statistically underperform. This finding suggests that the whole underperformance in Finland may be caused by anomalies related to different market values and book-to-market figures, and crashes that followed prevailing booms.

KEYWORDS: initial public offerings, underpricing, underperformance, industry effect, abnormal returns, CAPM, Fama-French three factor model

1. INTRODUCTION

Most companies start out by raising equity capital from a small amount of investors. Therefore, there is no liquid market existing for this kind of equity that reduces the price to be paid for the stock. Thus, these kind of private placements are usually less suitable for large offerings. Instead, going public through an *initial public offering* (IPO) is a fundamental way for privately-held corporations to raise capital and increase liquidity. Initial public offerings are sometimes called also as unseasoned new issues. This event changes a company from a “close” corporation (i.e. the equity value of the company is restricted to a relatively small group) to a public company (i.e. the equity of the company can be transferred without restrictions). After the IPO event, the shares of a company will be publicly traded in the stock market and thus the company will become owned more widely. (Ibbotson, Sindelar & Ritter 1988: 37; Aminhud & Mendelson 1989: 68; Ritter 1998: 1; Brealey & Myers 2003: 406–407; Bodie, Kane & Marcus 2005: 68.)

Initial public offerings have many advantages but also many disadvantages as well. For example, going public involves a great access to capital, not only instantaneously after the offering but also later in the future. However, initial public offerings are quite risky and far from cheap. Risks are faced by all involving parties. Furthermore, initial public offerings are expensive. For example, there is a need for supplying a great amount of information for public corporations. Moreover, there are several one-time costs, such as the dilution associated with selling shares with a price which on average is remarkably lower than the market price shortly after the offering. (Ibbotson & Ritter 1988: 37; Ritter 1998: 1.)

According to efficient market hypothesis (EMH) nobody can achieve consistently huge returns relative to the risk in security markets (Kauppi & Martikainen 1994: 5). However, it is verified in numerous studies that there are three regular IPO-related phenomena which contradict the efficient market hypothesis. Firstly, IPOs are consistently underpriced in addition to which they have poor long-run performance relative to common market (see e.g. Loughran, Ritter & Rydqvist 1994). Moreover, there is a so-called “hot issue” phenomenon (see e.g. Ibbotson & Jaffe 1975). Underpricing becomes evident in the first trading days of common stocks when the stock prices on average rise remarkably. Previous evidence also shows that the post-IPO stocks generate less gain for some years than the stock market in overall, a phenomena known as the long-run underperformance. Instead, the “hot-issue” is a phenomenon, according to which the greatness of

the underpricing depends on the point of time when the IPO is conducted. These phenomena lead to a conclusion that it is profitable for an investor, who is about to achieve quick gains, to buy shares within IPO and to sell them during the latter part of the first trading day. Since finance theory claims that there are no free lunches on Wall Street, should we believe in that nobody can pick up free lunches in the IPO market?

1.1. Purpose and Hypotheses of the Study

Initial public offerings are widely investigated in the field of finance. However, there are only few studies concerning the issue whether the line of business affects the anomalies associated with IPOs, i.e. whether *the industry effect* exist in post-IPO returns. Moreover, there are no previous studies on the industry effect exploiting Finnish data. This study examines whether the industry has any impact on the IPO underpricing and the long-run underperformance. The evidence is extracted from the 79 Finnish IPOs having taken place during a 15-year-period, from 1987 to 2002. Underpricing is examined using first-day returns whereas returns of up to following three years are used for the study of long-run performance.

Highly presumably, the two IPO-related anomalies, underpricing and underperformance, will also be found in this study. Instead, it is very interesting to see how the line of business affects these phenomena. The hypothesis that the line of business would affect the anomalies associated with IPO is very motivated. Firstly, investors are often more likely to invest in some “hot” industries. For example, before the “IT-bubble” was blown in the beginning of the new millennium, a lot of individual investors were seen standing in a queue to get IT shares within IPO. Moreover, the industry-specific factors very apparently affect these anomalies as pointed by Johnston (2000).

Furthermore, since this study uses four methods to determine the abnormal returns that the IPO anomalies will very likely generate, it is very interesting to see whether the choice of the pricing model has any impact on IPO anomalies over the industries. The abnormal returns will be calculated in the same way as in several previous IPO studies (see e.g. Ritter 1991), i.e. without a beta or any other risk factor. The abnormal returns will be determined using also the normal company-specific beta and the industry beta. Additionally, trying to remove the impacts the book-to-market ratio and the market value are found to have on the stock returns, the three-factor model created by Fama and French (1992, 1993) will be used.

The first aim of this study is to verify that both the underpricing and the long-run underperformance occur in the Finnish IPO market. In addition, the impact of the line of business on these phenomena is investigated. There are four research hypotheses given for this study. First of them is well motivated, because the same hypothesis is verified in several previous international and domestic studies (see e.g. Keloharju 1993; Loughran et al. 1994).

H_1 : Initial public offerings are underpriced in Finland

Many international studies (see e.g. Ritter 1991; Loughran et al. 1994) also verify the initial public offerings' long-run underperformance hypothesis. Loughran et al. (1994) showed that the same phenomenon occurs in all of the 25 countries included in their study. Keloharju's (1993) study shows that Finnish IPOs underperform the market. Therefore the following hypothesis is set:

H_2 : Post-IPO stocks produce poor returns in the long-run.

Some foreign studies (see e.g. Young & Zaima 1988, Johnston 2000) show that certain industries generate higher initial returns after IPO. Therefore the third hypothesis considers that the industry has some impact on the initial price performance of initial public offerings.

H_3 : The industry has impact on the initial price performance of initial public offerings.

Furthermore, Young et al. (1998) claims that the industries having greater abnormal initial returns also perform better in the long-run. Johnston (2000) verifies this statement to be true e.g. in the internet firm industry. Ritter (1991) also argues that the industry has a clear impact on the long-run negative drift of post-listing stock returns. The fourth hypothesis of this study thus expects that the industry affects the price performance after IPO.

H_4 : The industry has impact on the long-run price performance after initial public offerings.

1.2. Structure of the Study

The study consists of two parts with the theoretical background being the first. The first chapter begins with a brief introduction to the study including the purpose and the structure of the study. An overview for equity issues is provided in chapter two. Then efficient capital markets are discussed in the following chapter. That chapter introduces the efficient market hypothesis and the Fama's famous classification of market efficiency forms. Chapter four contains previous studies associated with the underpricing and the underperformance of initial public offerings and also a few studies concerning the "hot issue" phenomenon. The chapter also gives an overview for alternative theories of these phenomena. The following chapter deals with the stock valuation and discusses how to establish the price of the listing stock. The chapter also introduces some methods for determining expected security returns. Chapter six, in turn, introduces the data to be used in this study. The statistical methods to be used to examine whether the hypothesized effects appear in the Finnish stock market are also discussed.

The study continues with the empirical part. The chapter seven consists of the results obtained from the tests on underpricing and underperformance. Since a regression model is used with various methods to determine the industry's impact on the abnormal returns associated with IPOs, the results generated by several regressions are also discussed. The chapter eight summarizes the study and includes the conclusions. Some ideas for further investigations are also given.

2. NEW ISSUE MARKETS

When companies need for more capital they may choose to sell new securities. This type of market is called the primary market where issues of new stocks, bonds or other securities are marketed to the public, usually by investment bankers. Instead, trading of securities which are already issued, takes place in the secondary market. For example, the secondary market consists of common shares traded in organized stock exchanges and in the *Over-The-Counter* (OTC) market. (Bodie, Kane & Marcus 2005: 66.)

2.1. Introduction to Issues of a Common Stock

Primary issues of a stock can be sold either in a *private placement* or in a public offering. In case of private placement, shares are sold directly to a small group of institutional or wealthy investors. These issues are often far cheaper than public offerings but because they are not available for general public, they are generally less suitable for large offerings. Furthermore, private placements are not traded in secondary markets. This reduces their liquidity and thus the price to be paid for the issue is also lower. (Bodie, Kane & Marcus 2005: 66–68.)

Going public is a very important long-term decision for the company. Unlike private placements, selling the primary issue of a stock in a public offering provides an access to greater long-term capital. Moreover, going public enables the company to raise capital on more favourable terms in the future, not only equity but even just also debt. Furthermore, issuing stocks publicly is a process which normally involves the widening of the shareholder base by captivating a range of new shareholders. The mechanism through that is achieved can be either:

- (i). an issue of new shares by a certain private company which is raising capital by issuing securities to the public for the first time
- (ii). an issuance of shares by a company whose shares are already publicly traded

The first mechanism is usually called as an initial public offering, whereas the second is referred to as a *seasoned equity offering* (SEO) or just a secondary offering. (Sabine 1987: 33–34; Fuerst, Geiger, Peres, Gilo & Lubash 2002: 217; Brealey, Myers & Marcus 2004: 370–376.)

Seasoned equity offerings and secondary offerings are often used for financing large investments. These offerings can be issued as:

- (i). *rights issue*: an issue of securities is offered only to current shareholders.
- (ii). *general cash offer*: a sale of securities is open to all investors
- (iii). *private placement*: a sale of securities to a limited number of investors without a public offering.

These offerings have smaller risks compared to initial public offerings. For example, the market price of a stock is already known when issuing SEOs. Furthermore, seasoned equity offerings are much cheaper than IPOs. For example, issuing seasoned equity offerings don't require such an extensive documentation about the business as required for the initial public offerings. (Sabine 1987: 34; Brealey et al. 2004: 376–380.)

Associated with seasoned equity offerings, there is a very important rule in several countries. This rule is called as a *prior claim* or a *pre-emptive right* and it may be based on the law, the documents made by the company, stock exchange regulations or market practice (Sabine 1987: 99). In Finland, the law regulates the rule according to which current shareholders have a right to purchase new shares in the same proportion in which they currently have the shares of the company. This rule allows the shareholders to preserve their proportional position in the corporation (Osakeyhtiölaki 1978).

As IPOs are underpriced and perform poorly in the long-run, also other public offerings are anomalous. Spiess and Affleck-Graves (1995) studied whether the long-run underperformance phenomenon exists also within firms making seasoned equity offerings. They found that during 1975–1989, firms issuing SEOs substantially underperformed a sample of matched firms. They documented that the effect exists even when controlling for the industry and the size of firms. Moreover, controlling for trading system, offer size, issuing firm's age and book-to-market ratio did not extinguish the effect. They argued that SEOs perform similar to initial public offerings, suggesting that managers take advantage of overvaluation in both the initial and seasoned equity offering markets. The results are confirmed by Loughran and Ritter (1995) and later in several investigations (see e.g. Jung, Kim & Stulz 1996 and Teoh, Welch & Wong 1998).

2.2. Advantages and Disadvantages of Going Public

Regardless of great advantages, going public has also several disadvantages. In the following, the pluses and the minuses of going public are discussed. Firstly, an overview is given to show what the company gains in overall when it decides to organize the initial public offering. Then the disadvantages of going public are discussed. The properties represent US companies, but most of them describe well the situation in Finland. According to Sabine (1987: 41–43) and Fuerst et al. (2002: 219) going public has following advantages:

- *A great access to capital:* IPOs open up a new source of long-term capital for the company. The initial public offering entitles the company to get a great amount of capital through the IPO and give a chance to gain capital by additional offerings.
- *Liquidity and company's value:* Due to the enhanced liquidity and the insertion of money, the company's value is usually raised since starting trading in secondary markets.
- *An improved ability to borrow money:* Going public increases the company's equity and thus its ability to raise capital from auxiliary sources.
- *The possibility of expanding through mergers:* Public companies have the market price and thus their value is known. This helps the merging.
- *The ability to quickly realize profits:* Owners can more easily sell their holdings.
- *An instrument for providing employee incentives:* A traded company can establish plans for executive stock options which enable the employees to get valuable gain within the success of the company.
- *Improving the level of management:* Publicly traded companies often have experienced boards of directors. Furthermore the required level of financial reporting usually forces management to attach to higher managerial standards.
- *Public and market awareness:* A public company often has a higher public profile than a private company.

Several important disadvantages related to initial public offerings are defined in the literature. Sabine (1987: 43–44), Ritter (1998: 1), Ibbotson et al. (1988: 37) and Fuerst et al. (2002: 219–220) sum up following disadvantages of going public.

- *The cost of IPOs*: IPOs are very expensive. In particular, for publicly-traded companies, there are certain costs related to the need to supply information about the business to investors and regulators. Moreover, there are significant one-time costs associated with initial public offerings. These costs can be categorized as direct and indirect costs. Direct costs consist of the legal, auditing and underwriting fees. The indirect costs include the management time and effort spent for conducting the IPO. Since stocks are usually sold with a price which is on average remarkably lower than the market price shortly after the offering, the dilution of the share price is also regarded as an indirect cost.
- *Risk*: Initial public offerings are usually quite risky. Risks are faced by each of the three major parties involved since neither an issuer, nor an investment banker, and nor investors act without risk.
- *Loss of privacy*: Public companies are required to disclose a great deal of information about its business and its methods of operation and financing.
- *Expectations of short-term results*: Shareholders and analysts monitor the company's performance from one quarter to the next and expect to see an increase in performance. Companies may face difficulties in explaining a long-term plan which weakens the short-term performance.
- *Reduced operating flexibility*: The need for approvals of shareholders and the board may slow down business processes.
- *Restrictions on sales by managers*: Regulations concerning insider trading limit manager's ability to trade the shares of the company.
- *Legal exposure*: Publicly held companies are more exposed to legal suits in general compared to private companies.
- *Current expenses*: Public corporations are required to maintain a periodic reporting system which involves costs and payments to independent advisors.

- *Loss of founders' control*: The founders may lose their control to the firm within IPO.
- *Dividend policy*: Shareholders may expect a public company to adopt a dividend policy, and when distributed dividends, to persist in doing so. Any changes in the policy affect the share price.

2.3. Going Public Process

Going public is an important decision for a company. Therefore planning it usually takes a long time. Furthermore, preparing a company to achieve the requirements for the public listing often demands a remarkable period of time. In addition to the requirements for the exchange, these companies often make preparations related to communications and public relations. (Pricewaterhousecoopers 2005: 20–23.)

In addition to the issuer, underwriters have an important role in initial public offerings. The underwriters are investment bankers, which guarantee the issue. The tasks and liabilities of the underwriter are agreed upon in the contract into which an issuing firm enters with the underwriter. The task of underwriting is to share the risk of the issue. The role of the underwriter can be determined by a contract in several ways. In *firm commitment* underwriting the underwriter subscribes itself the securities to sell them again to investors. In *stand by* –contract, the underwriter commits to buy these securities that are not subscribed by investors. *All or none* –arrangement means that the issuer can cancel the issue if it's not fully subscribed. *Best effort* is a contract in which there is no actual underwriting. The role of the underwriter in these contracts is to market the issue and receive commission for sold securities. (Pricewaterhousecoopers 2005: 11.)

When stocks have been offered to the public first time it is followed by a so called subscription period within which the securities are sold to the public to be subscribed. The stocks can not be taken in the stock exchange list until the subscription period has expired. In Helsinki stock exchange, the decision whether the stock is accepted to be listed is made by the listing committee. When the subscription period has expired and the committee has accepted the listing, the stocks are traded publicly and the changes in the market value of the company can be followed by investors and others. (Pricewaterhousecoopers 2005: 30.)

2.4. Characteristics of Finnish Equity Market

A marketplace for publicly listed stocks in Finland is Helsinki Stock Exchange which currently is a part of Nordic stock exchange consortium, OMX. In addition to Helsinki's exchange, OMX contains Stockholm's, Copenhagen's as well as the Baltic countries' exchanges. This enables OMX to cover about 80 percent of Nordic security markets. (OMX Exchange 2005a: 2.)

In Helsinki Stock Exchange, stocks are traded mainly in three lists. These lists are the main list, I list and NM-list and they differ from each other by listing requirements. For example, a company has to have a 35 million (in EUR) market value to be listed in the main list, whereas the value of 4 million is enough to be accepted in the I-list and 2 million in the NM-list. Moreover, the public has to hold at least 25 % of listed stocks in the main list, while 15 % and 10 % is enough in the I-list and the NM-list, respectively. There is also a pre-list which is meant for temporarily listing. Usually, this is a list before actual listing. Listing in the pre-list usually lasts one year at the most. Appendix 1 presents the listing requirements for Helsinki Stock Exchange. (OMX Exchange 2006a.)

The main list is for blue chip companies with several years of operating history and established financial position. I-list is for midsize companies with stable operations and consolidated positions, whereas NM-list is for growth companies with an international orientation. Moreover, a firm must have sufficient profitability and operating capital to be accepted either in I-list or in NM-list. (OMX Exchange 2006b.)

OMX harmonized the industrial classification of listed companies in all of its exchanges in July, 2005. This classification follows GICS (Global Industry Classification Standard). The GICS structure consists of four levels: *sectors*, *industry groups*, *industries* and *sub-industries*. The classification of this study follows mainly the first level, called as sectors. In OMX, there are 10 classes in the first level. These sectors are energy, materials, industrials, consumer discretionary, consumer staples, healthcare, financials, information technology, telecommunication services and utilities. (OMX Exchange 2006c.)

In Finland, there are substantial delays between pricing and trading when issuing IPOs. This differs from a practice existing in US and increasingly in many countries in Europe where the offer price is set just a few days or even hours before trading in the stock market begins. This is an important point for the study of the underpricing effect. In US,

the market movements between pricing the stock and trading with it are negligible and thus can usually be ignored whereas in Finland adjusting the estimates of underpricing for interim market movements is sensible. (Ljungqvist 2005: 9.)

3. MARKET EFFICIENCY

The function of the capital markets is to transfer funds between lenders and borrowers efficiently. The existing capital markets allow companies, for example, to have better access to large investments by providing an opportunity to borrow money for their investments. For savers, the capital markets provide an environment to lend the needed money to the companies for getting higher return than they might otherwise earn. (Copeland, Weston & Shastri 2005: 353–354.)

This chapter gives an overview to market efficiency. Firstly, it is stated what is meant when using the idea of perfect capital markets. After that the idea of “randomly walking” stock prices is presented. Then the focus is on the efficient market hypothesis. Fama (1970) introduced three forms of market efficiency that are also described. This chapter contains also Fama’s (1991) modification of his traditional classification of market efficiency forms. Finally, a few words are used to give an overview to different anomalies as well as to behavioral finance theory.

3.1. Perfect Capital Markets

Before starting to describe efficient markets it would be useful to contrast them with *perfect capital markets*. According to the finance theory, the perfect capital markets have to achieve four following terms (Copeland et al. 2005: 353–354, Shapiro 1991: 59–61):

- (i). There is *no friction* in markets. Thus, markets have no taxes, transaction costs or constraining legislation. Furthermore, the investment targets can be completely classified and marketed.
- (ii). There is *perfect competition* in product- and security markets. Every producer offers its products at minimum average costs in product markets and all the parties trade at market price in security markets.
- (iii). Markets are *informationally efficient*. The information is free and available to all parties simultaneously. All the market parties are harmonious in interpretation of the information.

(iv). All the investors *rationally maximize their benefits*.

The perfect capital markets direct the funds efficiently. In markets like these all the information is reflected immediately into security prices and the saved funds are directed optimally to investments that are the most profitable. Anyway, all the assumptions presented above are theoretical and they do not appear in real markets. Nevertheless, the concept of ideal market provides a satisfactory base to evaluate the efficiency of existing markets. (Copeland et al. 2005: 353–354.)

3.2. Random Walk –Model

Random walk is a theory which is closely related to the idea of market efficiency. The basic idea of “randomly walking” stock prices was proposed by Bachelier (1900). However, the idea was nearly forgotten until Kendall (1953) studied the behavior of stock and commodity prices over 50 years later. Kendall reported that the stock prices follow random walk. The random walk –model assumes that changes in share prices are random and cannot be predicted. (Brealey et al. 2003: 347–348; Cootner 1967: 17–99.)

In the literature, four theories concerning the random walk -model are discussed. The very simply version of the model is a *fair-game* model. This means that, across the large number of samples, the expected return on an asset equals its actual return on average. This implies that the expectations are not biased. *Martingale* is a theory which states that tomorrow’s price is expected to be the same as today’s price. According to the martingale theory the return in the long-run is zero. *Submartingale* is a fair game where tomorrow’s price is expected to be higher than today’s price. Thus, the expected returns are positive. Finally, the pure random walk –theory states that there is no difference between the distribution of returns conditional on a given information structure and the unconditional distribution of returns. If returns follow random walk, the mean of the underlying distribution remains unchanged over time. (Copeland et al. 2005: 367–368.)

3.3. Efficient Market Hypothesis and Three Forms of Market Efficiency

Efficient market hypothesis (EMH) has had its form since 1970 when Fama made an investigation in which he tested its performance. EMH offers a more sensible benchmark of market efficiency than the pure perfect capital markets. EMH claims that the

market price of an asset is the best estimate for its right price, fully reflecting all publicly available information concerning its value. Thus, the capital market efficiency is less restrictive than the notion of the perfect capital markets. The efficient market hypothesis implicitly means that nobody can achieve consistently huge returns relative to the risk in security markets. However, many studies have later indicated that there are chances of excess returns relative to the risk in security markets. These phenomena are generally called as anomalies. (Brealey et al. 2003: 351, 358–359; Copeland et al. 2005: 353–354.)

Fama (1970) defined also three levels of market efficiency in his study. These levels are distinguished by the level of information reflected in security prices (Bodie et al 2005: 373; Brealey et al. 2003: 351; Copeland et al. 2005: 354–355):

- (i). *Weak form of market efficiency*: Security prices reflect the information contained in the past prices.

- (ii). *Semistrong-form of market efficiency*: Security prices reflect all the published information.

- (iii). *Strong-form of market efficiency*: Security prices reflect all the information, public and private.

If capital markets are weak-form efficient, security prices reflect all the information which is contained in past prices. If markets are efficient in this sense, it is not possible for anyone to predict future price movements from historical price performance of the security. This means that nobody can consistently achieve huge returns by looking backwards and studying historical price behavior. Instead, prices follow random walk. (Bodie et al. 2005: 373; Brealey et al. 2003: 351.)

In semistrong-form efficient capital markets, security prices reflect all the information which is publicly available. Then the prices reflect not only the past prices but also all the other published information, such as data which can be read from the financial press. In these markets, prices will adjust immediately to public information which can be for example an announcement of last quarter's earnings or a new issue of a common stock. (Bodie et al. 2005: 373; Brealey et al. 2003: 351.)

Fama's third level of market efficiency is called as strong-form efficiency. In strong-form efficient markets security prices reflect all the relevant information, despite whether it is publicly available. In these markets, security prices reflect all the information that can be obtained by doing an analysis of the company and the economy. In markets like these nobody is able to consistently achieve huge profits and anomalies do not exist. (Bodie et al. 2005: 373; Brealey et al. 2003: 351).

In Fama's (1970) classification of market efficiency, each level is based on the previous level. Thus, semistrong-form efficient markets are also weak-form efficient, and strong-form efficient markets are also semistrong-form as well as weak-form efficient. Therefore if some deflections in efficiency can be found in the strong-form of efficiency, deflections can be found also in semistrong-form and weak-form of efficiency. Moreover, if there are some deflections in semistrong-form of efficiency, markets are not completely efficient in the weak sense of efficiency, either. (Bodie et al. 2005: 373; Ross, Westerfield & Jaffe 1996: 340–341.)

In 1991, Fama modified his widely utilized traditional classification of market efficiency forms. While his earlier classification included weak-form tests, the appropriate tests were named as tests for return predictability in the new version of the classification. This group includes the time-series predictability of returns either with past returns or with other variables. While the weak-form tests were only concerned with whether the stock prices can be predicted using the past price performance of stocks, the tests for the return predictability category covers a lot larger area. The new category doesn't include studies forecasting stock returns with past price performance only but also with other variables, such as price-to-earnings ratios or interest rates. Also the studies using volatility tests and studies of seasonalities in returns (e.g. day-of-the-week and turn-of-the-month effects) are included in this group.

For the categories of semistrong-form and strong-form tests, Fama (1991) replaced just only the titles with more descriptive ones but left their coverage unmodified. In the new classification event studies correspond to the semistrong-form tests and are concerned with whether the stock prices fully reflect all the relevant information which is publicly available. Event studies focus on the behavior of stock prices around specific events which can be e.g. an earnings announcement. Since the event studies provide important information about the rapidity of the adjustment of stock prices to new information, Fama argued that the event studies give the most direct evidence of market efficiency.

Fama (1991) named the strong-form tests as tests for private information. These tests are used to examine whether some individual agents have private information which is not fully reflected in stock prices. For instance, there is clear evidence that corporate insiders have private information which is not completely reflected in stock prices. As a summary for the Fama's efficiency forms, table 1 demonstrates the differences between Fama's market efficiency classifications.

Table 1: A comparison of Fama's old and new classifications of market efficiency (Fama 1991; Kallunki 1995: 33)

Fama (1970)	Fama (1991)
Weak-form tests	Tests for return predictability <ul style="list-style-type: none"> • the time-series predictability of returns <ul style="list-style-type: none"> ○ with past returns ○ with other variables ○ also volatility tests and seasonals in returns
Semistrong-form tests	Event studies
Strong-form tests	Tests for private information

Efficient market hypothesis has many implications to initial public offerings. Efficient markets price the securities always correctly. Therefore entrepreneurs would never be able to have superior financing opportunities. Thus they wouldn't be able to take advantages by placing IPOs in some specific periods. However, earlier IPO studies claim that there are "windows of opportunities" (see e.g. Young & Zaima 1986:50). This means that during some specific periods IPOs are substantially overvalued. During those periods the entrepreneurs can take advantages of robust periods by placing IPOs then and thus achieving more capital than in "normal" circumstances.

Moreover, EMH claims that after a stock begins to be traded in the market, the market quickly sets a correct price for the security. This means that although there would ap-

pear some kind of initial returns, the abnormal performance is only temporal and immediately after the beginning of stock trading the abnormal performance disappears. Furthermore, EMH proclaims that nobody can achieve consistently superior returns with respect to the risk. Nevertheless, as verified in many studies, initial public offerings are remarkably underpriced and thus the IPO markets are associated with superior profit opportunities. Due to the underpricing phenomenon, investors can achieve huge returns by purchasing these stocks within IPO and then selling them before the end of the first trading day. Furthermore, as argued in many studies, the presence of poor long-run underperformance of IPO stocks violates the efficient market hypothesis.

Notwithstanding, all studies do not confirm that the abnormal performance after initial public offerings is against the market efficiency. Brav and Gompers (1997) studied the long-run underperformance of IPO stocks using a sample of nonventure-backed and venture-backed companies. Since IPO stocks are typically small growth stocks, they showed that when controlling the book-to-market ratios and market values of IPO companies, the underperformance does not differ from the performance of similar growth stocks. Motivated by these results, Fama (1998) argued that the long-run underperformance of IPO stocks tend to disappear with changes in technique. Thus, he did not agree that the long-run underperformance would not be a deflection from market efficiency.

3.4. Anomalies

An anomaly in the stock market is a phenomenon which contradicts the efficient market hypothesis. Berglund (1986: 26–27) makes a distinction between an observed anomaly and inefficiency. He claims that inefficiency disappears after it becomes widely known and an anomaly is apparently regarded as a profit opportunity by the market. However, as seen in many studies, theoretical models do not completely explain the reasons for the anomalies. Instead, according to French (2002: 1), anomalies often seem to disappear, reverse or attenuate when they are documented and analyzed in academic literature. He raises a question of whether profit opportunities existed in the past, but have since been arbitrated away, or whether the anomalies were simply statistical deflections that attracted the attention of academics and practitioners.

Several previous investigations indicate that there can be found deflections in all the levels of market efficiency in Finnish stock market (see e.g. Berglund 1986; Kauppi &

Martikainen 1994), and thus it seems that there are opportunities to achieve huge returns relative to the risk. Therefore, analyzing of the price outcome of stocks and the financial statements of companies seems to be beneficial. These results are consistent with the evidence also from large stock markets, such as from United States (see e.g. Ball 1978; Jensen 1978).

According to Kauppi et al. (1994: 7) anomalies can be classified in two groups: seasonalities and fundamental anomalies. Seasonalities (also called as calendar anomalies) are anomalies indicating that investors' required rates of return are dependent on the points of time when the investments are made. Seasonalities include anomalies such as turn-of-the-month anomaly (see e.g. Ariel 1987 and Lakonishok & Smidt 1988) and day-of-the-week effect (see e.g. Fama 1965 and Cross 1973). Fundamental anomalies are associated with regularities caused by firm specific variables such as earnings to price (see e.g. Basu 1977, Dimson 1988) and firm size (see e.g. Banz 1978, Reinganum 1981), for instance. Evidently, there are also anomalies that apparently are not seasonal or caused by firm-specific variables.

3.5 Behavioral Finance

Since research in experimental psychology had suggested that most people tend to “overreact” to unexpected and dramatic news events, DeBondt and Thaler (1985) investigated whether such a behavior affects stock prices. They ranked stocks on three- to five-year past returns and found that portfolios of prior “losers” outperform future “winners”. Their results suggested that past winners tend to be future losers and vice versa. DeBondt et al. argued that most people ‘overreact’ to unexpected and dramatic news event. They brought up a question whether such a behavior matters at the market level. The hypothesis of overreacting investors is confirmed later by e.g. Zarowin (1990).

The findings of DeBondt and Thaler (1985) that the overreaction really exists in the stock market raises up a question: Is there some kind of explanation of market inefficiency that the traditional finance theory has not taken into consideration? The reason for the creation of the behavioral finance –theory is that the traditional finance theory ignores how real people make decisions. Moreover, people make difference. Sometimes, rather than “believing” in the efficient market, it would be useful to explain stock

returns with a theory that takes the investors' behavior better into account. (Brealey et al. 2003: 361; Linnainmaa 2003: 1–2; Bodie et al. 2005: 396.)

Errors and bias cut across the entire financial landscape, affecting everyone doing something there. Behavioral finance is the application of psychology to financial behavior – the behavior of practitioners. It is a study of how psychology affects finance. Behavioral finance can be based upon three themes. Firstly, behavioral finance recognizes that practitioners use rules of thumb called heuristics to process data. This is called as a *heuristic-driven bias*. Secondly, behavioral finance postulates that practitioners' perceptions of risk and return are highly influenced by how decision problems are made, labelled as *frame dependence*. Thirdly, behavioral finance contends that heuristic-driven bias and frame dependence effects cause market prices to deviate from fundamental value, named as *inefficient markets*. (Shefrin 2002: 3–5).

Behavioral finance burgeoned when the advances made by psychologists came to the attention of economists (Shefrin 2002: 7). Although there has been need for behavioral finance -theory, it didn't come into existence to beat the traditional finance. Behavioral finance still considers the expected return and the risk to be quantifiable variables and the investment to be a task of estimating them. Although the decision calculus of investors being uncovered by behavioral finance is turning out to be quite different than the rational decision calculus assumed in traditional finance, the fundamental concepts such as the expected return, the risk and the investment remain the same. (McGoun & Skubic 2000: 135.)

According to Shefrin (2002: 239), all the three regular phenomena associated with IPOs; initial underpricing, long-run underperformance and “hot issue” market, are behavioral. He argues that “many investors experience an IPO-adrenaline rush on the first trading day as they search for a new Microsoft”. Long-run underperformance is explained so that the price reached in the first trading day often overshoots the fundamental value and will fall back over time. “Hot issue” phenomenon is, according to Shefrin, due to excessive optimism from the part of investors leading IPO prices to rise above fundamental value on the first day, and remain so for long periods.

4. PREVIOUS STUDIES OF IPO ANOMALIES

Initial public offerings have been widely researched in recent decades. The main emphasis of these studies has been on three related anomalous phenomena. Firstly, IPOs seem to be clearly underpriced and secondly to have poor performance in the long-run. Thirdly, the “hot issue” markets of IPOs seem to be evident. This chapter focuses on these three anomalies. The phenomena are discussed based on previous studies. Theories of underpricing and long-run underperformance are also discussed to obtain an overview of possible causes.

4.1. Underpricing of Initial Public Offerings

Probably the best known inefficiency related to the going public process is the frequent incidence of huge initial returns. The price usually jumps up when the trading in the stock exchange has just begun making it possible for the investors in IPOs to achieve great returns and increase their wealth. Interestingly, the first study concerning this phenomenon was not, however, provided by any academic institution. Instead, Securities and Exchange Commission (SEC) reported in 1963 that companies going public have positive initial returns on average.

In the academic literature one of the early IPO papers was provided by Reilly and Hatfield (1969). Their sample covered 53 new issues from 1963 to 1966 in the US stock market. They found that investors can achieve superior returns in new stock issues reporting 9,9 % initial returns in IPOs on average. Moreover, suggesting that investing in IPOs generates superior returns also in the long run, they interestingly found that IPO stocks overperform the market in the long run. This finding is not consistent with newer studies.

Another early study concerning IPO underpricing phenomenon was created by Stoll and Curley (1970). Stoll et al. examined the initial price performance of initial public offerings including a sample of 205 US firms during the period 1957–1963 in their study. They reported that when excluding the extreme values, the truncated market-adjusted return between the initial offering and the first market date was 42,4 percent. When not truncating the data and taking also extreme values into account, the corresponding return they reported was 60,6 %.

McDonald and Fisher (1972) investigated the price behavior of initial public offerings immediately after the IPO event during the period 1969–1970. As Stoll et al. used the first-day returns as initial returns; McDonald et al. measured the initial performance of 142 North-American IPOs by calculating the return between the offering price and the market price after the first week of the offering. They found that the first-week return in their period was 28,5 percent. They claimed that the underpricing of IPOs is due to underwriters; they might attempt to *underprice* new issues so that the offerings would be fully subscribed.

The very first IPO underpricing studies did not adjust the initial returns with any risk factor. Ibbotson (1975) developed a technique to estimate the beta-coefficients for IPO stocks. This technique is called as *Returns Across Time and Securities* (RATS). Ibbotson studied the initial and aftermarket performance of initial public offerings going public during 1960s by utilizing the RATS model he created. With a data set of 2650 IPOs he found that the average initial performance of IPOs is about 11,4 percent and positive.

Nevertheless, Ibbotson reported that the distribution of returns is skewed so that a subscriber of a single random IPO has about an equal chance for gain or loss. Nevertheless, the subscriber has a far higher likelihood of an extremely large positive performance than a correspondingly large negative performance. According to Ibbotson, positive initial performance along with aftermarket efficiency indicates that when companies go public, the shares they sell tend to be underpriced. Ibbotson did not, however, provide any adequate explanations for the underpricing phenomenon. He still suggested some possible scenarios that, even though they may not be very plausible, were at least consistent with the empirical findings.

Earlier studies associated with IPOs were usually done using US data. Buckland, Herbert and Yeomans (1981) studied the underpricing effect in the UK stock market with a data set of 297 issues from 1965–1975. They got results that the initial market-adjusted return was 9,7 % on average. Moreover, they made an interesting (but not so surprising) observation that the initial return is influenced by whether there exist bull or bear market. In bear market environment, they reported 5,2 % initial return whereas in bullish market the corresponding return was 11,8 %. They concluded that price discounts are at all times associated closely with excess demand in the market.

Dawson, instead, (1987) examined the secondary market price performance of initial public offerings in three Asian stock markets, Hong Kong, Singapore and Malaysia during the time period from 1978 to 1984. The data sample he had collected consisted of 21 IPOs in Hong Kong, 39 in Singapore and 21 in Malaysia. The first-day average market-adjusted return was 13,8 % in Hong Kong, whereas it was 39,4 % in Singapore and 166,6 % in Malaysia. It is good to notice that the Malaysian very great first-day return was not caused by some extreme cases, since the median of abnormal returns was 170 %, thus still exceeding the average

Young's and Zaima's (1988) study empirically examined the aftermarket returns of small publicly-held firms that have issued initial public offerings. They had a data of 562 IPOs during 1980–1984 in the US stock market. They reported that some industries exhibited significant initial returns, while others did not. For example, Young et al. reported that the average initial return was 36 % in chemical industry, whereas the corresponding return was statistically insignificantly -20 % in food and kindred industry. This means that the industry had impact on IPO initial returns within their data sample and they called this phenomenon as the *industry effect*. Thus, their results are consistent with the third hypothesis of this study. Interestingly, they did not find a positive risk-return relationship as they used issuing firm's age as a proxy measure of risk.

Lehtinen (1992) and Keloharju (1993) were the first IPO researchers who studied the performance of Finnish IPOs. Lehtinen studied the pricing of initial public offerings in the Finnish stock market. Unlike many others, Lehtinen investigated the effect only in OTC market. His data included 39 IPOs going public in OTC market during the period 1985–1989. Lehtinen used two ways to measure abnormal returns. Firstly, he calculated the initial abnormal returns without beta coefficient or any other risk factor, resulting that the initial return was 20 percent on average. Then, Lehtinen took the risk factor into account and calculated the beta coefficient using Ibbotson's RATS-model. Lehtinen got results that risk-adjusted initial abnormal return was 17,3 % on average and concluded that there is no significant difference whether the risk factor is used or not in calculation of abnormal initial returns of initial public offerings.

Keloharju (1993), instead, studied the IPO performance of the companies in the Finnish stock market with a data set of 80 IPOs issued both for the stock exchange and in OTC market between 1985 and 1989. Keloharju used the average of the highest and lowest first-day share prices as a measure of the first day's share price and calculated the abnormal return by taking the market return and also transaction costs into account. He

reported that Finnish IPOs are significantly underpriced: an initial market-adjusted return was 8,6 % on average. However, compared to other studies, the underpricing effect in Finland is not, according to Keloharju, as strong as in many other stock markets.

The event windows used in studies of IPO initial returns varies from study to study. Most papers utilize the pure first-day return, in which the initial return is calculated as a difference between the IPO price and the final price of the first trading day. In some studies also the first-week return is used and Keloharju also presented one way to measure the initial return. Barry and Jennings (1993) went to extremes and argued that the initial return should be calculated as a difference between IPO price and the first transaction price. They studied the IPO underpricing effect in US stock market and collected a data sample of 229 IPOs for 25-month period during 1988–1990. Barry et al. found that virtually all of the initial returns were due to the underpricing of IPOs occurring at the opening transaction. In addition, they argued that the underpricing effect can be corrected by the price-setting process that establishes the opening price. In fact, they found that the median first day's intraday return is zero while less than half of all IPOs have positive returns on the first day after the opening transaction. The results which Barry et al. got imply that only the purchasers of securities in the IPOs itself can benefit from the underpricing of IPOs. Furthermore, their investigation also found that closed-end funds exhibit no abnormal initial price performance.

Johnston (2000) studied the impact of industry-specific variables on initial public offerings. He included in his study the financial services industry with 438 IPOs during 1986–1998, savings bank industry with 95 IPOs during 1990–1998 and internet industry with 138 IPOs during 1996–1999. In addition that it was found that industry-specific variables have impact on IPOs in overall, Johnston found that the industry affects the underpricing effect. Johnston reported, for example, that internet firms have higher initial returns than other industries. Moreover, Johnston found that interest rates have impact on the pricing of IPOs in financial services industry.

Loughran's et al. (1994) study provides a good summary for IPO underpricing effect. They discussed evidence on the short-run and long-run performance of companies going public in many countries. According to them the short-run underpricing was found in all the 25 countries for which they had data. The variation between countries is, however, very large. Although the period, for which they had data, is not exactly same for different countries, it can be clearly concluded that the country in which IPO is conducted has an impact on the underpricing deepness. For example, in France the underpricing of

IPOs was about 4,2 % in period 1983–1992, whereas in Malaysia it was 80,3 % in period 1980–1991. Table two, which is an updated version for Loughran's et al. one, summarizes the underpricing effect and let us to conclude that the effect is a global phenomenon.

Table 2: Average initial returns in percentages for 33 countries (Ritter 1998: 5).

Country	Author(s) of Article(s)	Sample Size	Time Period	Average Initial Return
Australia	Lee, Taylor & Walter	266	1976-89	11.9%
Austria	Aussenegg	67	1964-96	6.5%
Belgium	Rogiers, Manigart & Ooghe	28	1984-90	10.1%
Brazil	Aggarwal, Leal & Hernandez	62	1979-90	78.5%
Canada	Jog & Riding; Jog & Srivastava	258	1971-92	5.4%
Chile	Aggarwal, Leal & Hernandez	19	1982-90	16.3%
China	Datar and Mao	226	1990-96	388.0%
Denmark	Bisgard	32	1989-97	7.7%
Finland	Keloharju	85	1984-92	9.6%
France	Husson & Jacquillat; Leleux & Muzyka; Paliard & Belletante	187	1983-92	4.2%
Germany	Ljungqvist	170	1978-92	10.9%
Greece	Kazantzis and Levis	79	1987-91	48.5%
Hong Kong	McGuinness; Zhao and Wu	334	1980-96	15.9%
India	Krishnamurti and Kumar	98	1992-93	35.3%
Israel	Kandel, Sarig & Wohl	28	1993-94	4.5%
Italy	Cherubini & Ratti	75	1985-91	27.1%
Japan	Fukuda; Dawson & Hiraki; Hebner & Hiraki; Pettway & Kaneko; Hamao, Packer, & Ritter	975	1970-96	24.0%
Korea	Dhatt, Kim & Lim	347	1980-90	78.1%
Malaysia	Isa	132	1980-91	80.3%
Mexico	Aggarwal, Leal & Hernandez	37	1987-90	33.0%
Netherlands	Wessels; Eijgenhuijsen & Buijs	72	1982-91	7.2%
New Zealand	Vos & Cheung	149	1979-91	28.8%
Norway	Emilsen, Pedersen & Sættem	68	1984-96	12.5%
Portugal	Alpalhao	62	1986-87	54.4%
Singapore	Lee, Taylor & Walter	128	1973-92	31.4%
Spain	Rahnema, Fernandez & Martinez	71	1985-90	35.0%
Sweden	Rydqvist	251	1980-94	34.1%
Switzerland	Kunz & Aggarwal	42	1983-89	35.8%
Taiwan	Chen	168	1971-90	45.0%
Thailand	Wethyavivorn & Koo-smith	32	1988-89	58.1%
Turkey	Kiyamaz	138	1990-95	13.6%
United Kingdom	Dimson; Levis	2,133	1959-90	12.0%
United States	Ibbotson, Sindelar & Ritter	13,308	1960-96	15.8%

4.2. Long-Run Underperformance of Initial Public Offerings

Other well-known inefficiency related to IPOs is a frequently poor underperformance of issuing companies. Usually, after the first day's jump of just issued stock, the stock price start to decline. The negative drift of post-listing stock returns usually continues for years, making investors lose their wealth in the long-run. For example, the average three-year underperformance in US has been about twenty percent whereas it was slightly more, 21 percent, in Finland. Although long-run underperformance is also a global phenomenon with an evidence e.g. from Australia and Japan, it seems that it is not real phenomenon in all stock markets. For example, IPO stocks did not underperform in Korea during 1985–1988 and in Sweden during 1980–1990 (Ritter 1998: 15). Following table illustrates the international evidence on long-run performance of IPO stocks.

Table 3: International evidence on long-run performance of IPOs (Ritter 1998: 15).

Country	Author(s)	Number of IPOs	Issuing years	Total abnormal return
Australia	Lee, Taylor & Walter	266	1976-89	-46.5%
Austria	Aussenegg	57	1965-93	-27.3%
Brazil	Aggarwal, Leal & Hernandez	62	1980-90	-47.0%
Canada	Jog and Srivistava	216	1972-93	-17.9%
Chile	Aggarwal, Leal & Hernandez	28	1982-90	-23.7%
Finland	Keloharju	79	1984-89	-21.1%
Germany	Ljungqvist	145	1970-90	-12.1%
Japan	Cai & Wei	172	1971-90	-27.0%
Korea	Kim, Krinsky & Lee	99	1985-88	+2.0%
Singapore	Hin & Mahmood	45	1976-84	-9.2%
Sweden	Loughran, Ritter & Rydqvist	162	1980-90	+1.2%
U.K.	Levis	712	1980-88	-8.1%
U.S.	Loughran & Ritter	4,753	1970-90	-20.0%

One of the first academic studies concerning the long-run performance of IPO firms was made by Reilly et al. (1969). Their results were, however, surprising in the light of newer investigations as they reported that IPO stocks also overperform the market in the long-run arguing that investing in IPO stocks generates positive post-listing abnormal returns. The results they had have not, however, received further acceptance. Despite a

few studies which report a small positive abnormal returns for IPO stocks in some markets also in the long-run (for a review, see Ritter 1998:15), the majority confirms the anomalous long-run underperformance of IPO stocks. One of the earliest studies reporting this was made by Stoll et al. (1970) and McDonald et al. (1972). Stoll et al. calculated the market-adjusted long-run returns for IPO companies between the final price of the first trading day (to eliminate the effect of first day's huge returns) and the last available quotation until September 1966. They reported that the market-adjusted long-run return was 7,4 % and thus investors in new issues experienced lower long-term returns than they would had experienced when investing in the market portfolio. McDonald et al., instead, reported that the average market-adjusted return of IPO stocks was -18,1 % in the first year.

Ibbotson's (1975) studied whether the IPO stock returns contradict the market efficiency in the aftermarket. With a data sample of IPOs conducted during 1960–1969, he got results that generally confirm that IPO markets are not efficient in the long-run, either. He documented that only the first six-month periods after IPO may have high performance, but few trading rules are profitable after allowance for transaction costs.

Ritter (1984) examined the aftermarket price behavior of stocks of natural resource industries. His study consisted of 1028 issues during period 1977–1982. Ritter investigated the returns in the aftermarket from September 1981 to August 1982 for these issued stocks and reported that the aftermarket returns clearly underperform the sectoral index of natural resource stocks being -15 % on average. Moreover, since during the study period, there was a “hot market” in the sector particularly for penny stock issues, Ritter suggested that a speculative bubble may had been occurring in the aftermarket trading for these stocks.

Young et al. (1988) found several interesting implications for the long-run underperformance effect. Since they had measured the aftermarket performance with a data set of over 500 small business IPOs during 1980–1984, they documented that old firms perform better in the long-run and hypothesized that these results could be evidence of a *survivorship bias*. Moreover, they found that, with the exception of oil and gas industry, every industry with significant initial returns also earned substantial 12- or 18-month returns arguing that the industries that experience significant initial returns also exhibit higher returns in the long-run. These same industries had generated, however, large standard errors implying that within any given industry, aftermarket returns of IPO stocks vary tremendously.

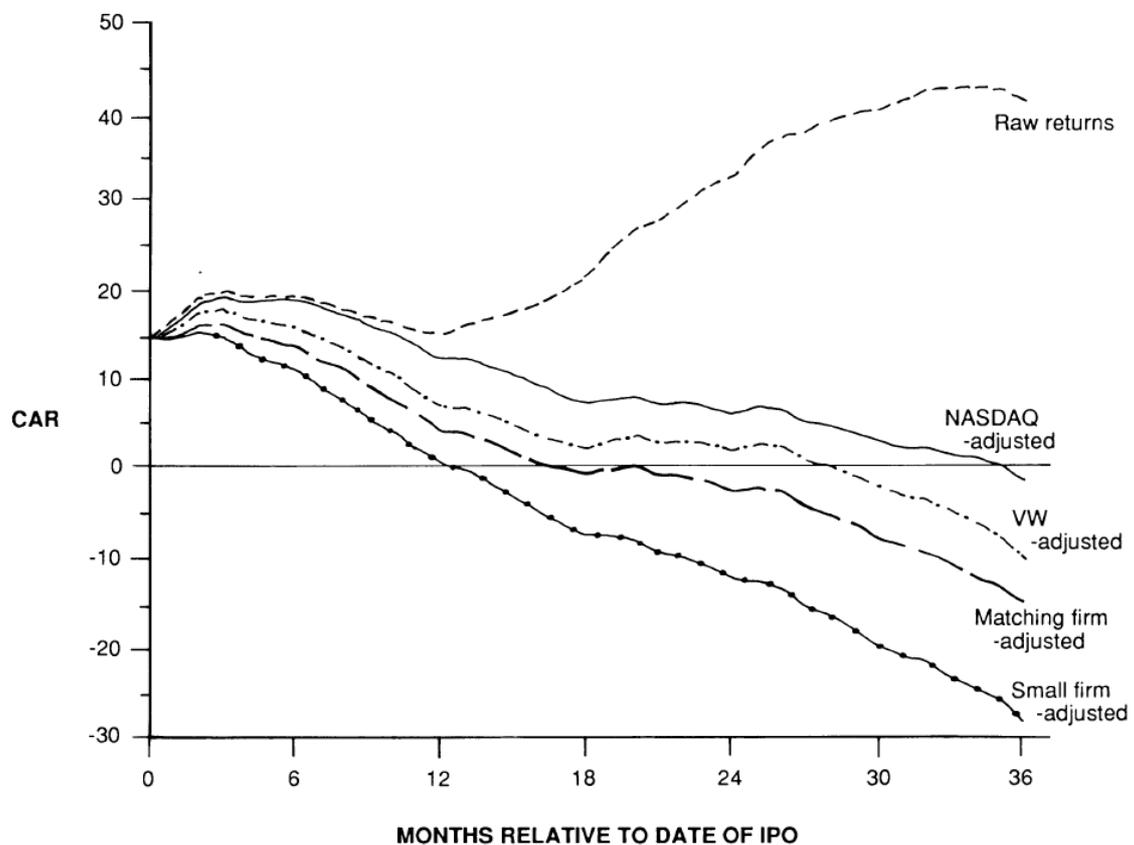
It seems that studying the underpricing of IPOs rather than studying the aftermarket performance had caught the attention of IPO researchers for decades. Although several earlier studies confirm the IPO stocks' poor long-run returns already in 1970s, Aggarwal and Rivoli (1990) were the first whose objective was to provide a comprehensive analysis of the long-term price performance of IPO stocks. They had a sample of 1598 common stock IPOs during 1977–1987. Aggarwal et al. reported that the market-adjusted return for investors who purchase the stock at the closing price on first day in the secondary market and hold it for 250 days is -13,73 % on average, being also statistically significant. The median of the corresponding returns was even more negative, -20,39 % suggesting that returns are biased towards zero by exceptional values and the average could be even more negative. Interestingly, the mean return was, however, positive in years 1977, 1978 and 1979 and swung to negative in 1980. They also argued that when taking the initial return into account, returns become negative approximately 220 days after the issue, suggesting that one explanation for the phenomenon could be the positive initial returns of IPOs. They also confirmed the Shiller's (1990) hypothesis that IPO market is subject to fads that affect market prices and cause IPO anomalies.

Aggarwal et al. also argued that their results have important implications for finance professionals. Firstly, they could provide defense against the charge of systematic underpricing for investment bankers. For financial managers, the results would suggest that the abnormal returns accruing to initial investors should not be interpreted as "money left in the table" in the form of underpricing by investment bankers. Furthermore, Aggarwal et al. argued that the results show for investors that IPOs are good investment targets in the short run, but over long periods, they perform poorly causing negative returns. Notwithstanding, they suggested that IPOs may present profitable short-selling opportunities.

Also Ritter (1991) made a thorough study concerning the underperformance phenomenon. Making his study more comprehensive, in addition to that he studied how IPO stocks perform in the long-run, he made various cross-sectional analyses to investigate possible explanations for the phenomenon. Ritter used a sample of 1526 IPOs that went public in the US during 1975–1984 and measured the long-term post-listing returns by excluding the initial returns from three-year returns. He found that the mean total return for three year holding period was 34,47 %. However, since a control sample of equal amount of listed non-issued stocks, matched by industry and market value, produced an average three-year total return of 61,86 %, Ritter concluded that IPOs underperformed the market from the closing price on the first day after IPO to their three-year anniversa-

ries 16,9 % on average. Moreover, he found that the median of corresponding returns was -39,9 %, that clearly suggests bias towards zero and let us to conclude that -16,9 percent mean abnormal return in the long-run is not caused by extreme negative values and the 'true' value of IPO stocks' underperformance should probably be even higher. Ritter also suggested that adjusting companies for matching firms or controlling the size produce poorer long-term returns than the market-adjusted returns would be. Figure 1 illustrates Ritter's results (raw returns include initial returns).

Figure 1: Long-run negative drift on stock returns after IPO (Ritter 1991: 11).



Furthermore, Ritter reported that there is some tendency for firms with high initial returns to have the worst aftermarket performance. However, this tendency is somewhat stronger for smaller issues than larger issues. Ritter concluded that this evidence is mildly supportive of the overreaction hypothesis created by DeBondt and Thaler (1985). Moreover, Ritter's findings suggest that there is a tendency for the smaller offers to have the worst aftermarket performance. Ritter also found that there is a strong mono-

tone relation between age and aftermarket performance. The younger the firm, the poorer was the long-run performance. In addition, Ritter reported that the long-run underperformance is not as general phenomenon as the short-run underpricing since the performance depends highly on the year of issuance.

From this thesis' point of view, it is very interesting that Ritter made an analysis concerning the aftermarket performance by industry. Ritter reported that the long-run performance of IPOs in different industries varies widely. Financial institutions had been performed quite well to have the best, 43,3 % three-year average total return after IPO. The worst performer had been oil and gas industry, the companies belonging to this industry had generated -68,3 percent three-year return on average after the first stock issue. Ritter pointed out, however, that the reason for good performance of finance sector and poor performance of oil and gas sector could be the large drop in interest rates during the study period and the decline of oil prices, respectively. Moreover, oil and gas industry had the lowest median age and the highest average initial return, while financial institutions had the highest median age and the lowest average initial return. Notwithstanding, the long-run underperformance of IPOs had been present in all but three of the 14 industry groupings. The underperformance of the IPOs in so many industries relative to other firms in the same industries might be interpreted, according to Ritter, as "evidence that is more consistent with a 'fads' explanation than mere bad luck". For a summary, it is clear that the industry had impact on IPO stocks' long-run poor performance in Ritter's study.

One target of Keloharju's (1993) study was to investigate the long-run performance of 80 IPO stocks in the Finnish stock market during 1985–1989. He found that Finnish IPOs clearly underperformed the market in the long-run reporting that from the offering price to three years later, the average return was -9,7 %, whereas investing in the market produced a return of 1,0 % over the same period. Moreover, Keloharju documented that the long-run underperformance is more severe when excluding the initial returns from the holding-period returns, producing -21,1 % three-year return on average in that case. Moreover, inconsistently with Ritter's (1991) results, Keloharju found that in Finland the long-run performance is relatively similar for IPOs issued in different years. Anyway, he reported that in Finland the underperformance effect is concentrated in small companies.

Keloharju made also an analysis whether the industry have impact on IPO long-run performance as Ritter (1991) reported. He found that the long-run underperformance of

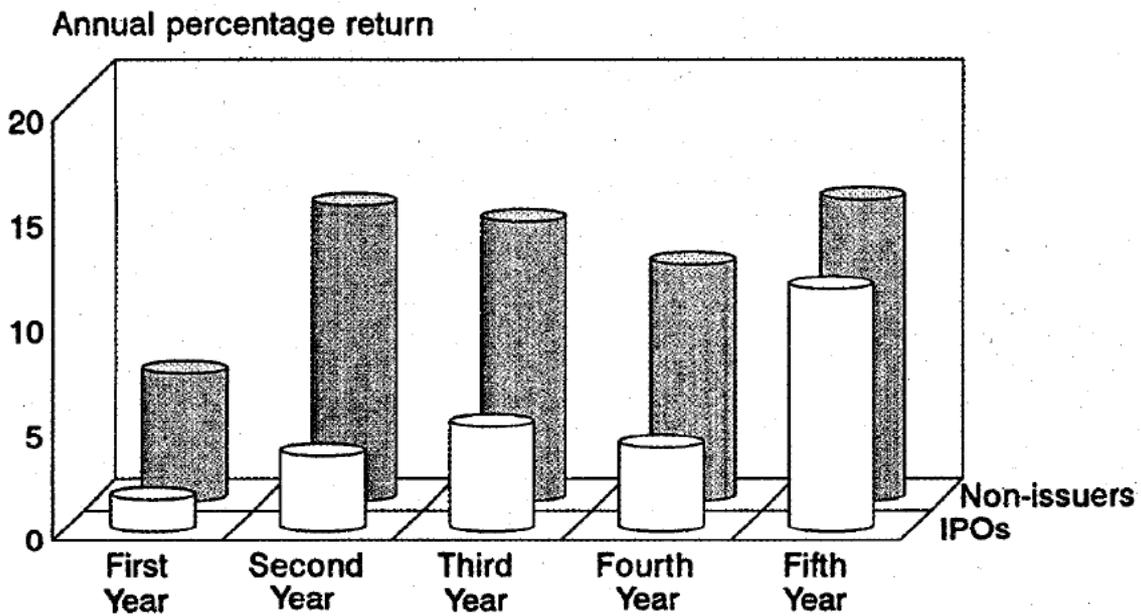
initial public offerings occurs in all business sectors. Furthermore, he reported that the underperformance doesn't vary from the industry to other concluding that the industry has no impact on poor long-run performance of IPO stocks. This contradicts the fourth hypothesis of this study. Nevertheless, since further papers document, that for example IT industry is associated with exceptional underperformance, and Keloharju made his investigation before the IT boom, the fourth hypothesis has still a strong base. Furthermore, the world has been changed a lot since Keloharju's study period.

Loughran and Ritter (1995) utilized data of 4753 initial public offerings during 1970–1990 to investigate the IPO long-run performance in the US stock market. In addition that they used a traditional way to measure the long-run returns, they used Fama-French three-factor model in order to investigate whether the poor performance of issuing firms is merely a manifestation of confounding effects, such as differences in betas, differences in sizes and differences in book-to-market ratios. They documented severe underperformance of IPOs suggesting that investors may systematically be too optimistic about the prospects of firms that are issuing equity for the first time. For the results, Loughran et al. reported that the average return on firms going public was five percent per year, whereas the corresponding return for matching firms was 12 percent. Thus, their results mean that the average one-year post-listing return, matched by nonissuing firms, was -7 %. Furthermore, they argued that holding both size and book-to-market ratio constant, IPO firms have lower subsequent returns than nonissuers and thus the long-run performance of IPO stocks should not be caused by these confounding effects. Moreover, they documented that issuers have higher betas than nonissuers. They even argued that “to the degree that beta risk is priced, issuers should have higher returns than nonissuers” and concluded that there is a mysterious, nonsolved puzzle. Figure 2 illustrates that, according to Loughran et al., how the post-listing stock returns behave in the long-run with respect to matching firms.

Affleck-Graves, Hedge and Miller (1996) investigated IPO stocks' price trends in the aftermarket. Their data included 2096 IPOs of common stock in the NASDAQ system during the 1975–1991 period. They argued that the firm-adjusted returns on initial public offerings in the short-term aftermarket are in the same direction as their initial mispricing, i.e. underpriced IPOs overperform size-matched firms and overpriced ones underperform them, clearly supporting the argument that IPO markets are not efficient. Two years after listing, both overpriced and underpriced IPOs were reported to have significant negative returns, producing -10,20% and -6,76 & average returns, respectively. Affleck-Graves et al. documented, however, that there is no statistical basis to

claim that the aftermarket performance of underpriced IPOs is different from that of overpriced IPOs. They were not able to provide a full and satisfactory explanation for their results, pointing out that market inefficiency provides a final possible explanation.

Figure 2: Comparison of the annual percentage returns from year to year for companies going public and nonissuing firms (Loughran & Ritter 1995: 34).



Brav and Gompers (1997) challenged the earlier findings of long-run underperformance. They studied the underperformance of initial public offerings on both venture and nonventure capital-backed companies. They had a sample of 934 venture-backed IPOs during 1972–1992 and 3407 nonventure-backed IPOs from 1975–1992. They made tests using several comparable benchmarks and the Fama-French three-factor model. They found that venture-backed companies do not significantly underperform, while the nonventure-backed firms do. However, they found that the underperformance of nonventure-backed companies is primarily caused by small companies. Moreover, they found that apparently similar techniques produce surprisingly dissimilar results. Brav et al. argued that underperformance, however, is not an IPO effect while IPOs are usually growth stocks and similar size and book-to-market nonissued firms perform as poorly as issued companies. The poor performance associated with IPOs reported in earlier studies would not be, according to them, due to sample firms being initial public

offering firms, but rather results from the types of firms they are, primarily whether they are small and have low book-to-market ratios.

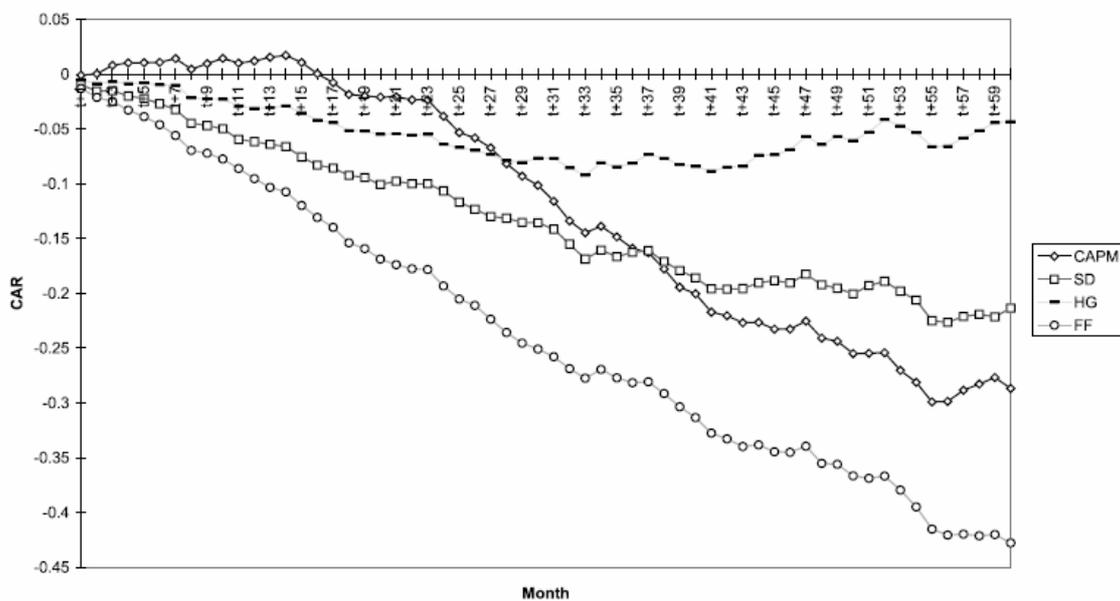
Fama (1998) criticized the discussion of long-run underperformance of IPO stocks. He argued that “if a reasonable change in the method of estimating abnormal returns causes an anomaly to disappear, the anomaly is on shaky footing, and it is reasonable to suggest that it is an illusion”. Motivated by Brav & Gompers (1997), he argued that since the low returns are shared with other similar firms, the poor long-term buy-and-hold returns following IPOs are not a special anomaly. Moreover, he suggested that consistently with the market efficiency prediction, this apparent anomaly can be due to methodology, while the anomaly tends to disappear with reasonable changes in technique.

Espenlaub, Gregory and Tonks (2000) examined the evidence on the long-run underperformance in the UK stock market using a data sample of 588 IPOs of non-financial companies during 1985–1987. They assessed abnormal performance using a number of alternative benchmarks and approaches including CAPM, size-adjustment model, multi-factor model and the Fama-French three-factor model. Furthermore, they utilized RATS procedure created by Ibbotson (1975) and executed both a calendar-time and an event-time approach. In the calendar-time regressions, all the benchmarks produced negative abnormal returns over 60 months, the results of the multifactor model, however, being insignificant in 5-year period but still significant up to 48 months. Although a statistically significant, 5-year underperformance was found using four of five different techniques, in a line with Fama’s (1998) conclusion, they suggested that the results on the long-run underperformance over 60 months after the IPO crucially depends on the choice of technique. Figure 3 illustrates the results Espenlaub et al. obtained when using the calendar-time approach.

Espenlaub et al. examined also the abnormal performance based on event-time portfolios of IPOs. They found that compared to calendar-time approach, across all the benchmarks the statistical significance of underperformance was significantly weaker under this approach. Moreover, they documented consistently with Brav et al. (1997), that different models produce very different results. Using this approach, only the Fama-French model, very interestingly, produced statistically significant negative returns in 60-month period. They documented that their findings support the Fama’s (1998) conclusion that anomalies can be due to methodology. Nevertheless, since Fama-French model has been observed to explain stock results quite well in many studies (see e.g. Fama & French 1992, 1993, 1995 and 1996), it is reasonable to ask, referring to Espenlaub et al. (2000),

why just using this model the results of the IPO long-run performance are found to be the poorest and statistically significant regardless whether the event-time or the calendar-time approach is used?

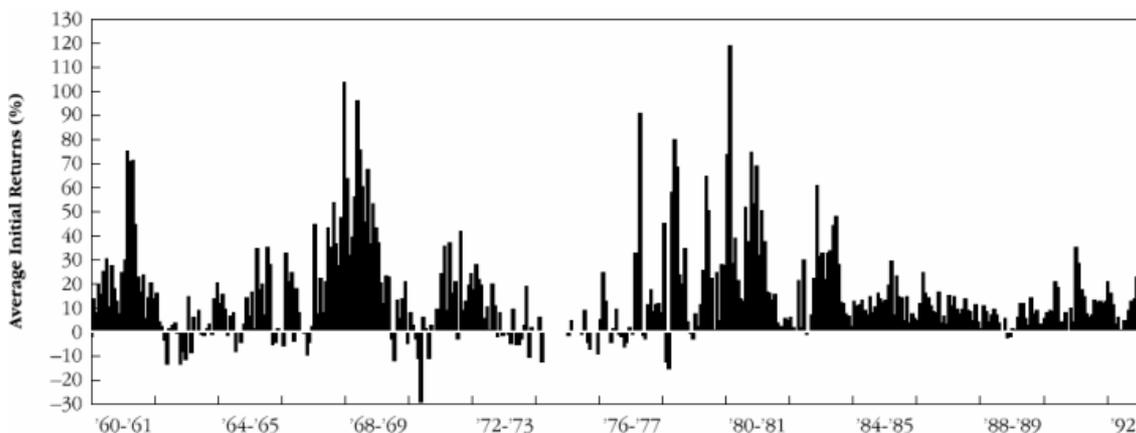
Figure 3: The long-run underperformance of IPOs using several event-time benchmarks. The line named as CAPM means that abnormal returns are measured by using the traditional CAP-model, whereas SD represents results when size-adjustment model is utilized. HG-line represents returns obtained using multifactor model and the line named as FF contains results using Fama-French three factor model. (Espenlaub et al. 2000: 329.)



4.3. “Hot Issue” Markets

The third inefficiency associated with IPOs, also well-known, is a phenomenon that the underpricing volume is dependent on when the listing process occurs. According to Ibbotson and Sindelar (1994: 68) the monthly average return associated with initial public offerings varied from -30 percent to 120 percent during 1960–1992, but being positive, however, nearly in every months but for some exceptions. Figure four clearly illustrates this phenomenon. The monthly variation in returns and the autocorrelation of these monthly average initial returns are conspicuous.

Figure 4: Average initial return by month (Ibbotson & Sindelar 1994: 68).

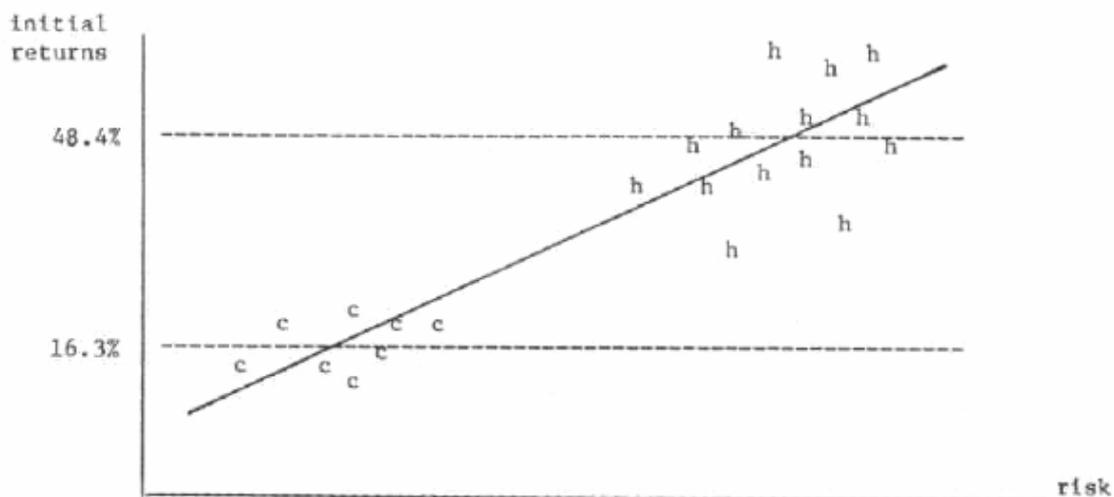


Ibbotson and Jaffe (1975) were the first researchers who reported about the existence of “hot issue” markets. Their sample consisted of all the common stock IPOs offered during 1960–1970. The results of several correlations as well as runs tests they made indicated that the first month series exhibits significant serial dependency. They concluded through further evidence that the series of first month’s residuals does not follow a random walk, suggesting that the first month series is predictable. Moreover, they reported that the standard statistical assumption of serial independency is not valid for IPO returns because the serial correlation exists in regression residuals for the first and second months.

Ritter (1984) continued the empirical research of hot issue markets. The primary target of his study was to investigate the behavior of initial returns associated with IPOs during 1977–1982. In addition, he collected data from 1960–1976 for investigating the initial returns also during this period. Referring to Ibbotson’s et al. (1975) findings, Ritter found that the autocorrelation of monthly average initial returns had been continued. He reported that there was the hot issue market in 1980, while the average initial return on IPOs was 48,4 percent during the 15-month period starting in January 1980, whereas the corresponding return was 16,3 % during the “cold issue” market comprising the rest of the 1977–1982 period. Ritter also documented that during 1960–1982 there had been 4 periods in which monthly average initial returns on IPOs had been extremely high for prolonged periods. Each of these hot issue market periods had been followed, according to Ritter, “by a large and prolonged increase in the volume of initial public offerings”.

From this thesis' point of view, Ritter very interestingly pointed out, that the hot issue markets had occurred, however, in only certain industries. He reported that, in the 1977–1982 period, there had been a tremendous disparity in the behavior of monthly average initial returns on natural resource issues and on non-natural resource ones. For non-natural resource issues, Ritter reported that the autocorrelation of monthly average initial returns had been low and within this sector there had been hardly any evidence that a hot issue market occurred. Moreover, Ritter documented that within that sector there is a positive and stationary relation between risk and average initial return. The high-risk offerings had displayed not only higher average initial returns but also a greater variability of initial returns. For natural resource issues, there had been, instead, a positive, but nonstationary relation between risk and average initial returns. Exactly, Ritter's results suggest that during the 1977–1982 period, only oil and gas industry, however, had provided significant initial returns, while others had not. His results suggest that the hot issues market existed for only the oil and gas industry during the period mentioned above.

Figure 5: Demonstration of changing risk composition hypothesis. Low-risk companies are illustrated as c's, whereas h's represent high-risk firms. (Ritter 1984: 221.)



Ritter provided also a possible explanation for the existence of hot issue markets. Ritter stated that there are periods in which companies conducting IPOs are riskier than in other periods. Moreover, Ritter found that high-risk initial public offerings are underpriced more than low-risk offerings. Named as *changing risk composition hypothesis*,

Ritter proposed that the average initial returns tend to be higher in periods when high-risk companies go public. According to Ritter, a part of hot issue markets during 1980–1981 can be explained with the hypothesis. Figure 5 illustrates the changing risk composition hypothesis.

Related to the hot issue markets, Affleck-Graves et al. (1996) made an interesting observation. They showed that there was a strong interrelationship between market condition and the number of overpriced IPOs. In particular, in hot markets they did not find any cases in their sample of 721 IPOs, in which would occur some overpricing. This finding clearly suggests that when markets are hot, the probability of buying an overpriced IPO stock is extremely small. Thus, if an investor has a strategy to buy shares within IPO in hot markets and to sell them in the immediate aftermarket, the risk of losing the wealth is small.

Motivated by previous research of hot issue markets, Jain and Kini (2006) made a research closely related to the phenomenon. Their article attempted to provide insights into the “industry clustering” phenomenon, according to which disproportionate numbers of firms within an industry conduct an IPO simultaneously. Their data sample included 6922 North-American IPOs during 1980–1997, the majority of issues concentrating however in period 1992–1997. Jain et al. made several significant findings. They reported that IPO clustering is more likely to occur in high growth, fragmented and R&D intensive industries demonstrating strong industry returns and profitability. On the other hand, they documented that industries that require a high degree of capital investment or advertising expenditures do not attract IPO clusters. Furthermore, they found that firms in clustered industries are able to raise more capital, attract more prestigious investment bankers, outspend their industry peers on R&D and capital expenditures. More significantly from this thesis’ point of view, they found that, consistently with Ritter’s (1984) results, firms in clustered industries generate higher initial returns.

4.4. Explanations for the IPO Anomalies

Since the IPO-related anomalous phenomena had been documented first time, have researchers tried to explain them. This chapter focuses on the theories of these phenomena. There are several theories both for the underpricing effect and the long-run underperformance. Interestingly, it seems that there has been a “race” in explaining the effects, since a theory is followed by another. All in all, although the theories are not mu-

tually exclusive, the IPO researchers have been far from concerted about the causes for these effects.

4.4.1. Theories of IPO Underpricing

Winner's Curse

Rock (1986) searched for explanations for IPO underpricing phenomenon. Since previous literature had defined the winner's curse as a tendency for the winning bid to exceed the intrinsic value of the item being auctioned (Thaler 1988: 191–192), Rock was the first researcher who associated the winner's curse and the IPO underpricing phenomenon. His hypothesis is known as *winner's curse hypothesis*. Rock argued that there are two types of investors in the market: uninformed and informed. When offering issues, some investors are better informed about the true value of stocks than investors in general, or even the issuing firm and its underwriting bank. Rock claimed that if the stocks being issued are priced to their expected value, informed investors bid only for attractively priced IPOs, whereas uninformed investors bid indiscriminately. Informed investors crowd out the others when good issues are offered and withdraw from the market when bad issues are offered. Uninformed investors thus face a winner's curse. If they get all of the shares they demand, it is because the informed investors don't want the shares. Faced with this *adverse selection* problem, uninformed investors only submit purchase orders if IPOs are underpriced sufficiently to compensate them for the bias in the allocation of new issues. The offering firm must therefore price the stocks at a discount in order to guarantee that the uninformed investors purchase the issue. Keloharju (1993) claimed that the underpricing effect in Finnish stock market can be explained with the winner's curse hypothesis. His evidence from 80 IPOs during 1984–1989 supported the Rock's model suggesting that the winner's curse figures importantly in initial IPO returns in the Finnish market.

Lawsuit Avoidance

According to *lawsuit avoidance hypothesis*, the underpricing of initial public offerings is due to issuers' desire to avoid future lawsuits. Rather than underpriced issuances, it is more likely that issuances will be settled in court if they are overpriced. Ibbotson (1975) was first who suggested that IPO underpricing might be due to lawsuit avoidance – hypothesis. Tinic (1988) argues also that underpricing serves as an efficient form of insurance against potential legal liabilities of issuers and their agents, suggesting this for an explana-

tion for underpricing phenomenon. Giving support for the lawsuit avoidance –hypothesis, Ritter (1991) reported that the offerings with the highest initial returns tend to have the worst ones in the long run that may be a manifestation of a desire by issuers to avoid future lawsuits. Keloharju (1993) argued that, due to several reasons, it is very unlikely that potential legal liability has much to do with the initial returns associated with IPOs in Finland and thus, the lawsuit avoidance would not cause the underpricing effect in the Finnish stock market. He was not even able, with two experts in this field, to find any cases in which a suit had been filed against an issuing company as a result of an IPO.

Investments Bankers' Reputation

Beatty and Ritter (1986) argued that the underpricing is caused by the reputation of investments bankers. They showed that there is a monotone relation between the expected underpricing of an initial public offering and the uncertainty of investors regarding its value. They also argued that while investments bankers have reputation capital at stake, the resulting *underpricing equilibrium* is enforced by investments bankers. On this equilibrium an investment banker would lose potential investors if it didn't underprice enough. On the other side, if the banker underpriced too much, it would lose issuers and thus the value of its reputation capital would be forfeited. Dunbar (2000) got results consistent with Beatty's et al. He found that banks subsequently lose in the IPO market if they either underprice or overprice too much.

Market Feedback

Market feedback hypothesis is based on the assumption that investors are better informed about the value of IPO share than the issuer or the investment banker. Benveniste and Spindt (1989) considered that investors incur no cost in becoming informed and therefore investment bankers exploit the information their clients have. According to the hypothesis, investment bankers persuade their investor clients to expose the information concerning the value of the IPO stock before its IPO process. In order to motivate the investors to frankly share the private information, investment bankers compensate this help for investors by underpricing the IPOs. The market feedback hypothesis, which is also known as the *costly information acquisition hypothesis* in later academic literature, is later examined in many studies (see e.g. Hanley 1993, Barry et al. 1993).

Stabilization

Ruud (1993) took a statistical point of view to examine the underpricing puzzle. Her investigation of the distribution of initial returns following IPOs showed that positive mean initial returns may reflect the existence of a partially unobserved left negative tail. Moreover, since most IPOs with zero one-day returns subsequently fall in price, she suggested that underwriter price support may account for the skewed distribution and hence the phenomenon of positive average initial IPO returns, even if offering prices are set at expected market value. Ruud argued that the *stabilization* is the practice of buying a great amount of issued stocks immediately after the trading has begun in the aftermarket. Moreover, she claimed that the stabilization is an effort by the underwriter to prevent the stock price from falling beneath the price for which it was offered within IPO.

Signalling

Ibbotson (1975) was the first researcher who presented a kind of *signalling hypothesis* for the explanation of IPO underpricing. He suggested one scenario that companies tend to underprice the IPOs and leave investors in a good mood with ‘a good taste in their mouths’. This is because, according to Ibbotson, firms will be able to sell further issues at a higher price than they would get in the case of initial overpricing. The same hypothesis is later examined in several studies (see e.g. Welch 1989). The signalling hypothesis is based on the assumption that the issuing firm itself knows the true value of the company. The model claims that high-quality firms underprice their issues as a way to report to the market that they have a high value.

Cascades

Cascades hypothesis (also known as *bandwagon hypothesis*) was proposed as an explanation for the underpricing effect by Welch (1992). He argued that there are clear “cascades” in the IPO market as subsequent investors in IPOs may optimally ignore their private information and imitate earlier investors in these offerings. If an investor notices that nobody else is willing to subscribe, he therefore decide, in spite of the information he has about the company, also himself to not subscribe. Thus, if an important investor rejects for subscribing the issue, others follow and the issue might leave unsubscribed. Therefore, investment bankers underprice the issues to ensure that the IPOs will be fully subscribed in spite of the information the investors have about the company.

Prospect Theory

Loughran and Ritter (2004) argued that the issuing firm's executives bargain less hard for a higher offer price in this circumstance than they would otherwise. They used *prospect theory* to explain why underwriters prefer to underprice IPOs rather than charge higher gross spreads. Loughran et al. claimed that issuers pay less attention to the opportunity cost of underpricing than the direct cost of gross spreads. If underwriters can allocate underpriced IPOs to buy-side clients who are competing for favourable allocations by overpaying for other services, part of the profits that investors receive on underpriced IPOs will therefore wind up to the underwriters.

4.4.2. Theories of IPO Long-Run Underperformance

Fads and Overoptimism

Motivated by the responses Shiller (1990) received for the questionnaires he had sent to IPO investors, he claimed that IPO markets are clearly subjects to *fads and overoptimism* affecting firstly a jump in the first trading day and then poor performance in the long run. The first day's initial returns are, according to Shiller, due to speculation and overoptimism that force the stock prices temporarily to rise above their fundamental values. These jumps inexorably cause the poor performance in the future. Shiller as well as researchers who have made further studies about the fads hypothesis (see e.g. Rajan and Servaes 1997), argue that stocks with the highest returns in the immediate aftermarket have the poorest performance in the long-run.

Windows of Opportunity

Since Ritter (1991) and Loughran et al. (1995) have documented significantly poor returns of IPO firms in the long run, they argued that investors are overoptimistic about the earnings potential of young growth companies. Firms take therefore advantage of these *windows of opportunity* (i.e. periods when investors are willing to pay high prices) to issue stocks publicly. The "windows of opportunity" hypothesis is closely related to fads and overoptimism. Rajan and Servaes (1995) presented evidence consistent with Loughran et al. They documented that firms typically conduct IPOs when seasoned firms within same industries are trading at high multiples relative to the stock market and historical levels. Rajan et al. (1997) got also results that add evidence for the existence of windows of opportunity.

Divergence of Opinion

Miller (1977) argued that only investors who are the most optimistic about an IPO will buy them. According to him, the stock price in the immediate aftermarket is set by this small group of excessively optimistic investors, because others do not buy them until more information about the value of the stock will become available. Especially when there is a great amount of uncertainty about the value of issued stock, optimistic investors may value the stock much higher than typical investors. This argument is called as *divergence of opinion* hypothesis. The divergence of opinion in valuation of issued stock is greatest immediately after the stock has issued and narrows as time goes on, and therefore the market price of the stock will drop over time.

Creative Accounting

Both Jain and Kini (1994) and Mikkelson, Partch and Shah (1997) observed that IPO firms have superior earnings in years prior to the offering. They also documented that IPO firms have accelerating growth in the earnings before they conduct their IPOs. Motivated by these earlier studies, Teoh, Welch and Wong (1998) hypothesised that initial public offerings are subjects to intensive earnings management. They also empirically examined the *creative accounting hypothesis* they created and found evidence for it. Teoh et al. proposed that when investors notice that the earnings performance is weaker after IPO than it was before conducting it, the market price of the stock will be subsequently priced by its “right” value.

5. DETERMINING THE VALUE OF A STOCK

According to financial theory, the market price of a stock is the best estimate of its correct value, fully reflecting all relevant information concerning the value. Initial public offerings do not, however, have any market price that complicates the valuation of the issues. This chapter provides an introduction to some widely utilized valuation models. Moreover, it is focused on the expected returns and the pricing of IPOs.

5.1. Valuation Models

Discounted cash flow models provide a very fundamental approach for valuation. These models are based on the concept that the company's value is equal to the present value of the net cash flows expected to receive from its processes. More accurately, the value of a company can be computed as a sum of the discounted net cash flows over the valuation horizon and the forecasted value of the business at the horizon. This model is also known as a *free cash flow model*. (Elton, Gruber, Brown & Goetzmann 2003: 445–446; Brealey et al. 2003: 76–77.)

$$(1) \quad V_0 = \frac{FCF_1}{1+r} + \frac{FCF_2}{(1+r)^2} + \dots + \frac{FCF_n}{(1+r)^n} + \frac{PV_n}{(1+r)^n}$$

Using same logic, the value of a stock is same as the present value of the cash flows that a shareholder expects to receive from it. Thus, the value at this point can be determined as the sum of the dividends to be paid during the holding period and the stock price after the time period, discounted at this time point. (Elton et al. 2003: 445–446; Bodie et al. 2005: 609–610.)

$$(2) \quad V_0 = \frac{D_1 + P_1}{1+r}$$

The stock can also be thought to generate a dividend flow. Then the stock price should equal the present value of all expected future dividends into perpetuity:

$$(3) \quad V_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \dots = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$$

This formula is called the *dividend discount model* (DDM) of stock prices. When supposing stocks to be non-growth stocks, whose dividends continue infinitely, and the dividend and the rate of return remains the same over the whole period, based on mathematical definition of perpetuity, the net present value of a stock can be determined as a quotient of the stable dividend and the rate of return. (Brealey et al. 2003: 37; Bodie et al. 2005: 609–610.)

$$(4) \quad V_0 = \frac{D}{r}$$

This model does not however take any growth factor into account. The constant-growth dividend discount model (constant growth DDM), also known as Gordon model, makes the difference by taking the growth rate into consideration. According to the model, the value of a stock is the stable dividend divided by the difference of the rate of return and the growth rate. (Elton et al. 2003: 447–448; Bodie et al. 2005: 611.)

$$(5) \quad V_0 = \frac{D_0(1+g)}{r-g} = \frac{D_1}{r-g}$$

Since many firms conducting IPOs are young and growing companies, Kim and Ritter (1991: 409) recommend using comparable firm multiples and accounting numbers when valuing IPOs. These multiples are calculated by proportioning the value of a company by some variable in the financial statement. These indicators are then compared with multiples of a benchmark firm or the whole industry (Pricewaterhousecoopers 2005: 26). Table four presents most commonly used multiples used in valuation of companies.

Table 4: Common multiples used in company valuation (Pricewaterhousecoopers 2005: 26).

P/E	<i>Price-to-earnings</i>
P/EBIT	<i>Price-to-earnings before interest and taxes</i>
P/CF	<i>Price-to-cash flow</i>
P/S	<i>Price-to-sales</i>
P/BV	<i>Price-to-book value</i>
EV/EBITDA	<i>Enterprise value-to-earnings before interest, taxes and amortization</i>

5.2. Models for Determining Expected Returns

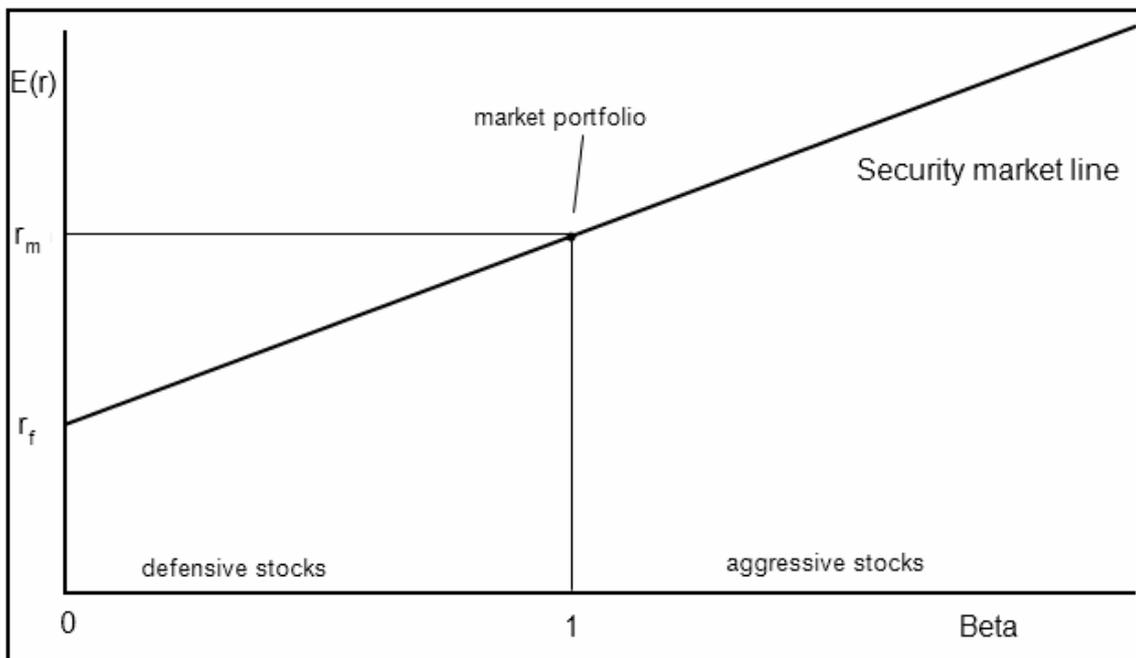
Capital Asset Pricing Model

Based on *Markowitz portfolio theory*, the standard *capital asset pricing model* (CAPM) developed by Treynor (1961), Sharpe (1964) and Lintner (1965) assumes that there is an equilibrium in the security market according to which all the securities are priced to their risk. The standard CAPM is based on the assumption that the expected return of a portfolio or a single stock can be defined as a sum of price of time and the product of price of risk and amount of risk. This can be also presented as

$$(6) \quad E(r) = r_f + \beta(r_m - r_f),$$

where $E(r)$ is expected return, r_f is risk-free rate, β is risk factor and r_m is market return. This equation constructs a line, when illustrating in the coordinates. This line is called as *security market line* (SML), and every security in the security market should follow this line. Figure 6 illustrates the Capital Asset Pricing Model. (Brealey et al. 2003: 194–198; Elton et al. 2003: 295–297.).

Figure 6: The Capital Asset Pricing Model



The beta, which represents the risk in the CAPM, is the covariance between return of certain stock or portfolio and the market return divided by the variance of the market return:

$$(7) \quad \beta_i = \frac{\sigma_{im}}{\sigma_m^2}$$

Based on the statistical basis of the covariance and the variance, a portfolio, which includes all the stocks in the market, has a beta equal to one, because the covariance term is then equal to the variance term. Defensive stocks have beta below one, because the covariance term for these stocks is lower than the variance term. For aggressive stocks, the beta is more than one, because the covariance term is greater than the variance term for these stocks. Analogously, a risk-free investment has the beta equal to zero and thus has no risk. (Brealey et al 2003: 177; Elton et al. 2003: 297–299.)

There are, however, several simplifying assumptions underlying the CAPM. First, the model assumes that there are no transaction costs. Secondly, the model assumes that assets are infinitely divisible. Moreover, in “CAPM world” there is the absence of personal income tax. Furthermore, there is an assumption that an individual cannot affect the price of a stock by any trading action. In addition, investors are expected to make decisions solely in terms of expected values and variances. There are also assumptions that unlimited short sales are allowed and investors have access to unlimited lending and borrowing at risk free rate. The model also expects that investors are concerned with the mean and the variance of returns, and all the investors define the relevant period in exactly the same manner. Moreover, the model assumes that all the investors have identical expectations with respect to the necessary inputs to the portfolio decision. Furthermore, the model assumes that all the assets, including even human capital, are marketable and thus to be sold and bought in the market. (Elton et al. 2003: 292–293.)

Arbitrage Pricing Theory

Ross (1976) suggested an alternative approach to explaining the pricing of assets. His model is based on the law of one price: two items that are same cannot be sold at different prices. Ross’ model is called as *arbitrage pricing theory* (APT). The model does not ask which portfolios are efficient. Instead, it assumes that each stock’s return depends partly on pervasive macroeconomic influences and partly on “noise” events that are

unique to the company. Ross' model thus says that the return is assumed to obey the following simple relationship:

$$(8) \quad r = a + b_1 r_{\text{factor1}} + b_2 r_{\text{factor2}} + b_3 r_{\text{factor3}} + \dots + \varepsilon$$

Nevertheless, the theory doesn't tell what the factors are. One might be for example return on the market portfolio, for example, but it still might not also. (Brealey et al. 2003: 204–205, Elton et al. 2003: 364–365.)

Fama-French Three Factor Model

Fama's and French's (1992, 1993) *three factor model* (FF model) is based on the arbitrage pricing theory. The systematic factors in the FF model are market index, firm size and book-to-market ratio (Bodie et al. 2005: 429–430). The factors concerning book-to-market and market value factors are empirically motivated by many observations that historical average returns on stocks of small companies as well as on stocks with high ratios of book equity to market equity are higher than predicted by the security market line of the CAPM. Fama and French managed to create a model, which should explain the stock returns much better than the original CAPM (see e.g. Fama & French 1996, Davis, Fama & French 2000).

Firm size was first observed to affect expected returns by Banz (1978). He reported the negative relation between the market value of equity and the expected return. Thus, smaller firms (measured by market capitalization) have larger expected returns than bigger ones. While this negative effect of firm size on risk-adjusted stock returns had seemed to be a general phenomenon without proper answer, after Banz's investigation many studies confirm that the market beta is not properly estimated (for empirical findings see e.g. Reinganum 1981, Chan & Chen 1988 and Fama & French 1992). The size effect has been reported to exist also in Finland, for example, by Berglund (1986) and Yli-Olli & Virtanen (1992).

The first finding concerning the issue that the ratio of a firm's book value of equity (BE) to its market value (ME) has some impact on the average stock returns was made by Stattman (1980). Stattman found that the higher the BE/ME a company has, the higher are the average returns of a common stock of the company. This finding is confirmed later in many studies (see e.g. Rosenberg, Reid & Lanstein 1985; Chan, Hamao & Lakonishok 1991 and Fama & French 1992). Still, it is questionable whether the book-to-

market ratio has any real role in explaining the cross-section of stock returns in other stock markets (for evidence from UK, see e.g. Kothari, Shanken and Sloan 1995),

Fama and French three-factor model includes three stock market factors, the market return premium ($R_m - R_f$), small size premium (SMB) and high book-to-market premium (HML). SMB is calculated as the difference in returns between portfolios of small companies and portfolios of big companies. HML factor, instead, is the difference in returns between high book-to-market portfolios and low book-to-market portfolios. The Fama-French three-factor asset pricing equation is:

$$(9) \quad r_i - r_f = a_i + b_i(r_m - r_f) + s_i \text{SMB} + h_i \text{HML} + e_i$$

In order to calculate SMB and HML factors, six portfolios by the size and the book-to-market value has to be constructed. The small firm group (S) includes all firms with the market value below the median. Big firm group (B), instead, includes all firms above the median. Furthermore, firms are sorted into three groups based on book-to-market ratio: a low book-to-market ratio group (L) with the 30 % lowest B/M ratio, and high-ratio group (H) the 30% highest B/M ratio. Remaining 40 % constructs a medium ratio group (M). The intersections of the two size groups with three value groups result in six portfolios (S/L, S/M, S/H, B/L, B/M, B/H). SMB and HML factors are then calculated from the returns of these six portfolios by the following equations:

$$(10) \quad \text{SMB} = \frac{1}{3}(r_{S/L} + r_{S/M} + r_{S/H}) - \frac{1}{3}(r_{B/L} + r_{B/M} + r_{B/H})$$

$$(11) \quad \text{HML} = \frac{1}{2}(r_{S/H} + r_{B/H}) - \frac{1}{2}(r_{S/L} + r_{B/L})$$

The coefficients b_i , s_i and h_i are the factor loadings on the three risk factors. The factor loading b_i is analogous to the beta in CAPM, but is not the same since two additional factors are added to explain the variation in returns. In addition to loading the market premium, both SML and HML factors are loaded by coefficients which are determined by the portfolio the stock belongs to. The coefficients b_i , s_i and h_i are estimated by utilizing a time-series regression for all the six portfolios created by the sizes and the book-to-market values. (Fama et al. 1992; Davis et al. 2000; Bodie et al. 2005: 429–430.)

5.3. Pricing of Initial Public Offerings

Setting the price of an initial public offering is crucial to a successful offering. However, the pricing of IPOs is difficult, because there is no observable market price prior to the initial public offering. Moreover, many issuing firms, especially in “hot issue” periods, have little operating history that makes the pricing still more difficult. If the price is set too low, the issuer does not get the full advantage of its ability to raise capital. In case that the offering is priced too high, the investor would get an inferior return and consequently might reject the next offering. Investors, moreover, would be unwilling to purchase offerings from an investment banker which has regularly executed overpriced offerings. Furthermore, the market without accurate pricing could wither as one side or the other is unsatisfied. Without a healthy market for IPOs, young growth companies would have only limited access to the public in raising capital. (Ibbotson et al. 1988: 37–38.)

Initial public offering can be priced mostly using two methods. By practising so-called *bookbuilding*, a company asks for offers that are not legally binding from institutional investors. The information to be obtained can be used in determining the offering size, price and the allocation of shares. Alternatively, companies may want to determine the stock price in advance without the offers mentioned above. Then there may be a risk that the price is not based on the demand situation. (Pricewaterhousecoopers 2005: 26–27.)

Kim et al. (1999: 409) argued that discounted cash flow analysis is very imprecise to value IPO companies since most firms conducting IPOs are young companies for which it is complex to forecast future cash flows. Instead, according to them, the use of comparable firm multiples and accounting numbers is widely recommended in both academic and practitioner publications. Notwithstanding, since they paper examined the pricing of IPOs using comparable firm multiples, they found that valuing IPOs on the basis of the price-to-earnings, price-to-sales, enterprise value-to-shares and enterprise value-to-operating cash flow ratios of comparable firms is limited if historical numbers rather than forecasts are used. They documented that within an industry, the variation in these ratios is very large, both for public firms and IPOs and thus they have only modest predictive value. Furthermore, many idiosyncratic factors, unless made various adjustments for differences in growth and profitability, are not captured by industry multiples. According to Kim et al., when using forecasts, instead, the valuation accuracy is improved substantially. Moreover, they argued that the valuation accuracy is higher for

older firms than for younger ones. When using historical accounting information and controlling for the leverage effects, Kim et al. documented that the enterprise value-to-sales ratio worked reasonably well for both young and old firms.

Because the pricing of young growth company IPOs is difficult, there is evidence that the market fails to get the price right. This appears as anomalies: three well-documented anomalies are associated with initial public offerings that are a hard challenge to the efficient markets hypothesis. The poor long-run performance of IPOs indicates that, in spite of the underpricing phenomenon, the cost of equity capital is not excessively high for young growth firms. More troublesome, however, is that the terms on which equity capital can be raised appear to vary substantially over time. Thus the ability to finance promising investments is subject to the whims of the market, as well as the fundamentals of the company. (Ibbotson et al. 1994: 74.)

6. DATA AND METHODOLOGY

This chapter first briefly introduces the data to be used in this study. Then the methodology is presented. As usually used in the stock market studies, this investigation also uses statistical approach. This chapter tells to a reader how the existence of abnormal returns is measured and how the statistical significance is determined. The chapter explains also why and how the abnormal returns are measured by using different approaches.

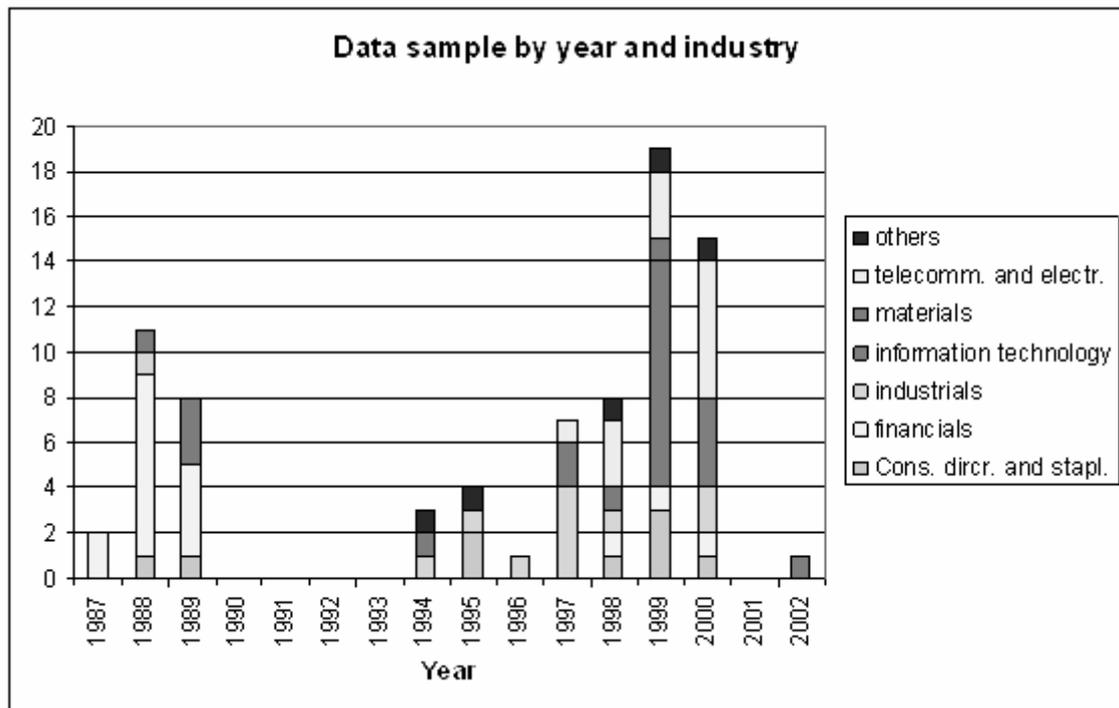
6.1. Data

The data to be used in this thesis is from 16-years period, from 1987 to 2002. The main reason for such a long period to be used is that there are so few IPOs in Finland, that for the industry-specific review it has to be taken a long period to obtain enough observations. It is required for the initial public offering to be included in this study that (i) the offering had to be targeted to large group of investors, (ii) the stock was initially listed in Helsinki Stock exchange, (iii) the IPO was not conducted due to an acquisition or a merger and (iv) data for the offering was available. The final sample includes 79 firms that are divided into six industries. The classification is mainly based on the GICS; according to which OMX currently groups the companies. The six industries in this study are (i) *consumer discretionary and staples*, (ii) *financials*, (iii) *industrials*, (iv) *IT industry*, (v) *materials* and (vi) *telecommunications and electronics*. Data sample contains also 5 companies which are not classified in any industries (see appendix 2). These firms would belong to healthcare as well as energy and power industries, but these industries are excluded from the cross-sectional analysis due to so few IPOs in these industries. These IPOs are still included, however, for testing hypotheses one and two to ensure that underpricing and underperformance effects exist in Finnish stock market during the study period.

The data is obtained from numerous sources. Information about the IPOs conducted in Finland is acquired from stock exchange announcements and from annual published stock market reference books such from *Pörssiyhtiöt* and *Pörssitieto*. The offering periods, listing dates as well as offering prices are fetched from these reference books and from the exchange announcements. The daily returns, risk free rates, as well as data for market and industry indices are obtained from databases of University of Vaasa. *Pörssiyhtiöt* and *Pörssitieto* books, as well as later published *Listatut yhtiöt* books provide also

a great source of equity book and market values. The missing book and market values that are not found in these books are gathered both from numerous university's databases, such from ETLA's one and from the monthly statistics provided by OMX.

Figure 7: Data sample used in this study



6.2. Methodology

This study investigates the underpricing and the underperformance effects and concentrates on the question how the industry affects these phenomena. Earlier studies have found significant abnormal returns associated with these effects. Moreover, defenders of efficient markets have argued that especially the long-run underperformance anomaly can be due to methodology, while the anomaly tends to disappear with changes in technique. Therefore, in this study four different methods are used to measure abnormal returns related to IPOs.

6.2.1. Measuring Initial and Aftermarket Performance

The abnormal returns are calculated such as in many earlier IPO studies (see e.g. Ritter 1991), i.e. without beta or any other risk factor. The abnormal returns are determined also using the normal company-specific beta. Using the industry beta is also well motivated, because the purpose of this thesis is to investigate the industry effect. Additionally, to remove the impacts, which the book-to-market ratio and the market value have been found to have on the stock returns, the three-factor model created by Fama and French (1992, 1993) is utilized.

The methodology of this thesis has impulses from several earlier IPO studies, especially from Ritter's (1991) and Espenlaub's et al. (2000) investigations. Initial returns are calculated for the period between an IPO day and the listing date. The first day of subscription period is used as the IPO day. In addition to the measuring of initial return performance, long-run returns are analyzed. Long-run performance is determined, similarly to Ritter (1991) and Espenlaub et al. (2000), by excluding the initial returns from the long-run returns. The returns are construed for 6-months', 12-months', 18-months', 24-months', 30-months' and 36-months' periods. If a company has delisted between any periods, the last quotation is used for the calculation of the next period's return after that the firm is excluded for further analyzing.

When the abnormal returns for either an initial aftermarket period or a long-term period are being calculated using certain method, cumulative abnormal returns are used as a proxy of return performance. Daily abnormal returns with respect to each four benchmarks are computed and are cumulated over time up to period T after the IPO.

$$(13). \quad \text{CAR}_{i,T} = \sum_{t=1}^T \text{AR}_{i,t}$$

where $\text{CAR}_{i,T}$ is cumulative abnormal return for period T for stock i

For testing the statistical significance of either initial or aftermarket abnormal returns, Student's t-test is used. For this purpose, the offerings are weighted with all IPOs during the period to calculate cumulative average abnormal returns.

$$(14). \quad \text{CAAR}_T = \sum_{t=1}^T \frac{1}{n} \sum_i \text{AR}_{i,t}$$

where $CAAR_T$ is the cumulative average abnormal return for period T

In Student's t-test, the null hypothesis is that $CAAR_T = 0$. Following t-statistic is calculated:

$$(15). \quad t = \frac{CAAR_T}{s/\sqrt{n}}$$

where s is the standard deviation of cumulative average abnormal returns
 n is the number of observations

To determine whether the industry has impact on the abnormal returns of certain period, a regression model is used. In the model, industry dummies are used to measure the industry effect. These variables get a value of one if a company includes in the sector which are represented with the dummy, whereas they are otherwise zero. The coefficient factors of these variables are regressed to determine the performance of every industry in certain period. The industry effect on long-run performance is measured, similarly to Ritter (1991), using 36 months CARs.

$$(16). \quad CAR_{i,T} = \beta_1 D_{con} + \beta_2 D_{fin} + \beta_3 D_{ind} + \beta_4 D_{it} + \beta_5 D_{mat} + \beta_6 D_{tel} + \varepsilon$$

where D_{con} , D_{fin} , D_{ind} , D_{it} , D_{mat} and D_{tel} are the dummy variables determined by into which sector; consumer discretionary and staples, financials, industrials, information technology, materials or telecommunications and electronics, the company belongs
 ε is the error term

To achieve normality of the return distributions, in addition to the logarithmic transformation which is discussed more in the following subchapter, outliers are excluded by analysis to analysis. Outliers are identified by using box-and-whiskers method. The normality is tested with *Kolmogorov-Smirnov* test in which the hypothesized distribution is normal. Moreover, the *Durbin-Watson* test is used for every regression to analyze whether there is autocorrelation in residuals.

6.2.2. Methods for Determining Abnormal Returns

Market-Adjusted Returns

Ritter (1991), among several other researchers of IPO puzzles, uses market-adjusted returns as proxies of abnormal returns. This method is utilized also in this thesis. The model argues that abnormal return on investment is:

$$(17). \quad AR_{i,t} = R_{i,t} - R_{m,t}$$

where $AR_{i,t}$ is abnormal return on investment i for the period t

$R_{i,t}$ is realized return on investment i for the period t

$R_{m,t}$ is realized market return for the period t

Closing prices are used to calculate the returns. Logarithmic returns, throughout the study, both on stocks and market indices are used. Thus, the resulting abnormal returns tend to be somewhat closer to the zero than they would otherwise be. However, this method is often considered better when examining the behavior of stock returns since there occur long tails in return distributions (i.e. the distributions are not symmetric). Logarithmic returns are calculated by:

$$(18). \quad R_{i,t} = \ln P_{i,t} - \ln P_{i,t-1}$$

where $P_{i,t}$ is investment's i price (adjusted for capital events) or index value at the time point t

$P_{i,t-1}$ is the investment's i price or index value at the time point $t-1$

Hex All Share Index is used as a proxy of market returns. This selection is often criticized because of the dominating effect of large companies on the index. Since the study period begins in 1987 and the calculation of weight-limited portfolio index has been started in 1990s', there are not, however, sensible alternatives.

The Traditional CAPM

Market-adjusted returns do not take any risk factor into account. The traditional CAPM, according to which the beta is the only proxy of risk, is therefore used. The abnormal

returns are calculated using an equation which represents that abnormal return is the difference of return on investment i and the expected return on it by CAPM:

$$(19). \quad AR_{i,t} = R_{i,t} - [R_{f,t} + \beta_i (R_{m,t} - R_{f,t})]$$

where $R_{f,t}$ is return on risk-free investment for the period t
 β_i is the beta of an investment i

The betas are estimated by following equation:

$$(20). \quad \beta_i = \frac{\sigma_{i,m}}{\sigma_m}$$

where $\sigma_{i,m}$ is the covariance between investment's i returns and market returns
 σ_m is the variance of market returns

In addition to the beta, this method requires using risk-free returns. Consistently throughout the study, 12-month helibor / euribor is used as a proxy return of riskless investment. Because logarithmic returns on the investments are used, logarithmic transformation is made also for riskless investment. Betas are calculated using same way as Espenlaub et al. used. They used returns for 60 months to estimate them, since they had 5-year study period. The study period is shorter in this thesis so returns for three years are used to estimate betas. In the case of a company has delisted during the following 36 months, betas for these stocks are calculated using returns on the period they have been listed. Monthly returns are used, due to thinness of Finnish equity market. This method allows to minimize the number of zero returns.

Industry-Beta CAPM

The industry-beta CAPM differs from original model as betas for it are estimated by using returns on industry indices rather than certain stocks. Because the classification of industries is mainly made based on GICS, the GICS indices are used to estimate industry betas. Therefore the data to be used in the estimation is available only since the new classification has been launched. The period selected for this purpose is from July 1, 2005 to August 31, 2006. Daily logarithmic returns are used for this purpose. Following equation is used in order to calculate abnormal returns:

$$(21). \quad AR_{i,t} = R_{i,t} - [R_{f,t} + \beta_{\text{ind}} (R_{m,t} - R_{f,t})]$$

in which

$$(22). \quad \beta_{\text{ind}} = \frac{\sigma_{\text{ind},m}}{\sigma_m}$$

where $\sigma_{\text{ind},m}$ is the covariance between returns on sectoral index and market index

The sectoral indices for financials, industrials and materials in OMX represent just similar firms that in this thesis. Therefore the ready index data is used for these sectors and logarithmic returns are calculated to estimate the betas. An industry named as *information technology* exists also in GICS, but the content of this industry in OMX is not consistent with this study's one but consists also of companies included in *telecommunications and electronics* sector in this thesis. Therefore, for this index the daily data are calculated by determining daily returns on a portfolio, for which value-weighted returns of current IT companies (following classification of this study) have been summed up. This is made according to OMX's guide (OMX Exchange 2005b). Same method is used for calculating index daily data for *telecommunications and electronics* sector since the contents of this sector follows Helsinki stock exchange's previous industry classification. Furthermore, the daily returns on OMX's *consumer discretionary* index are used for the returns of *consumer discretionary and staples* industry. Since these industries are separated in OMX, this selection is very motivated. Firstly, only one company of the data sample would include in consumer staples sector. Secondly, it is noticed when estimated betas for these sectors using returns on single indices that the difference of betas of these separate industries is very small and thus can be ignored.

The Fama-French Model

For the Fama-French model, market and book values of equity for every company listed in Helsinki stock exchange are collected for the period from 1987 to 2005. In addition, annual logarithmic returns for stocks of these companies are gathered. A sum of free and bound equity capital is used for the book value of company whereas market value is defined as the number of shares outstanding times the stock price in the end of the year. These stocks are categorized annually in six portfolios based on their book-to-market values and market capitalizations. Value-weighted returns and the breakpoints for these portfolios are recorded. Similarly to Davis et al. (2000), negative BE firms are not in-

cluded when calculating the portfolio breakpoints. Furthermore, in order to avoid comparing IPO firms to themselves, similarly to Brav et al. (1997), IPO firms are eliminated from the benchmark portfolios for three years after the issue. According to the FF model, abnormal return on stock i in year t is:

$$(23). \quad AR_{i,t} = R_{i,t} - [R_{f,t} + b_i(R_{m,t} - R_{f,t}) + s_iSMB_t + h_iHML_t]$$

The three systematic factors in the Fama-French model are measured annually. Market return premium is defined as difference between logarithmic return on market index and logarithmic return on risk-free investment. HML is calculated annually as difference between equal-weighted return on two high book-to-market portfolios and equal-weighted return on two low book-to-market portfolios, whereas SMB is estimated annually as difference between equal-weighted return on three small company portfolios and equal-weighted return on three big company portfolios. The time-series OLS regression is used to regress the factor multiples b_i , s_i and h_i for all the six portfolios. In order to calculate abnormal returns for IPO stocks, they are annually aligned with right portfolios and corresponding factors as well as multiples are used.

7. EMPIRICAL RESULTS

This chapter presents the results of various analyses. These empirical results are reported by method to method and finally the results are summed up. Firstly, the results obtained from the analysis of the initial performance are discussed. The chapter continues with the documentation of the results of the long-run performance. After that the industry effect on both these phenomena are analyzed and documented.

7.1. Initial Performance of IPOs

H_1 : Initial public offerings are underpriced in Finland

The first research hypothesis states that Finnish IPOs are underpriced. This hypothesis is examined by calculating initial abnormal returns for all the four benchmarks and making t-tests for all the initial average abnormal returns.

Market-Adjusted Returns

The test results firstly suggest that the average market-adjusted return (logarithmic-transformed) in the study period is about 12 percent. The median is clearly lower, suggesting that the 12 % mean is caused by high outliers. When excluding two outliers, the mean clearly drops that also supports the argument that outliers dominate the results. However, the t-test value, whether or not the outliers are excluded, is significant in some used significance level suggesting the acceptance of first research hypothesis. These results are reported in table 5.

Furthermore, consistently with Ibbotson's (1975) results in US, there has still been a significant chance to gain loss in first trading day since 30 percent of market-adjusted initial returns are negative. Moreover, it is interesting to point out that inconsistently with Affleck-Graves et al. (1996), there are found also negative initial returns during hot issue markets. In particular, there are several first-day underperformers in the IT sector even though they conducted their IPOs during the hottest IT boom.

Table 5: Market-adjusted initial returns of IPOs

N	Min	Max	Median	Mean	Std. Deviation	t-value
79'	-0,488	1,183	0,041	0,1184***	0,295	3,566
77''	-0,488	0,942	0,040	0,0921***	0,248	3,256

*** Statistically significant at 1 % significance level

^ Outliers included

'' Basware and Data Fellows excluded

Traditional CAPM -Adjusted Returns

As it can be seen from the table 6, the average CAPM-adjusted initial return is slightly lower than corresponding market-adjusted return. When excluding two outliers the mean still drops and the difference even grows. Since the market-adjusted model contains no risk factor, the resulting lower mean returns with a model which contains such one is sensible. The median is again remarkably lower than the average suggesting that there are outliers that increase the mean. However, again, in spite of inclusion or exclusion the extreme outliers, the mean is significant at 1 % significance level. This clearly adds support for the acceptance of the first research hypothesis.

Table 6: CAPM-adjusted initial returns of IPOs

N	Min	Max	Median	Mean	Std. Deviation	t-value
79'	-0,407	1,224	0,031	0,1039***	0,274	3,370
77''	-0,407	0,899	0,029	0,0775***	0,222	3,075

*** Statistically significant at 1 % significance level

^ Outliers included

'' Basware and Data Fellows excluded

Industry-Beta CAPM –Adjusted Returns

Table 7 presents the t-test results when industry-beta CAPM is used as a method for determining the abnormal initial returns. The sample size is smaller now, because the industry beta is not determined for any of the five companies that are not included in any industry of the thesis. The mean initial return, whether or not excluding two outliers, is slightly higher compared to traditional CAPM corresponding figure being nearly equal to the market-adjusted initial return. The median is again, in both the cases, clearly lower than the average. Both the t-values are again, however, statistically significant at one percent significance level adding more support for the acceptance of the first research hypothesis.

Table 7: Industry-beta CAPM -adjusted initial returns of IPOs

N	Min	Max	Median	Mean	Std. Deviation	t-value
74 ^ˆ	-0,447	1,199	0,052	0,1165***	0,302	3,322
72 ^{ˆˆ}	-0,447	0,935	0,042	0,0872***	0,248	2,987

*** Statistically significant at 1 % significance level

^ˆ Outliers included

^{ˆˆ} Basware and Data Fellows excluded

Fama-French Model –Adjusted Returns

Firstly it is good to point out that the Fama-French model quite well explains the stock returns of some size and book-to-market groups in the Finnish stock market. The R square of all the six regressions is the highest for the regression representing BIG SIZE/LOW B/M companies with a value of 0,97. This means that during 1987–2005, the model is able to explain 97 percent of the returns of the portfolio constructed by B/M group. Instead, the number is the lowest for the regression representing BIG SIZE/MEDIUM B/M companies with a value of 0,73. In overall, the R square is between 0,9 and 1,0 in two regressions, between 0,8 and 0,9 in one regression whereas the number is between 0,7 and 0,8 in three regressions. Entirely, the explanatory power of

the model is not; however, as superior as Davis et al. (2000) documented it to be for the analysis of US stock market.

For taking the final step to accept the first research hypothesis, the t-test is made for Fama-French model –adjusted initial returns. The test results show that the mean doesn't be substantially changed, but the median drops clearly being now only under two percent in both the cases. This implies that the dominating effect of the outliers is the greatest when Fama-French three-factor model is used to explain the underpricing of Finnish IPOs. The median does not, however, clearly drop when excluding two outliers. The t-test results report that the mean is statistically significant at one percent significance level clearly suggesting the acceptance of the first research hypothesis. Table 8 reports the results.

Table 8: Fama-French model -adjusted initial returns of IPOs

N	Min	Max	Median	Mean	Std. Deviation	t-value
79 ^ˆ	-0,365	1,251	0,017	0,1152***	0,302	3,386
77 ^{ˆˆ}	-0,365	0,977	0,016	0,0863***	0,246	3,082

*** Statistically significant at 1 % significance level

^ˆ Outliers included

^{ˆˆ} Basware and Data Fellows excluded

Initial Performance of IPOs - Summary

The results of initial returns using four comparable benchmarks clearly suggest that Finnish IPOs are on average underpriced. Despite the model, the average initial returns are positive and statistically significant at one percent significance level. Notwithstanding, the medians of initial returns are in every case remarkably lower than the means suggesting that the return distributions are skewed. Nevertheless, even after excluding the heaviest outliers, the t-tests imply that the means remain statistically significant at 1 % significance levels in all the cases. All the results therefore suggest the acceptance of the first research hypothesis and thus H_1 is accepted. Therefore, consistently with Le-

htinen (1992) and Keloharju (1993) and many other international studies, Finnish IPOs are underpriced. The underpricing occurs irrespective of the underlying model.

7.2. Long-Run Performance of IPOs

The second research hypothesis considers that Finnish IPO stocks perform poorly in the long-run. In order to verify this hypothesis, the t-test is run for the cumulative average abnormal returns of all the four benchmarks for every six specified periods in the after-market.

H_2 : Post-IPO stocks produce poor returns in the long-run.

Market-Adjusted Returns

Firstly, the tests are made for market-adjusted returns. The results clearly report the existence of long-run underperformance when measuring the effect with market-adjusted returns. The mean is statistically significant at some used significance level in all the periods with one exception. After 6 months, the logarithmic-transformed cumulative average abnormal return is about -12,4 percent being already statistically significant at one percent significance level. The 12-month cumulative average abnormal return is not, however, statistically significant when outliers are excluded whereas it is at 10 % level when not excluding the outliers. 18-month cumulative average abnormal return is significant at 5 % significance level whether or not excluding the outliers. 24-, 30- and 36-month mean abnormal returns are statistically significant at one percent significance level, although excluding outliers, if any exist.

A further analysis exhibits again that the returns are skewed and deepness of the underperformance measured by market-adjusted returns is probably caused by more extreme values. The median is almost in every case remarkably closer to zero than the mean. When hold-and-buy strategy is used for IPO stocks, the 36-month market-adjusted cumulative average return is however both statistically and economically negative since even after excluding outliers, the logarithmic-transformed 36 CAAR is about -56 percent. This result gives a strong signal to accept the third research hypothesis. Table 9 reports the results obtained from the analysis of the long-run performance of market-adjusted returns.

Table 9: Market-adjusted aftermarket returns of IPOs

T	N	Min	Max	Median	Mean	Std. Dev.	t-value
6	79	-1,530	1,157	-0,085	-0,1244***	0,417	-2,652
12	79 ^ˆ	-3,715	2,266	-0,133	-0,1686*	0,799	-1,875
	78 ^{ˆˆ}	-2,142	2,266	-0,129	-0,1232	0,694	-1,567
18	79 ^ˆ	-3,281	1,745	-0,126	-0,2674**	0,969	-2,452
	78 ^{ˆˆ}	-2,400	1,745	-0,123	-0,2288**	0,912	-2,214
24	78	-3,818	2,448	-0,218	-0,4071***	1,073	-3,349
30	76	-5,119	1,615	-0,416	-0,5644***	1,221	-4,030
36	74 ^ˆ	-4,709	1,725	-0,377	-0,6675***	1,223	-4,696
	72 ^{ˆˆˆ}	-3,881	1,725	-0,372	-0,5565***	1,037	-4,555

* Statistically significant at 10 % significance level

** Statistically significant at 5 % significance level

*** Statistically significant at 1 % significance level

^ˆ Outliers included

^{ˆˆ} Satama Interactive excluded

^{ˆˆˆ} Nedecon and Nobiscum excluded

Traditional CAPM –Adjusted Returns

As seen from table 10, post-IPO returns even more underperform the CAPM model compared to the pure market. The CAARs of all the periods are statistically significant. Furthermore, they are significant at one percent level in all except one case. The CAPM-adjusted logarithmic-transformed abnormal return for 36-month period is about -60 percent on average although when excluding the outliers. These results support also the third research hypothesis which states that the IPOs are poor investments in the long-run.

Evidently, the medians do not differ from means as strongly as they differ from CAARs of market-adjusted returns. This is quite surprising but in fact the finding is consistent with Fama's (1998) and Espenlaub's et al. (2000) conclusions since they reported that the underperformance of IPOs varies from methodology to other. In overall, the results

however suggest that the deepness of the underperformance of Finnish IPOs is higher when the traditional beta is used as a risk factor.

Table 10: CAPM-adjusted aftermarket returns of IPOs

T	N	Min	Max	Median	Mean	Std. Dev.	t-value
6	79	-1,555	0,749	-0,084	-0,1108***	0,370	-2,664
12	79 ^ˆ	-3,667	1,383	-0,145	-0,2499***	0,722	-3,077
	75 ^{ˆˆ}	-1,360	1,383	-0,121	-0,1290**	0,482	-2,317
18	79	-2,801	1,204	-0,216	-0,4007***	0,836	-4,258
24	78 ^ˆ	-3,222	1,064	-0,309	-0,5194***	0,910	-5,043
	77 ^{ˆˆ}	-2,931	1,064	-0,289	-0,4843***	0,861	-4,937
30	76 ^ˆ	-5,210	1,225	-0,517	-0,6589***	1,090	-5,269
	75 ^{ˆˆˆ}	-2,755	1,225	-0,504	-0,5529***	0,882	-5,394
36	74 ^ˆ	-4,818	1,663	-0,669	-0,7146***	1,083	-5,675
	72 ^{ˆˆˆ}	-2,991	1,663	-0,639	-0,6009***	0,849	-6,004

** Statistically significant at 5 % significance level

*** Statistically significant at 1 % significance level

^ˆ Outliers included

^{ˆˆ} EQ, Nedecon, QPR and Satama Interactive excluded

^{ˆˆˆ} Nedecon and Nobiscum excluded

Industry-Beta CAPM –Adjusted Returns

The results of industry-beta CAPM -adjusted aftermarket returns mainly follow the pattern of the results of traditional CAPM -adjusted corresponding returns and thus also support the acceptance of the third research hypothesis. The main difference is that the 6-month CAAR is statistically significant no less than 10 % significance level. The CAAR of every case from 12-month holding period up to 36-month period is statistically significant at one percent significance level. The 36-month logarithmic-transformed CAAR is about -60 percent even after excluding two extreme underperformers.

The means of industry-beta CAPM -adjusted CARs are, similarly to the means of traditional CAPM -adjusted CARs, evidently closer to the median than the market-adjusted CARs are. These findings are likely to signal, that taking the market risk factor into account for the analysis of the IPO long-run performance reduces the problems of skewed return distributions. Table 11 includes the results of the analysis of the performance of industry-beta CAPM -adjusted aftermarket returns.

Table 11: Industry-beta CAPM -adjusted aftermarket returns of IPOs

T	N	Min	Max	Median	Mean	Std. Dev.	t-value
6	74	-1,511	1,366	-0,066	-0,0890*	0,424	-1,806
12	74 ^ˆ	-3,487	1,740	-0,196	-0,2590***	0,747	-2,982
	73 ^{ˆˆ}	-2,011	1,740	-0,171	-0,2148***	0,648	-2,834
18	74	-2,600	1,236	-0,408	-0,4256***	0,840	-4,357
24	72	-3,175	1,005	-0,446	-0,5656***	0,916	-5,275
30	71 ^ˆ	-4,712	1,149	-0,498	-0,6754***	1,062	-5,360
	70 ^{ˆˆˆ}	-3,946	1,149	-0,474	-0,6178***	0,951	-5,436
36	70 ^ˆ	-4,846	1,536	-0,633	-0,7538***	1,048	-6,043
	68 ^{ˆˆˆˆ}	-2,941	1,536	-0,603	-0,6445***	0,825	-6,442

* Statistically significant at 10 % significance level

*** Statistically significant at 1 % significance level

^ˆ Outliers included

^{ˆˆ} Satama Interactive excluded

^{ˆˆˆ} Nobiscum excluded

^{ˆˆˆˆ} Nedecon and Nobiscum excluded

Fama-French Model -Adjusted Returns

At the latest the results of the analysis of Fama-French aftermarket abnormal returns exhibit that, consistently with Espenlaub's et al. (2000) results of UK IPOs, also the aftermarket performance of Finnish IPOs is dependent on the choice of the method. When FF model is used as a benchmark, IPOs do not statistically significantly underperform

up to 12 months. 18-month CAAR instead is, statistically significant at 5 % significance level. Even 36-month CAAR is significant no less than at 5 % significance level when outliers are excluded. Furthermore, all the CAARs are substantially closer to zero compared to corresponding returns of other benchmarks. However, the results suggest that although the Fama-French three factor model is used, Finnish IPOs are poor investments in the long-run, consistently with the third hypothesis of the study. The 36-month logarithmic-transformed CAAR is about -31 percent and thus also economically significant. Table 12 summarizes the results of Fama-French model –adjusted aftermarket returns of Finnish initial public offerings.

Table 12: Fama-French model -adjusted aftermarket returns of IPOs

T	N	Min	Max	Median	Mean	Std. Dev.	t-value
6	79	-1,445	1,770	-0,022	-0,0241	0,446	-0,480
12	79 ^ˆ	-3,766	1,995	-0,008	-0,1167	0,783	-1,324
	77 ^{ˆˆ}	-2,283	1,440	-0,008	-0,097	0,628	-1,350
18	79	-3,044	1,454	-0,002	-0,2287**	0,848	-2,398
24	78	-2,799	1,611	-0,031	-0,3102***	0,872	-3,142
30	76	-3,875	1,436	-0,087	-0,3692***	1,058	-3,041
36	74 ^ˆ	-4,121	1,451	-0,089	-0,3933***	1,120	-3,021
	73 ^{ˆˆˆ}	-3,338	1,451	-0,064	-0,3051**	0,994	-2,603

** Statistically significant at 5 % significance level

*** Statistically significant at 1 % significance level

^ˆ Outliers included

^{ˆˆ} Aldata and Satama Interactive excluded

^{ˆˆˆ} Nedecon and Nobiscum excluded

The medians of Fama-French CARs are in every case more moderate compared to the means, being always less than 10 percent negative. This implies that when explaining the risk (i.e. variation) of return, compared to CAPM models, with two additional components, the problems of skewed distributions tend to increase. The model is, however, able to better explain the long-run underperformance puzzle compared to CAPM mod-

els. This indicates also that a part of the phenomenon can be explained with two other commonly accepted anomalies. Although consistently with Brav's et al. (1997) results in US, the deepness of the long-run underperformance is weaker when Fama-French model is used, in contrast with their results, the phenomenon does not seem to completely disappear when the model is utilized.

Long-Run Performance of IPOs - Summary

Figure 8: The long-run underperformance of Finnish IPOs

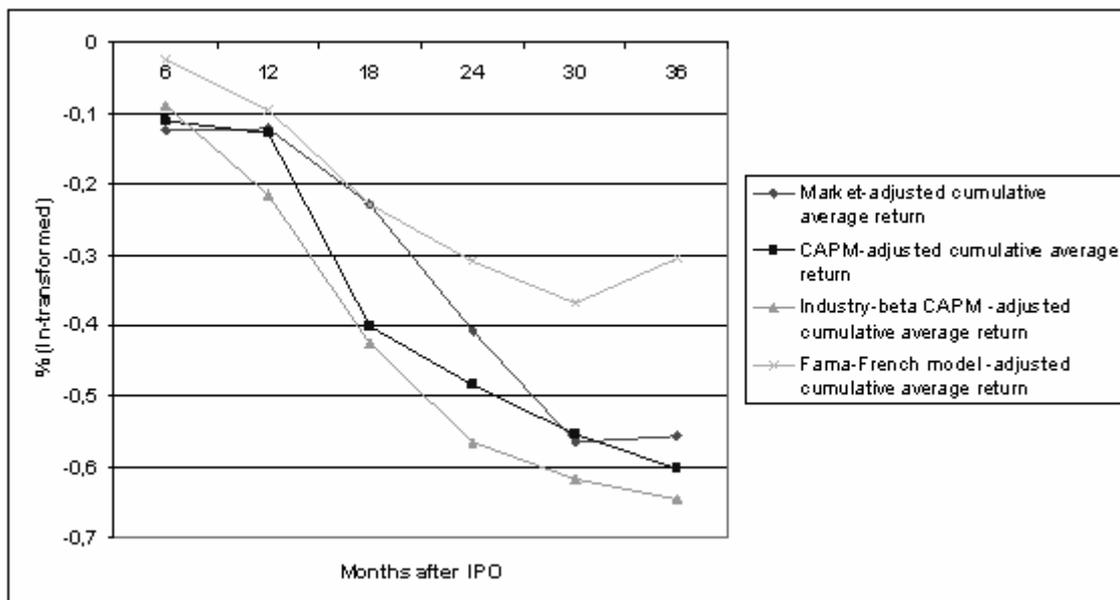


Figure 8, which summarizes the findings of the analysis, shows that irrespective of the model, Finnish IPOs underperform the benchmark. Furthermore, the tests being utilized exhibit that the 36-month cumulative average abnormal return is statistically significant using any of the four benchmarks. Therefore the second research hypothesis is clearly accepted. The deepness of the underperformance is however dependent on the model with which the abnormal return is measured and thus the long-run underperformance anomaly in Finland seems, consistently with Fama's (1998) conclusion, partly to be due to underlying methodology. The Fama-French model produces both economically and statistically the most moderate return pattern in the long-run. The 36-month Fama-French CAAR is however statistically significant at 5 percent level whereas other corresponding returns are significantly different from zero at one percent level. Furthermore,

the Fama-French return between 30 and 36 months is even positive. Moreover, CAPM models generate the poorest post-listing returns in the long-run. Furthermore, the traditional CAPM- and industry-beta CAPM –models generate the least skewed return distributions.

7.3. Industry Effect on Initial Performance

The third research hypothesis assumes that the industry has impact on the IPO initial returns. In order to verify this hypothesis, the regression model is run for the initial abnormal returns obtained from all the four models.

H_3 : The industry has impact on the initial price performance of initial public offerings.

Market-Adjusted Returns

Firstly, the regression is run for market-adjusted initial abnormal returns. The regression results imply that the industry has at least some role, still although a weak, in explaining the market-adjusted initial returns since the R-square is 17,5 %. A less biased meter, adjusted R square, is however only 10 percent. The F-value is 2,34 and thus the model is statistically significant at 5 % significance level. The Durbin-Watson value indicates that there is no autocorrelation in residuals.

The results also indicate that firms including in the industrials, financials and telecommunications & electronics sectors are the best initial performers in the study period when measuring the performance with market-adjusted returns. Instead, materials sector generates lowest, even negative average initial return. IT firms, after excluding two superior initial performers in this sector, generate even lower initial returns than the average. Companies belonging to consumer discretionary and staples industry generate relatively small, but still positive initial market-adjusted return on average. Nevertheless, no more than the three best performers produce abnormal average initial returns which are statistically significant at used significance levels. The standard errors are the highest for coefficients representing the performance of consumer discretionary & staples and materials industries. That number is the lowest for the coefficient of financial sector suggesting the smallest variation in returns in this group.

In overall, the regression results indicate that the industry is not a superior explainer of IPO underpricing, when measuring the initial performance with market-adjusted returns. However, the industry seems to explain a part of initial market-adjusted returns. There are found three industries that have produced statistically significant average returns. Moreover, no every industry produces positive market-adjusted return. A scale of average initial returns of industries is from -1,8 percent to 18,4 percent. Therefore the results give support for accepting the third research hypothesis. Table 13 illustrates the regression results.

Table 13: Regression results when market-adjusted initial abnormal return is dependent factor

	R²	Adj. R²	F value	D-W	coefficient	Std. Error	t-value
Model	0,175	0,100	2,339**	2,031			
D_{con}					0,023	0,086	0,270
D_{fin}					0,119*	0,062	1,909
D_{ind}					0,184**	0,078	2,368
D_{it}					0,085	0,071	1,186
D_{mat}					-0,018	0,086	-0,205
D_{tel}					0,129*	0,071	1,805

* Statistically significant at 10 % significance level

** Statistically significant at 5 % significance level

$$CAR_{i,T} = \beta_1 D_{con} + \beta_2 D_{fin} + \beta_3 D_{ind} + \beta_4 D_{it} + \beta_5 D_{mat} + \beta_6 D_{tel} + \varepsilon, \text{ Basware and Data Fellows excluded}$$

Traditional CAPM -Adjusted Returns

The regression model is also run for examining possible industry effect in CAPM-adjusted initial returns. The results show that the R square and the adjusted R square are nearly the same compared to the regression results when the market-adjusted initial return is the dependent factor. That indicates that with respect to plain market model, the industry's explanatory power on abnormal returns do not grow when the pure market risk factor is added. The F-value is also nearly the same being significant at 5 % signifi-

cance level. The Durbin-Watson value is above two indicating that there are no autocorrelation in residuals. Table 14 reports the regression results.

Table 14: Regression results when CAPM-adjusted initial abnormal return is dependent factor

	R²	Adj. R²	F value	D-W	coefficient	Std. Error	t-value
Model	0,174	0,099	2,323**	2,013			
D_{con}					0,022	0,076	0,294
D_{fin}					0,066	0,055	1,196
D_{ind}					0,186***	0,069	2,700
D_{it}					0,077	0,063	1,211
D_{mat}					-0,011	0,076	-0,141
D_{tel}					0,121*	0,063	1,909

* Statistically significant at 10 % significance level

** Statistically significant at 5 % significance level

*** Statistically significant at 1 % significance level

$$CAR_{i,T} = \beta_1 D_{con} + \beta_2 D_{fin} + \beta_3 D_{ind} + \beta_4 D_{it} + \beta_5 D_{mat} + \beta_6 D_{tel} + \varepsilon, \text{ Basware and Data Fellows excluded}$$

The results also report that the mean returns of all sectors but financials have remained somewhat the same. Materials sector is again the poorest initial performer with negative return. There is no great difference between market-adjusted and CAPM-adjusted returns in consumer discretionary and staples, it, telecommunications and electronics and industrials sectors, either. Industrials industry is the best performer again. The average initial abnormal return of industrial firms is statistically significant even at 1 % significance level being 18,6 percent on average. In addition to industrial firms, telecommunications & electronics companies generate statistically significant initial returns also when measuring the performance with CAPM. Instead, average returns of other industries are not statistically significant. Inconsistently with market-adjusted returns, the financial sector does not generate statistically significant abnormal average initial return when CAPM is used as a benchmark. The standard errors, in a line with previous fig-

ures, are the highest for coefficients representing consumer discretionary and staples and materials industries and the lowest for the coefficient representing financial sector.

With a data sample of Finnish IPOs, Lehtinen (1992) concluded that there is no significant difference whether or not the risk factor is used in the analysis of initial returns in overall. Although the Student's one-sample t-test, which was exploited earlier, gives some support for Lehtinen's argument, the regression results suggest, however, that the beta has some, although a weak, role for the industry-specific review of these returns.

Industry-Beta CAPM –Adjusted Returns

The regression is also run for industry-beta CAPM -adjusted initial returns. There is not, again, substantial difference between R square or adjusted R square of the industry-beta CAPM regression and corresponding figures of other regressions. The F-value is likewise almost the same and significant at 5 % significance level. The Durbin-Watson value indicates again that there is no autocorrelation in regression residuals. An industry-specific review, as regards, supports the acceptance of the third research hypothesis.

When used industry-beta as a risk proxy of CAPM model, industrial firms are the best performers again. They produce on average 18 percent initial abnormal returns when industry-beta CAPM is used as a measure of abnormal returns. This return is statistically significant at five percent significance level. The abnormal average initial return of financials sector is turned into statistically significant at 10 % significance level. Because the corresponding return is not statistically significant when ordinary CAPM is used, it can be concluded that the single company betas of the sector are on average higher than the estimated industry beta. However, the resulting abnormal average industry-beta CAPM -adjusted initial return of that sector is only slightly lower than corresponding market-adjusted return.

Furthermore, telecommunications and electronics industry produces also over ten percent abnormal initial returns, being statistically significant at 10 % significance level. Both information technology and consumer discretionary & staples sectors generate almost similar abnormal average returns compared to ordinary CAPM figures, both being statistically insignificant at any used significance level. In addition, the abnormal average return of companies including into materials industry is over -5 percent being however statistically insignificant. This implies that the industry-beta of this sector is higher than the ordinary company betas in overall. Furthermore, the same pattern is found in

standard errors. The deviation of the returns is therefore the lowest in financial group and the biggest in consumer discretionary and staples and materials industries. Table 15 reports the regression results.

Table 15: Regression results when industry-beta CAPM -adjusted initial abnormal return is dependent factor

	R²	Adj. R²	F value	D-W	coefficient	Std. Error	t-value
Model	0,181	0,107	2,434**	1,990			
D_{con}					0,018	0,082	0,220
D_{fin}					0,107*	0,060	1,793
D_{ind}					0,180**	0,074	2,419
D_{it}					0,085	0,068	1,237
D_{mat}					-0,052	0,082	-0,630
D_{tel}					0,129*	0,068	1,888

* Statistically significant at 10 % significance level

** Statistically significant at 5 % significance level

$$CAR_{i,T} = \beta_1 D_{con} + \beta_2 D_{fin} + \beta_3 D_{ind} + \beta_4 D_{it} + \beta_5 D_{mat} + \beta_6 D_{tel} + \varepsilon, \text{ Basware and Data Fellows excluded}$$

Fama-French Model –Adjusted Returns

When Fama-French model -adjusted initial return is used as dependent factor in the regression, the results report the greatest R² (even adjusted) of all of the four regressions. The difference is not, however, noteworthy large to conclude that the explanatory power of the model would be significantly better when Fama-French model is used in calculation of the abnormal initial returns. The F-value is again significant at 5 % significance level. Moreover, the Durbin-Watson value moderately suggests that no autocorrelation exists in residuals.

By the way, the regression results mainly follow the same pattern. The coefficient of dummy variable for the industrials industry is the same than it is in the previous regression. Telecommunications & electronics industry produce now slightly smaller initial

return. The statistical significance of these two variables is however remained the same being significant at 5 % and 10 % significance levels, respectively. Financial companies produce their highest initial return when the three-factor model is used being statistically significant at 5 % significance level. Other coefficients imply no great difference compared to earlier results. Materials sector is again the poorest performer with -4,4 percent Fama-French model -adjusted initial return whereas IT companies produce an average under the mean, and consumer discretionary and staples firms generate slightly positive abnormal returns on average. The returns of these performers are not, however, statistically significant, either. The pattern of the standard errors is also remained the same compared to the other regressions. Table 16 presents the regression results.

Table 16: Regression results when Fama-French model -adjusted initial abnormal return is dependent factor

	R²	Adj. R²	F value	D-W	coefficient	Std. Error	t-value
Model	0,184	0,110	2,483**	1,754			
D_{con}					0,007	0,084	0,087
D_{fin}					0,135**	0,061	2,207
D_{ind}					0,180**	0,076	2,372
D_{it}					0,079	0,070	1,124
D_{mat}					-0,044	0,084	-0,525
D_{tel}					0,118*	0,070	1,688

* Statistically significant at 10 % significance level

** Statistically significant at 5 % significance level

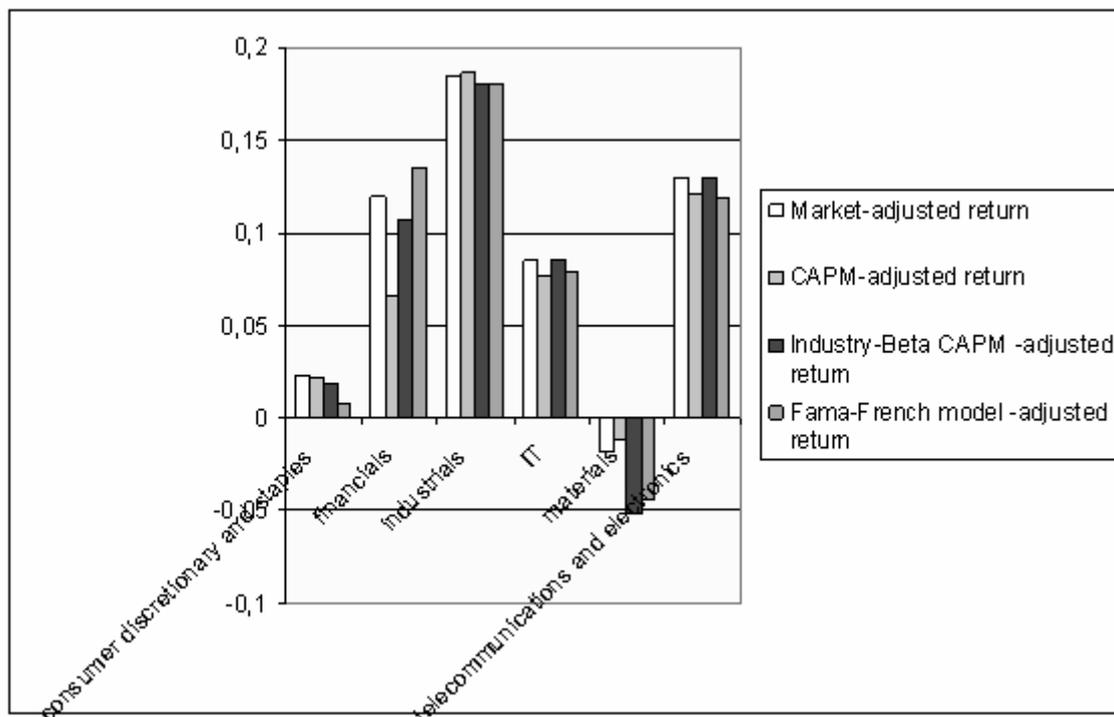
$$CAR_{i,T} = \beta_1 D_{con} + \beta_2 D_{fin} + \beta_3 D_{ind} + \beta_4 D_{it} + \beta_5 D_{mat} + \beta_6 D_{tel} + \varepsilon, \text{ Basware and Data Fellows excluded}$$

Industry Effect on Initial Performance – Summary

The results of four regressions indicate that although the industry seems not to be a superior explainer of IPO underpricing, it can explain a part of the variation in the initial returns. Industrial companies are on average the best performers when utilizing any of the four differing benchmarks, being statistically significant at least 5 % significance

level in every case. Telecommunications and electronics companies produce about 12 percent initial abnormal return on average, despite the method, being in every case statistically significant at 10 % significance level. Moreover, financial firms produce statistically significant abnormal initial return in three of four cases. Instead, IT companies do not, perhaps quite surprisingly, perform better than other companies in overall when two superior performers are excluded from the analyses as outliers. Materials sector seems to be the poorest performer in the immediate aftermarket since despite the model the sector is the only one which generates negative initial mean return. Consumer discretionary and staples industry generates the most moderate but still positive initial average return despite the underlying method. The third research hypothesis is accepted since the results in overall clearly suggest that some industries generate higher initial returns than others. Figure 9 illustrates the inter-industry variation of average abnormal initial returns.

Figure 9: Initial average abnormal returns by method and industry



It is important to point out that the same pattern in standard errors is found in all of the four regressions. The standard errors imply that irrespective of the underlying model, deviation of the returns is the lowest in financial group. This implies that financial com-

panies generate somewhat steadier initial returns with respect to others being significantly positive in three of four analyses being probably due to prevailing “hot issue” season when majority of the IPOs in the sector were conducted. Other interesting point is that the two poorest initial performers; consumer discretionary & staples and materials sectors, have in every case the highest deviation in initial returns. This finding implies that there are both remarkably better and also remarkably poorer initial performers in these sectors.

It is still questioned why the underpricing effect exists by the initial returns of some certain industries. The initial returns of telecommunications & electronics as well as financials sectors can be probably explained by prevailing booms when majority of the IPOs of these industries were conducted. Instead, quite surprisingly, IT companies, after excluding two outliers belonging to the industry, do not, irrespective of the model, generate initial average returns that would exceed the means of overall IPOs. Very interesting point is that quite surprisingly, industrial firms, despite the underlying benchmark; generate the greatest initial returns on average. Noticeable is that in this sector, IPOs were conducted steadily through the study period.

7.4. Industry Effect on Long-Run Performance

The fourth research hypothesis states that the industry has impact on the IPO long-run performance. The regression is run for all the 36-month CARs to examine whether this hypothesis holds.

H_4 : The industry has impact on the long-run price performance after initial public offerings

Market-Adjusted Returns

The regression results of the analysis of market-adjusted CARs indicate that the industry remarkably better explain the variation of aftermarket market-adjusted returns of IPO companies compared to explanatory power of corresponding initial returns. Both the adjusted and non-adjusted R squares are over 43 percent indicating that the industry can explain over 43 percent of the long-run underperformance. The F value implies also that the model is significant being statistically significant at one percent significance level. However, the Durbin-Watson test value reports that there may be autocorrelation in the

residuals. This is on the other hand understandable taking the nature of the model into account. Nevertheless, the existing autocorrelation could bias the results.

The results report that consumer discretionary and staples industry is the best performer in the long-run when measuring the performance with market-adjusted returns. The 36-month average return of that industry is even positive suggesting no IPO long-run underperformance in this industry. The coefficient, however, is statistically insignificant. However, the standard error is the greatest just for that sector indicating large variability of returns in the group. Industrials industry, instead, generates slightly negative market-adjusted average return being likewise statistically insignificant. Materials sector produces about -33 percent return, but that is not statistically significant. Financial companies generate negative 36-month average return which is statistically significant at ten percent significance level. Both the high-technology industries, instead, produce negative 36-month average returns that are statistically significant at one percent significance levels. Companies including in IT group, perform on average still remarkably poorer than firms belonging to telecommunications and electronics sector. Noticeable is that the standard errors of coefficients for financials and IT groups are lowest indicating that the variation between returns is smaller in these groups compared to others. Table 17 summarizes the regression results.

These results are in a contrast with Keloharju's (1993) study. Keloharju measured the aftermarket performance with market-adjusted returns and reported that the industry has no impact on the long-run underperformance of Finnish IPOs. However, it is good to point out that there are some important differences between this thesis and Keloharju's investigation. Firstly, Keloharju's data consisted mainly of OTC companies. This thesis does not include them, due to data unavailability. The second difference is the study period. Keloharju's data sample was from 1985–1989 since this thesis contains IPOs from 1987 to 2002. Thus, the results are probably not straight comparable with others. In overall, the results of the regression support for the acceptance of the fourth research hypothesis.

Table 17: Regression results when market-adjusted 36-month cumulative abnormal return is dependent factor

	R²	Adj. R²	F value	D-W	coefficient	Std. Error	t-value
Model	0,485	0,435	9,743***	1,159			
D_{con}					0,018	0,316	0,056
D_{fin}					-0,430*	0,231	-1,861
D_{ind}					-0,011	0,270	-0,040
D_{it}					-1,510***	0,239	-6,316
D_{mat}					-0,334	0,298	-1,121
D_{tel}					-1,004***	0,270	-3,712

* Statistically significant at 10 % significance level

*** Statistically significant at 1 % significance level

$$CAR_{i,T} = \beta_1 D_{con} + \beta_2 D_{fin} + \beta_3 D_{ind} + \beta_4 D_{it} + \beta_5 D_{mat} + \beta_6 D_{tel} + \varepsilon, \text{ Nedecon and Nobiscum excluded}$$

Traditional CAPM –Adjusted Returns

When taking the traditional CAPM –adjusted 36-month CAR as the dependent factor of the regression, the model gives results that the explanatory power of the model even grows being 64,4 or 58,7 percent depending whether the ordinary or adjusted R square is selected as a measure of explanatory power. The F value is again significant at one percent significance level. The Durbin-Watson test value moderately states that the residuals are not autocorrelated in this case.

Consumer discretionary and staples sector is the best performer also when CAPM is used. The firms in this industry produce on average 12,4 percent logarithmic-transformed CAPM-adjusted return during following 36 months after IPOs. The variation of returns is again, however, largest in this group. The 36-month average return of the sector is not, however, statistically significant. Material companies perform better compared to previous results producing a negative, but still weaker average return compared to market-adjusted corresponding return. In this case industrials sector produces a negative average return which is statistically significant at ten percent significance level. Furthermore, the results report that the underperformance of financial firms is remarka-

bly deeper when a risk factor is taken into account in terms of CAPM. The 36-month mean returns of both the hi-tech industries are in a line with the market-adjusted figures. Both of them are statistically significant at one percent level, again. It is good to notice that again the coefficients of financials and IT dummies have the lowest standard errors. This implies that the variation of the returns is the smallest in these groups even if CAPM is used in order to take a risk factor into account. In overall, these results add support for the acceptance of the fourth research hypothesis. Table 18 consists of the regression results associated with 36-month CAPM-adjusted CARs.

Table 18: Regression results when traditional CAPM -adjusted 36-month cumulative abnormal return is dependent factor

	R²	Adj. R²	F value	D-W	coefficient	Std. Error	t-value
Model	0,624	0,587	17,118***	1,669			
D_{con}					0,124	0,239	0,520
D_{fin}					-0,648***	0,174	-3,713
D_{ind}					-0,344*	0,204	-1,687
D_{it}					-1,416***	0,181	-7,843
D_{mat}					-0,099	0,225	-0,439
D_{tel}					-1,000***	0,204	-4,909

* Statistically significant at 10 % significance level

*** Statistically significant at 1 % significance level

$$CAR_{i,T} = \beta_1 D_{con} + \beta_2 D_{fin} + \beta_3 D_{ind} + \beta_4 D_{it} + \beta_5 D_{mat} + \beta_6 D_{tel} + \varepsilon, \text{ Nedecon and Nobiscum excluded}$$

Industry-Beta CAPM –Adjusted Returns

Taking industry-beta CAPM –adjusted 36-month CAR as dependent factor for the regression, the regression results exhibit that the explanatory power of the model is over 50 percent also in this case. The F value is significant at one percent significance level. The Durbin-Watson value for its part implies that there is no autocorrelation in residuals in this case, either.

Consumer discretionary and staples industry generates a slightly positive 36-month industry-beta CAPM -adjusted average return. Instead, all rest of the industries produce negative corresponding returns, which all are statistically significant at some used significance levels. Hi-tech industries are again the poorest long-run performers with average returns that are statistically significant at one percent level. These industries perform however slightly better compared to traditional CAPM results. Differing from CAPM results, material companies produce both economically and statistically significant negative return when industry-beta CAPM is used. Interestingly, a same phenomenon concerning the standard errors is found also in the results of this regression. The standard error is the highest for the group of consumer discretionary and staples companies and the lowest for the group of financials and IT firms. In addition to giving support for the acceptance of the fourth research hypothesis, these results together with CAPM ones imply that the results of the industry-specific review are different between analyses in which the market risk factor is and is not included. Furthermore, the results indicate that the industry better explains the variation of the long-run underperformance when this kind of risk factor is used. The regression results are summarized in table 19.

Table 19: Regression results when industry-beta CAPM -adjusted 36-month cumulative abnormal return is dependent factor

	R²	Adj. R²	F value	D-W	coefficient	Std. Error	t-value
Model	0,571	0,530	13,772***	1,743			
D_{con}					0,016	0,253	0,063
D_{fin}					-0,314*	0,184	-1,703
D_{ind}					-0,445**	0,215	-2,067
D_{it}					-1,387***	0,191	-7,262
D_{mat}					-0,567**	0,238	-2,429
D_{tel}					-0,883***	0,215	-4,100

* Statistically significant at 10 % significance level

** Statistically significant at 5 % significance level

*** Statistically significant at 1 % significance level

$$CAR_{i,T} = \beta_1 D_{con} + \beta_2 D_{fin} + \beta_3 D_{ind} + \beta_4 D_{it} + \beta_5 D_{mat} + \beta_6 D_{tel} + \varepsilon, \text{ Nedecon and Nobiscum excluded}$$

Fama-French Model –Adjusted Returns

When running a regression for the Fama-French model –adjusted CARs, it is firstly good to point out that both R squares are near to the numbers of the regression of market-adjusted CARs and far from the figures of CAPM models. Implicitly, this is not surprising since two additional factors explain the variation of stock returns in the Fama-French model. Thus, the explanatory power of the industry is not so strong compared to CAPM models which have only one risk factor. The F value is however significant at one percent level indicating that the model is statistically significant. The Durbin-Watson value clearly indicates that there is no autocorrelation in the regression residuals. Table 20 exhibits the regression results.

Table 20: Regression results when Fama-French model -adjusted 36-month cumulative abnormal return is dependent factor

	R²	Adj. R²	F value	D-W	coefficient	Std. Error	t-value
Model	0,472	0,421	9,248***	1,859			
D_{con}					0,490*	0,282	1,735
D_{fin}					0,191	0,206	0,928
D_{ind}					0,006	0,241	0,025
D_{it}					-1,241***	0,213	-5,813
D_{mat}					-0,071	0,266	-0,281
D_{tel}					-1,014***	0,389	-4,213

* Statistically significant at 10 % significance level

*** Statistically significant at 1 % significance level

$$CAR_{i,T} = \beta_1 D_{con} + \beta_2 D_{fin} + \beta_3 D_{ind} + \beta_4 D_{it} + \beta_5 D_{mat} + \beta_6 D_{tel} + \varepsilon, \text{ Nedecon and Nobiscum excluded}$$

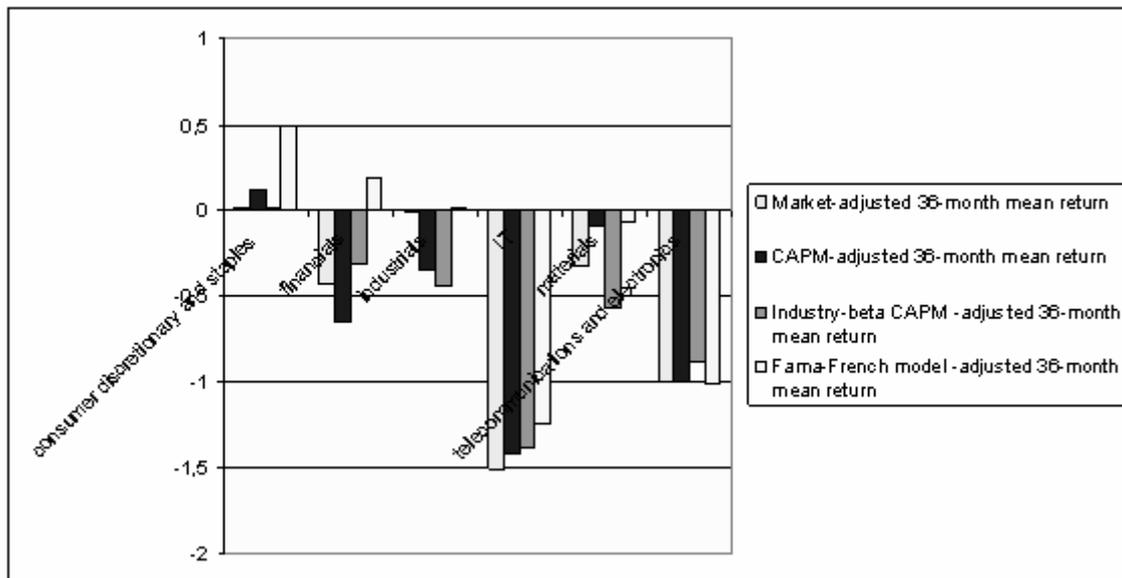
The results indicate that when utilizing a model which takes into account two anomalies associated with company sizes and book-to-market figures, there are even industries that generate statistically significant positive average returns. In particular, consumer discretionary and stables industry generates almost 50 percent logarithmic-transformed return during the 36 months following the IPO event when the Fama-French return is used as

the benchmark. On average, financial and industrial firms do not underperform the benchmark, either, but on the other hand, they do not generate statistically significant 36-month mean returns. Material firms slightly underperform, but not statistically significantly. Instead, hi-tech firms produce again the poorest returns. The 36-month average returns of both the groups are statistically significant at one percent significance level. IPOs of both of these industries seem therefore to be very poor investments in the long-run, irrespective of the underlying model. The standard error is the highest in telecommunications and electronics group. Instead, it is the lowest again in financials and IT groups. In overall, the results verify that the long-run underperformance is dependent on the industry also when measuring the performance with the Fama-French model.

Industry Effect on Long-Run Performance – Summary

The industry-specific analysis indicates that there are found industries that generate exceptional poor 36-month mean returns. In particular, the hi-tech industries, both IT sector and telecommunications & electronics industry, generate both statistically and economically significant 36-month average abnormal returns despite the underlying method. Financials sector, instead, generates on average statistically significant 36-month return in three of four cases. Instead, the 36-month average return of financials companies, adjusted for different company sizes and book-to-market figures, is even positive, not however significantly. The 36-month mean return of industrials industry is statistically significant in two of four cases whereas materials industry produce significantly negative mean return in one case. It is worthwhile to point out that no more than three industries generate on average negative 36-month returns when the Fama-French model is used as a benchmark. Moreover, only two of these figures are statistically significant. Consumer discretionary and staples industry generates even statistically significant positive 36-month mean return when that model is utilized.

Furthermore, some industries do not perform poorly in the long-run implying that the industry effect exists in the IPO aftermarket returns. In particular, consumer discretionary and staples industry generates positive 36-month average return irrespective of the underlying method. When taking different market- and book-to-market figures into account, the long-run underperformance occurs statistically significantly only in the high-tech industries. All the results therefore suggest that the industry affect the IPO long-run underperformance and thus the fourth research hypothesis is accepted. Figure 10 summarizes the sectoral variation of 36-month average returns.

Figure 10: The long-run performance of IPOs by method and industry

An interesting point is that consumer discretionary & staples industry does not produce very substantial initial returns. In fact, this finding is somewhat in a line with the fads hypothesis which claims that the poorest initial performers generate the highest returns in the long-run. However, the finding is totally inconsistent with Young's et al. (1988) conclusion since they documented that significant initial performers produce better returns in the long-run. Moreover, the 36-month average return of telecommunications and electronics industry can also be partly explained with the fads hypothesis, proposed by Shiller (1990). The observed underperformance in financials, industrials and materials industries can very likely be due to the different company sizes and book-to-market values since the underperformance in these sectors seems to disappear when utilizing a model which takes these figures into account.

An important point is that when utilizing the FF model, only the high-tech industries statistically underperform the benchmark. Again, it is reasonable to ask whether the underperformance of these sectors is only due to the occurring blow-outs of the bubbles after the prevailing booms in these sectors. Interesting point is that the standard errors are the lowest for coefficients representing the performance of financials and IT sectors. Since majority of financials IPOs were conducted during financial boom in the latter part of 1980s' and majority of IT firms during IT boom in the change of the millennium, the smallest standard errors probably imply that majority of the firms of these sectors

behaved moderately similarly as other companies of these sectors. The finding might probably explain the existence of the underperformance in these industries. Moreover, since Fama-French model shows no underperformance in others than high-tech industries, the whole IPO underperformance in Finnish stock market may probably be explained with blow-outs of bubbles in certain sectors and anomalies related to different market capitalizations and book-to-market values.

8. SUMMARY AND CONCLUSIONS

The purpose of this study was to investigate the behavior of stock returns after initial public offerings and to examine whether the industry has any impact on these returns. The study was based on the efficient market theory which states that nobody can consistently pick up exceptional returns in stock markets. However, many earlier studies have empirically verified that IPO markets are not efficient in this sense. Firstly, initial public offerings are on average associated with abnormally high initial returns. Secondly, they usually are poor investments in the long-run. Furthermore, there have been found hot issue seasons when initial public offerings are even more underpriced than “normally”. The study utilized four comparable benchmarks in order to examine whether these effects appear in Finland and what is the impact of the industry on these phenomena.

In spite of using the four comparable benchmarks to investigate the underpricing phenomenon, the results clearly suggested that Finnish IPOs had been underpriced during study period since the calculated initial returns adjusted with all the benchmarks were statistically significant at one percent significance level. The method had still some impact on the industry-specific review. Therefore, it seems that the strategy to sell the IPO stocks in the immediate aftermarket has provided superior gaining opportunities for IPO purchasers. The best initial returns existed, quite surprisingly, in the industrials sector. Telecommunications and electronics sector produced statistically significant initial return despite the method as well. The initial return of financials industry, instead, was statistically significant in three of four cases. Other industries, even IT after excluding two extreme outliers, did not generate statistically significant initial return in any cases. However, it is noticeable that the initial return of materials industry was negative in all the cases. No adequate explanation was found for the underpricing mystery. Nevertheless, initial abnormal returns of high-tech and financial industries could probably be partly explained with hot issue seasons whereas negative initial returns on materials sector probably derive from the nature of the industry, since investing in this traditional sector has not probably been as attractive as in other industries.

It was also found that Finnish IPOs underperformed all the benchmarks in the long-run. However, the deepness of the underperformance was dependent on the underlying model. The results suggested that part of the underperformance anomaly is due to two prevailing anomalies since the underperformance was clearly more moderate when the Fama-French three factor model was used as the benchmark. Industry-beta CAPM – adjusted returns generated the poorest performance in the long-run. Further analysis in-

dicated that the high-tech industries were the only sectors that statistically significantly underperformed all the benchmarks. Financials industry underperformed three of the four benchmarks in the long-run. Instead, consumer discretionary and staples industry produced a positive 36-month return in all the cases being even statistically significant when the Fama-French model was utilized. Noticeable is that only the high-tech sectors underperformed the FF model.

So, the industry-specific review showed that the long-run underperformance of Finnish IPOs might probably be explained with blow-outs of bubbles and patterns in market capitalizations and book-to-market values. It seems that these anomalous patterns might wholly explain the long-run underperformance of initial public offerings in Finnish stock market. In order to obtain further evidence for this argument, it should be possible to compare the performance of IPO stocks with non-issuing stocks in the high-tech sectors during the market crash. Since virtually all of the companies in IT sector had gone public during the IT boom, thus sharing the market crash, this kind of analysis would not be possible for IT stocks. Instead, this kind of analysis could probably be possible for companies belonging into telecommunications and electronics sector. Therefore further investigation could examine whether there was difference between the returns on non-issuing stocks and IPO stocks in telecommunications and electronics sector during the bubble blow-out at the beginning of the current millennium.

Since previous studies present that the long-run underperformance is associated with seasoned equity offerings as well, further investigation could also examine the industry effect on SEOs. The paper could utilize several benchmarks to analyze the impact of the methodology on possible outcomes. It would be also interesting to see whether the same impact of the figures of market capitalizations and book-to-market values exist on seasoned equity offerings and if these patterns could therefore explain the possible existence of the underperformance of SEOs as well. Furthermore, the industry effect on IPOs in other European countries could also be a target for a further study.

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APPENDIX I

Listing requirements in Helsinki Stock Exchange (OMX Exchange 2006b).

	MAIN LIST "blue chip"	I LIST mid cap	NM LIST "growth companies"
Share	Reliable price formation - sufficient demand and supply. Shares freely transferable		
Ownership	Public holdings 25% of listed shares and 10% of all votes. 500 owners each owning at least a round lot.	Public holdings 15% of listed shares	Public holdings 15% of shares or at least 10 % and plan of expansion within 3 years
Share capital and own capital	Share capital 2 million euros and equity capital 4 million euros		
Market value	35 million euros	4 million euros	2 million euros
Financial status	Sufficient profitability, solvency and ability to distribute dividends	Sufficient profitability and operating capital to liquid assets ratio	Sufficient operating capital and well-founded estimate on the development of profitability, solvency and ability to distribute dividend
Operating history, business area at listing	At least 3 audited financial statements	At least 2 audited financial statements	At least 1 audited financial statement. Initial public offering if operating history less than 2 years. Major owner lock-up if operating history less than 3 years
Administration	The administration, result monitoring, risk management, and company disclosure of the company and the liability relations relating thereto have been arranged in an appropriate manner taking into consideration the nature and scope of the operations of the company and so that the company has prerequisites for producing reliable and sufficient up-to-date information on the development of the operations and the financial status of the company		
Rules	Rules of the stock exchange	Rules of other public trading	
Listing decision	Listing committee		
Non-ETA company	Share listed in domestic stock exchange	Share listed in ETA state or market-making agreement for the share	

APPENDIX II**Data sample used in the study**

IPO YEAR	COMPANY	INDUSTRY
1987	OP-Rahoituskeskus	Financials
1987	STS-Invest	Financials
1988	Julius-Tallberg Kiinteistöt	Financials
1988	YIT-kiinteistöt	Financials
1988	Op-Sijoitus	Financials
1988	Suomen Kiinteistöinvestointi	Financials
1988	Interavanti	Financials
1988	Siltasaari-Invest	Financials
1988	Valmet	Industrials
1988	Outokumpu	Materials
1988	Yrityspankki SKOP	Financials
1988	Citycon	Financials
1988	Itikka-Lihabotnia	Consumer discretionary and staples
1989	Interbank	Financials
1989	Investa	Financials
1989	OKO A	Financials
1989	Starckjohann	Materials
1989	Stromsdal	Materials
1989	Fazer musiikki	Consumer discretionary and staples
1989	Rautaruukki	Materials
1989	Nobiscum	Financials
1994	Raute	Industrials
1994	Kemira	Materials
1994	Espoon Sähkö*	
1995	Nokian Renkaat	Consumer discretionary and staples
1995	Suunto	Consumer discretionary and staples
1995	Rauma	Industrials
1995	Neste*	
1996	KCI Konecranes	Industrials

1997	PK Cables	Industrials
1997	Nordic Aluminum	Materials
1997	Kyro	Industrials
1997	Rocla	Industrials
1997	Elcoteq Network	Telecommunications and electronics
1997	Jaakko Pöyry	Industrials
1997	Metsä-Tissue	Materials
1998	A-Rakennusmies	Industrials
1998	PMJ Automec	Telecommunications and electronics
1998	Sponda	Financials
1998	JOT Automation Group	Telecommunications and electronics
1998	Exel	Materials
1998	Sonera	Telecommunications and electronics
1998	Rapala	Consumer discretionary and staples
1998	Fortum*	
1999	Janton	Consumer discretionary and staples
1999	Marimekko	Consumer discretionary and staples
1999	TJ Tieto	Information technology
1999	Eimo	Materials
1999	Teleste	Telecommunications and electronics
1999	Stonesoft	Information technology
1999	Nedecon	Information technology
1999	Technopolis Oulu	Financials
1999	Biohit*	
1999	Perlos	Telecommunications and electronics
1999	Sanitec	Consumer discretionary and staples
1999	TH Tiedonhallinta	Information technology
1999	SysOpen	Information technology
1999	Tieto-X	Information technology
1999	Liinos	Information technology
1999	Proha	Information technology
1999	Aldata Solution	Information technology
1999	Data Fellows	Information technology
1999	Comptel	Telecommunications and electronics
2000	BasWare	Information technology

2000	Satama Interactive	Telecommunications and electronics
2000	Saunalahti	Telecommunications and electronics
2000	eQ	Financials
2000	Etteplan	Industrials
2000	Wecan Electronics	Telecommunications and electronics
2000	Tekla	Information technology
2000	Iocore	Information technology
2000	Digital Open Network Environment	Telecommunications and electronics
2000	Biotie Therapies*	
2000	Tecnomen	Telecommunications and electronics
2000	Okmetic	Telecommunications and electronics
2000	Belttan Yhtiot	Consumer discretionary and staples
2000	Vacon	Industrials
2000	SSH Communications	Information technology
2002	QPR Software	Information technology

*Used only in pure tests of the underpricing and the underperformance (hypotheses H_1 and H_2).